



# **ROAD SAFETY COMMITTEE**

## **Inquiry into Serious Injury**

Government Printer for the State of Victoria

May 2014

Parliamentary Paper

No 329 of 2010-2014



Cover Design: Mono Design

Parliament of Victoria

Road Safety Committee

Subject: Inquiry into Serious Injury

ISBN: 978-0-9807166-3-4



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## THE ROAD SAFETY COMMITTEE

The Victorian Road Safety Committee (the Committee) is constituted under the *Parliamentary Committees Act 2003*, as amended.

The Committee comprises five Members of Parliament: four from the Legislative Assembly and one from the Legislative Council.

Section 15 of the *Parliamentary Committees Act 2003*, describes the functions of the Committee:

*The functions of the Road Safety Committee are, if so required or permitted under this Act, to inquire into, consider and report to the Parliament on any proposal, matter or thing concerned with -*

*(a) road trauma;*

*(b) safety on roads and related matters.*

## COMMITTEE ADDRESS

Address:	Parliament House Spring Street East Melbourne, Victoria 3002
Telephone:	+61 3 8682 2846
Facsimile:	+61 3 8682 2818
Email:	<a href="mailto:rsc@parliament.vic.gov.au">rsc@parliament.vic.gov.au</a>
Website:	<a href="http://www.parliament.vic.gov.au/rsc">www.parliament.vic.gov.au/rsc</a>
Twitter:	<a href="http://www.parliament.vic.gov.au/committees">http://www.parliament.vic.gov.au/committees</a>  #rsctee



## COMMITTEE MEMBERS

Mr Murray Thompson MP	Chair
Mr Telmo Languiller MP	Deputy Chair
Mr Andrew Elsbury MLC	
Mr Bill Tilley MP	
Mr Jude Perera MP	

## SECRETARIAT

Ms Kylie Jenkins	Executive Officer until February 2013
Ms Yuki Simmonds	Executive Officer from February 2013
Mr John Aliferis	Research Officer
Ms Christianne Castro	Office Manager



## TERMS OF REFERENCE

That under s 33 the *Parliamentary Committees Act 2003*, the Road Safety Committee is required to inquire into, consider and report no later than 12 December 2013\* on the nature and extent of serious injury in motor vehicle accidents in Victoria and the Committee should:

- (a) determine the appropriate methodology to identify the cost of a serious injury to the Victorian community and economy;
- (b) identify processes, including the exchange of data and information between agencies, that will facilitate accurate, consistent and timely reporting of road related serious injuries;
- (c) consider best practice definitions and measures of road related serious injury and injury severity, and recommend how road related serious injuries and their severity should be identified and reported in Victoria;
- (d) determine the correlation between reductions in fatalities and serious injuries (including for different levels of severity) resulting from different road safety countermeasures;
- (e) identify cost effective countermeasures to reduce serious injury occurrence and severity; and
- (f) identify best practice in managing long term reductions in serious injury including raising the profile of the serious injury burden.

Received from the Legislative Assembly of the 57<sup>th</sup> Parliament, 29 November 2012.

\* The reporting date was extended to 30 June 2014 by the resolution of the Legislative Assembly on Wednesday, 26 June 2013.





## CHAIR'S FOREWORD

In 2013, Victoria recorded its lowest road toll, with 242 deaths, as compared to over a thousand people in the late 1960s and early 1970s. Our success in reducing the road toll has been achieved through a collaborative approach. The community, the Parliament, dedicated road safety experts, academics from diverse policy areas, the media and industry, have collectively been crucial in achieving that success. At the start of this century, however, it has become clear that our focus on fatalities alone has masked the hidden road toll of serious injury. In presenting evidence to the Committee, Associate Professor Stuart Newstead from the Monash University Accident Research Centre, stated that Victorian road safety has had a 'mono-focus' on road fatalities, to the detriment of serious injuries. I strongly agree with this view. More importantly, a growing awareness of the need to tackle serious injuries is shared by other jurisdictions, nationally and internationally.

It is in the context of this new focus on serious injuries that the Committee received the Terms of Reference for this inquiry. The Inquiry has expanded on some of the issues investigated in the Committee's previous *Inquiry into Motorcycle Safety*. In contrast, this inquiry included areas for investigation that are not traditionally identified with road safety. Injury definitions, road crash costs, best practice evaluation and data linkage and exchange are complex areas. While these Terms of Reference appear to be disparate, what links them more broadly to serious injuries is that together they form the key foundations of how we should address the significant burden of road trauma. Without robust foundations, we simply will not achieve meaningful reductions in road crashes, irrespective of how much money we spend, and how many laws we introduce.

A clear conclusion reached early in the Inquiry and reinforced throughout the Committee's investigations was that future decisions about road safety need to be based on the best possible foundations. This begins with best practice injury definitions and data collection processes that provide decision-makers with a comprehensive picture about serious injuries and fatalities, and their impact on individuals and the broader community. In turn, this information, along with the consistent use of best practice evaluations, and robust cost methodologies, should always inform the allocation of government resources into evidence-based policies and interventions. We must know what works, rather than rely on anecdotes, or what we think should, or might, work.

There is also a clear need to shift away from Victoria's traditional approach to road safety and towards working across government. Long-term reductions in serious injuries require innovative thinking, community support, and collaboration between road safety and other government policy areas like public transport, urban planning, justice and health. The strong findings and recommendations in the report reflect these needs and aim to ensure that road safety in Victoria is based on the most robust foundations possible.

Given the nature of the Terms of Reference, the Committee sought out a diverse range of witnesses and experts to guide and inform its investigations. Policy and road safety experts, health professionals, academics, economists, local councils, actuaries, lawyers and others offered their time and expertise to the Committee. I would like to extend my personal gratitude and appreciation on behalf of the Committee for their involvement. Their insights and views helped ensure that the Committee was best placed to deal with the myriad issues raised during the Inquiry.

As we near the end of the 57<sup>th</sup> Parliamentary term, I wish to thank my fellow Committee members for their hard work and inquisitiveness in their investigations, and in the deliberation of this report. That work, which began with the *Inquiry into Motorcycle Safety*, will be completed with the tabling of this report. The Committee's work has been aided by a thoughtful, diligent, industrious secretariat that dealt with the highly complex and technical issues brought to the Committee's attention. I would like to thank Ms Yuki Simmonds, Executive Officer, Mr John Aliferis, Research Officer and Ms Christianne Castro, Office Manager for their excellent work.

It is time for Victoria to focus on serious injuries. I also believe that road safety in Victoria is well placed for the challenges of this new century. The growth of alternative forms of transport, the importance of striving for quantum reductions in trauma, particularly serious trauma, and the possibilities of new ideas, new technologies and new approaches, offer both challenges and opportunities. If we meet and grasp them, then we will ultimately realise the vision of a society where no one is seriously injured or killed on our roads. In my view, this report can guide the refocusing of Victorian road safety towards serious injuries and ultimately, their reduction.

Mr Murray Thompson MP  
Chair, Victorian Parliamentary Road Safety Committee

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## EXECUTIVE SUMMARY

The *Inquiry into Serious Injury* is timely. In the last decade or so, there has been an increasing awareness of the impact and cost of serious injuries from road crashes. For policy and decision-makers in Victoria, this interest has occurred at the same time as a shift in the basis for the development and implementation of road safety initiatives. These changes, which have been driven through the adoption of the Safe System approach in Victoria, nationally and internationally, aim to provide further, consistent reductions in road trauma. Ultimately, the goal of the Safe System approach and road safety more generally, is that no one should be seriously injured or killed on the roads.

Those who work in road safety also recognise that the foundations on which decisions and policies are based, need to be sound. These foundations should comprise accurate and comprehensive road crash data, the use of transparent and best practice approaches to formulating policy solutions to road safety issues, and subjecting these solutions to best practice evaluations to determine their efficacy. It is these foundations that will ensure that public funds are best utilised. In many respects, the Inquiry's Terms of Reference (ToR) have sought to quantify the soundness of these foundations and, where necessary, recommend changes to ensure reductions in road trauma continue to be achieved in the 21<sup>st</sup> century.

This Inquiry required the Committee to investigate a number of distinct policy areas and their associated issues, some of which are not typically dealt with outside a small group of road safety, medical, and regulatory specialists. For example, the areas covered in ToR (a) to (c) relating to the cost of road trauma, data linkage, and serious injury definitions, are areas of complexity and specialisation. The other ToR deal with more traditional road safety areas.

Given the distinct nature of the ToR, the report is separated into three parts, the contents of which are briefly summarised in the following pages.

### **Part One**

Part One of the report comprises four chapters that investigate ToR (b) and (c). These ToR represent the first and most important foundational components to developing road safety policy, including injury definitions and crash data, data reporting responsibilities and data sharing. The first three chapters address ToR (c), beginning with Chapter Two which provides the background to, and explores, the use of serious injury definitions in Victorian road safety, their importance, and benefits and issues with the current approach. The chapter concludes with a need for change in the way crash related serious injury is defined, and how such data is collected, shared and reported. It draws attention to the link between an enhanced road crash data system and the reporting of that data, as a contributor to ongoing reductions in road trauma.

Chapter Three outlines and assesses the different ways to define and measure injuries, based on resource-use measures, threat to life measures and burden of injury measures. It also refers to national attempts to create a harmonised serious injury definition. A key conclusion reached in Chapter Three is that different definitions fulfil different purposes, and no single definition can achieve every research and policy-making objective.

Chapter Four comprises the Committee's recommendations for the introduction of a tiered trauma definition structure, with a serious injury defined as a 'major trauma', mirroring the definition currently used in the Victorian State Trauma System. It is proposed that the current serious injury definition, which is based on the proxy of an admission to hospital, is retained in order to meet the national approach to defining serious injury. The Committee also proposes that this definition be renamed. Further, it is recommended that Disability-Adjusted Life Years be used to measure the burden of injuries. The recommended tiered definitions structure captures each of the resource-use, threat to life and burden of injury categories and represents a best practice approach. The Committee also addresses reporting responsibilities for road crash data, and proposes that responsibility for medical data be moved to the Department of Health and the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), the latter being the entity responsible for gathering, categorising and collating trauma data. The collection of crash data relating to the causes of a crash should remain the responsibility of Victoria Police.

The last chapter of this part focuses on the use of data linkage to improve the usefulness of road crash data and the quality of policy and decision-making by linking data held by different government agencies. Chapter Five outlines the process of data linkage, and includes an overview of current data linking practices in Australia and internationally. It also addresses key concerns surrounding privacy and ethical considerations, many of which were perceived by Inquiry participants to be a barrier to data linkage. Another key focus of Chapter Five is the assessment of different proposals for data linkage in Victoria. The Committee recommends that the VSTORM undertake a pilot project to link different road crash and road safety data in order to answer specific policy questions. However, the Committee believes this should be an interim step, with best practice linkages as implemented in New South Wales and Western Australia being the longer term solution, and one which the Committee recommends Victoria explore.

## **Part Two**

Part Two of the report comprises Chapters Six and Seven, which address ToR (a). This ToR was an area of strong interest for many of the Inquiry participants. Chapter Six explores the different methods for deriving road crash costs, with a focus on the existing approach, the Hybrid-Human Capital approach, and the Willingness-To-Pay approach (WTP), its mooted successor. The benefits, issues and concerns with these approaches are identified and discussed at length, as are alternative cost methodologies used in other policy areas,

such as the occupational health and safety and transport accident compensation schemes, among others. Where Chapter Six is contextual and provides a background to cost methodologies, Chapter Seven addresses the question of which cost methodology should be used in Victorian road safety, and concerns with the WTP approach.

The Committee makes a number of recommendations, with key recommendations being that Victoria should not adopt the WTP approach and that support for a national project to develop and undertake a WTP study be revisited by Victoria given the substantial concerns and issues identified in this part.

### **Part Three**

The last part of the report focuses on more traditional road safety areas, such as countermeasures and improving reductions in serious injury in Victoria. This part comprises two chapters, which cover ToR (d) to (f). The key focus of Chapter Eight is ToR (e), which examines the processes and tools employed by the Victorian Government and the road safety agencies to determine the most appropriate ways to reduce road trauma, and to provide guidance on the prioritisation of resource allocation. The use of modelling to identify effective countermeasures to address road safety problems and the importance of post-implementation evaluations are also assessed and discussed. The chapter focuses on these areas rather than identifying actual cost-effective countermeasures because there are limited studies relating to individual countermeasures. Recommendations and findings in this chapter centre on the importance of evaluation and assessment tools when designing and implementing road safety policy, and the use of these tools to prioritise different countermeasures.

Chapter Nine addresses ToR (d) and (f), examining how the Victorian Government can enhance the focus on serious injuries, and investigating ways to achieve best practice in road safety and manage long-term serious injury reductions. The chapter also provides an overview of how the Safe System approach has been implemented in Victoria. The Committee was not in a position to determine the correlation between reductions in road trauma and particular countermeasures because these studies either have not been undertaken, or focus on risk reduction rather than actual reductions. Countermeasures proven effective in reducing road trauma, particularly those relating to infrastructure and vehicle safety, are outlined, as are new technologies that could help achieve future trauma reductions as part of an Intelligent Transport System.

A key theme in this chapter is a new approach for dealing with serious injuries in order to both raise the profile of these injuries and to reduce them. The Committee proposes that there is an urgent need to take a whole of government approach to road safety, and one that moves away from the traditional engineering/enforcement approach. The integration of road safety policy into broader government objectives around health, planning, justice, transport, environment and education is considered the key to significantly reducing road trauma. This is particularly important given the rise of

alternative modes of travelling in Victoria, specifically bicycling and motorcycling. While these transport modes are of increasing concern in road safety, they also represent positive opportunities in terms of improved accessibility to employment and social activities, as well as health.



## RECOMMENDATIONS

**Recommendation 1:** That the Victorian Government adopt a tiered trauma definition structure comprising the following categories, in ascending order of seriousness:

- (a) Fatalities;
- (b) Major trauma patients;
- (c) Disability-Adjusted Life Years;
- (d) Admitted to hospital;
- (e) Attended an emergency room; and
- (f) Not injured. .... 94

**Recommendation 2:** That the current ‘serious injury’ definition used in Victoria be renamed ‘admitted to hospital’ ..... 96

**Recommendation 3:** That the classification guidelines used by the Victorian State Trauma Outcomes Registry and Monitoring Group to code road crashes be amended so that they align with the definition of a ‘road’ and ‘road related area’ as set out in the *Road Safety Act 1986*. .... 101

**Recommendation 4:** That the Victorian State Trauma Outcomes Registry and Monitoring Group and the Victorian State Trauma Committee be given responsibility for the monitoring of changes to Disability-Adjusted Life Years and Years of Life Lost values and their updating as needed. .... 103

**Recommendation 5:** That the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) undertake a 12 month trial using Disability-Adjusted Life Years (DALYs) to measure the burden of injury in road trauma patients who have met the ‘major trauma’ definition as used in the Victorian State Trauma Registry. The trial should involve patients from all road user categories (pedestrian, bicyclist, motorcyclist, passenger and freight vehicles), with trial outcomes submitted to the Minister for Roads once completed. An assessment by VSTORM of DALYs for use in road safety should also be conducted, with input from road safety agencies. .... 103

**Recommendation 6:** That the Victorian Government establish a *Road Safety Trauma Definitions Committee* chaired by the responsible Minister, with secretariat support provided by the Victorian State Trauma Outcomes Registry and Monitoring Group steering committee. The Committee should comprise representatives from road safety agencies, the Department of Health, the commissioners for privacy and health records, and other relevant stakeholders. Its role will be to identify, assess, and make

recommendations on the most suitable serious injury definition based on a threat to life measure and a burden of injury measure. This Committee should assess the ability of each of the recommended measures to be mapped or compared against other threat to life measures; its utility in countermeasure development; and its capacity to monitor trends, over time. This Committee is to provide its findings and recommendations to the Ministerial Council for Road Safety within 12 months of this report being tabled.....104

**Recommendation 7:** That Victoria, through the Standing Council on Transport and Infrastructure, raise the harmonisation of injury definitions, using the Victorian approach as a possible national model.....105

**Recommendation 8:** That the Department of Health collect and collate the following quarterly and yearly trauma statistics for those injured in a road crash:

- (a) The number of emergency room presentations; and
- (b) The number of patients admitted to hospital.....109

**Recommendation 9:** That the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) be responsible for collecting and collating the following quarterly and yearly trauma statistics for those injured in a road crash:

- (a) The number of major trauma patients as per the VSTORM definition of a major trauma; and
- (b) The number of Disability-Adjusted Life Years and Years of Life Lost.

In order to be made responsible, the Department of Health is to direct the VSTORM to undertake this new reporting role.....110

**Recommendation 10:** That the quarterly and yearly statistics compiled by the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) and the Department of Health (DoH) are provided to the following entities for the purposes of developing road safety policy, monitoring the burden of road crashes, undertaking research, and for public education purposes:

- (a) The Ministers for health, roads, justice and the responsible Minister for the Transport Accident Commission (TAC);
- (b) Road safety agencies comprising the TAC, VicRoads and Victoria Police; and
- (c) In the case of the VSTORM collected data, the DoH.

The statistics collected by the VSTORM and the DoH should include analyses of gender, age and road user group.....110

**Recommendation 11:** That the Department of Health publish the total number of road crash patients who attend an emergency room, and those who are admitted, on a quarterly and annual basis.....111

**Recommendation 12:** That the Victorian Government direct VicRoads and the Transport Accident Commission to publish the trauma statistics produced by the Victorian State Trauma Outcomes Registry and Monitoring Group and the Department of Health on their websites and in a yearly publication.....111

**Recommendation 13:** That the Victorian Government amend the work program of the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) to include the monitoring and reporting of road crash trauma as described in Recommendations 3, 4, 5, 9 and 10, and provide any additional resources to VSTORM to complete these tasks. ....111

**Recommendation 14:** That Victoria Police reintroduce the collection of non-injury crash statistics. ....112

**Recommendation 15:** That road safety agencies, in cooperation with the Victorian State Trauma Outcomes and Registry Monitoring Group (VSTORM), undertake a pilot data linkage project. Upon the project’s completion, the VSTORM should report the project’s findings, including any issues with the process, the governance arrangements and any other relevant information, to the Ministerial Council for Road Safety. ....155

**Recommendation 16:** That road safety agencies ensure that all road safety linkage project applications meet the ethical requirements set out by the Victorian State Trauma Committee, the privacy and patient record legislation that applies in Victoria, and the release of data requirements set by data custodians and the legislation that applies to them.....155

**Recommendation 17:** That a working group be established to investigate the implementation of an independent data linking entity, and be comprised of:

- The Transport Accident Commission (TAC), VicRoads and Victoria Police;
- The Department of Health;
- The Victorian State Trauma Outcomes Registry and Monitoring Group and the Victorian State Trauma Committee; and
- The Victorian Health Records and Privacy Commissioners.

The working group should be chaired by an independent expert, and report on issues, options and solutions for the implementation of an independent data linking entity within 18 months of the tabling of this report. The working group should investigate New South Wales’ Centre for Health Record Linkage (CHeReL) and other entities, including the

Western Australian Enhanced Road Safety Information System, as part of its assessment. The report produced by the working group should be provided to the Ministerial Council for Road Safety, and ministers responsible for health, justice, roads and the TAC. ....156

**Recommendation 18:** That the Victorian Government does not adopt the New South Wales Willingness-To-Pay values for serious injuries and fatalities for use in road safety projects and investment proposals. ....207

**Recommendation 19:** That regulatory tools such as Regulatory Impact Statements, policy documents and communication materials need to ensure that any references to Willingness-To-Pay values, if such values are used, are referred to as prices for risk reduction, not the actual value of an injury or fatality. ....211

**Recommendation 20:** That the Victorian Government continues to use the Hybrid-Human Capital approach for valuing the cost of serious injury. ....217

**Recommendation 21:** That the Victorian Government does not adopt the Willingness-To-Pay (WTP) approach, including in WTP studies undertaken nationally, to calculate road safety costs.....218

**Recommendation 22:** That the Victorian Government, through its position on the Standing Council on Transport and Infrastructure, raise the issues and concerns identified by this Committee with Willingness-To-Pay (WTP), and recommend the national WTP study be re-appraised with reference to these issues. ....218

**Recommendation 23:** That the Victorian Government ensure that the current costs methodology be updated by using the new tiered trauma definition structure recommended by the Committee in Chapter Four, if that recommendation is adopted by the Victorian Government. ....219

**Recommendation 24:** That the Victorian Government reformulate the existing Macro Estimates for Target Setting (METS) to incorporate the major trauma, admitted to hospital, attended an emergency room and Disability-Adjusted Life Years measures.....233

**Recommendation 25:** That the Victorian Government, where possible, translate result findings from previous evaluations of road safety countermeasures from the existing serious injury measure to the major trauma, admitted to hospital and Disability-Adjusted Life Years measures. ....234

**Recommendation 26:** That the Victorian Government and road safety agencies publicly release existing and future evaluations of road safety countermeasures. ....250

**Recommendation 27:** That when evaluating road safety countermeasures, Victorian road safety agencies should examine the impact of countermeasures based on separate

categories of trauma, as identified in Recommendation One, in addition to the impact of countermeasures on different road user groups. ....254

**Recommendation 28:** That the Victorian Government and road safety agencies ensure that evaluation frameworks for individual road safety countermeasures be developed and evaluation funding be secured prior to the implementation of countermeasures. ....260

**Recommendation 29:** That when designing evaluation frameworks for individual road safety countermeasures, the Victorian Government and road safety agencies consider the issues and concerns identified by the Committee in findings 34 to 38. Evaluation designs should reflect high validity and be effective in removing or minimising study biases.....272

**Recommendation 30:** That the Victorian Government and road safety agencies build measures of cost-effectiveness into post-completion evaluation studies of road safety countermeasures. ....273

**Recommendation 31:** That the Victorian Government recommend to the Standing Council on Transport and Infrastructure that an online, searchable road safety handbook be developed which reports on the efficacy and cost-effectiveness of countermeasures that address road related road trauma through meta-analysis of Australian and international studies. ....283

**Recommendation 32:** That the Victorian Government publish a bulletin, accompanied by a media release, on a quarterly basis outlining the latest fatality, major trauma and admitted to hospital road tolls. ....285

**Recommendation 33:** That the Victorian Government incorporate the major trauma and admitted to hospital measures into *Victoria’s Road Safety Strategy 2013-2022* and accompanying action plans through the establishment of major trauma and admitted to hospital targets, and that such targets be broken down into road user groups.....286

**Recommendation 34:** That the Victorian Government recommend to the Standing Council on Transport and Infrastructure that a national benchmarking study be conducted into the road safety performance of all Australian jurisdictions, against agreed key performance indicators. ....291

**Recommendation 35:** That the Victorian Government identify the Victorian State Trauma System as a countermeasure in the *Victorian Road Safety Strategy 2013-2022* and include it in accompanying, future, action plans. This is in recognition of its role in addressing road related trauma. ....295

**Recommendation 36:** That the Victorian Government work with the Victorian State Trauma Committee to undertake an audit of the Victorian State Trauma System with the aim of devising a schedule and funding plan to upgrade its equipment. ....296

**Recommendation 37:** That the Victorian Government develop terms of reference for an inquiry into bicycling, its challenges and opportunities, to be conducted by the Victorian Parliamentary Road Safety Committee. ....302

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## ACRONYMS

AAA	Australian Automobile Association
AAAM	Association for the Advancement of Automotive Medicine
ABS	Anti-lock Braking System
ABS	Australian Bureau of Statistics
ADR	Australian Design Rules
AIHW	Australian Institute of Health and Welfare
AIS	Abbreviated Injury Scale
ANCAP	Australasian New Car Assessment Program
ANCIS	Australian National Crash In-depth Study
ANRAM	Australian National Risk Assessment Model
AR-DRGS	Australian Refined Diagnosis-Related Groups
ARRB	Australian Road Research Board
ATC	Australian Transport Council
ATSB	Australian Transport Safety Bureau
AusRAP	Australian Road Assessment Program
BAC	Blood Alcohol Concentration
BC	Business Case
BCA	Benefit-Cost Analysis (also referred to as Cost-Benefit Analysis)
BCR	Benefit-Cost Ratio
BIA	Business Impact Assessment
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BOD	Burden of Disease
BTRE	Bureau of Transport and Regional Economics
CARRS-Q	Centre for Accident Research and Road Safety – Queensland
CASR	Centre for Automotive Safety Research

CBA	Cost-Benefit Analysis
CDC	Centres for Disease Control
CEA	Cost-Effectiveness Analysis
CEDR	Conference of European Directors of Roads
CERH	Centre for Economic Research on Health
CHeReL	Centre for Health Record Linkage (NSW)
CHPPE	Centre for Health Policy, Programs and Economics
CIDMU	Clinical Informatics and Data Management Unit
C-MARC	Curtin-Monash Accident Research Centre
CMF	Crash Modification Factors
COAG	Council of Australian Governments
CODES	Crash Outcome Data Evaluation System
COI	Cost of Illness
CONROD	Centre for National Research on Disability and Rehabilitation Medicine
CPI	Consumer Price Index
CRF	Crash Reduction Factors
CRS	Centre for Regulatory Studies (Monash University)
CTP	Compulsory Third Party Insurance
CV	Contingent Valuation
DALY	Disability-Adjusted Life Year
DLB	Data Linking Branch (VIC)
DLU	Data Linking Unit (WA)
DoH	Department of Health
DoJ	Department of Justice
DTF	Department of Treasury and Finance
EC	European Commission

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ECIS	Enhanced Crash Investigation Study
ERSIS	Enhanced Road Safety Information System
ESC	Electronic Stability Control
ETSC	European Transport Safety Council
EU	European Union
FCI	Functional Capacity Index
FDSRL	Fixed Digital Speed and Red Light Cameras
FYRR	First Year Rate of Return
GB	Great Britain
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GLS	Graduated Licensing Scheme
HC	Human Capital
HM	Her Majesty
HRA	<i>Health Records Act 2001 (Vic)</i>
HREC	Human Research Ethics Committee
ICD	International Classification of Diseases
ICD-10-AM	International Statistical Classification for Diseases and Related Health Problems, Revision 10, Australian Modification
ICISS	International Classification of Diseases-based Injury Severity Score
IPA	<i>Information Privacy Act 2000 (Vic)</i>
IPP	Information Privacy Principle
iRAP	International Road Assessment Program
IRR	Internal Rate of Return
IRTAD Group	International Traffic Safety Data and Analysis Group
IRTAD	International Road Traffic and Accident Database

ISA	Intelligent Speed Assist
ISS	Injury Severity Score
ITS	Intelligent Transport System
LIV	Law Institute of Victoria
MAIS 3+	Maximum Abbreviated Injury Score Above 3
MAIS	Maximum Abbreviated Injury Scale
MAV	Municipal Association of Victoria
MCA	Multi-Criteria Analysis
MEP	Monitoring and Evaluation Plan
METS	Macro Estimates for Target Setting
MLK	Master Linkage Key
MOU	Memorandum of Understanding
MTS	Major Trauma Services
MUARC	Monash University Accident Research Centre
NCHS	National Centre for Health Statistics
NDS	National Data Set (for compensation-based statistics)
NeuRA	Neuroscience Research Australia
NHMD	National Hospital Morbidity Database
NHMRC	National Health and Medical Research Council
NISS	New Injury Severity Score
NISU	National Injury Surveillance Unit
NPV	Net Present Value
NRSS	National Road Safety Strategy
OECD	Organisation for Economic Co-operation and Development
OH&S	Occupational Health and Safety
OLA	Objective facts, List of solutions, Addressed action plans



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PAS	Performance Assessment Score
PBN	Principal Bicycle Network
PBS	Pharmaceutical Benefits Scheme
PIPP	(Victoria) Police Information Processes and Practices
PPN	Principal Pedestrian Network
PPN	Project-specific Person Number
QALY	Quality-Adjusted Life Year
QTR	Queensland Trauma Registry
RACS	Royal Australasian College of Surgeons
RACV	Royal Automobile Club of Victoria
RBT	Random Breath Testing
RCIS	Road Crash Information System (VicRoads)
RCT	Randomised Controlled Trial
RIS	Regulatory Impact Statement
RoTES	Review of Trauma and Emergency Services
RP	Revealed Preference
RPMI	Risk of Permanent Medical Impairment
RSAGIM	Road Safety Action Group Inner Melbourne
RSC	WA Road Safety Council
RS-WTP	Relative Social Willingness-To-Pay
RTA	Roads and Traffic Authority
RTM	Regression to the mean
RUE	Road User Effects
RWC	Road Worthy Certificate
SAPHaRI	Statistical Application for Population Health and Intelligence
SAS	Statistical Analysis System

SCOTI	Standing Council on Transport and Infrastructure
SP	Stated Preference
SRIP	Safer Roads Infrastructure Program
SRIP2	Safer Roads Infrastructure Program Stage 2
SRIP3	Safer Roads Infrastructure Program Stage 3
SRR	Survival Risk Ratio
STAR	State Traffic Accident Record
STEP	Speed Tolerance Enforcement Program
STRADA	Swedish Traffic Accident Data Acquisition
SWBSP	State-Wide Black Spot Program
SWOV	Netherlands Institute for Road Safety Research
TAA	<i>Transport Accident Act 1986 (Vic)</i>
TAC	Transport Accident Commission
TARS	Transport and Road Safety (TARS) Research
TIS	Traffic Incident System (Victoria Police)
TIS BSU	TIS Business Support Unit
TOOCS	Type of Occurrence Classification System
TOR	Terms of Reference
UK	United Kingdom
UKPDS	United Kingdom Prospective Diabetes Study
V2I	Vehicle to Infrastructure
V2N	Vehicle to Nomadic device
V2V	Vehicle to Vehicle
VACC	Victorian Automobile Chamber of Commerce
VACIS	Victorian Ambulance Clinical Information System
VAED	Victorian Admitted Episodes Dataset

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VAGO	Victorian Auditor-General's Office
VCEC	Victorian Competition and Efficiency Commission
VDL	Victorian Data Linkages
VEMD	Victorian Emergency Minimum Dataset
VGR	Victorian Guide to Regulation
VISU	Victorian Injury Surveillance Unit (Monash University)
VLY	Value of a Life Year
VOC	Vehicle Operating Costs
VOSL	Value of a Statistical Life
VOTOR	Victorian Orthopaedic Trauma Outcomes Registry
VRSS	Victorian Road Safety Strategy
VSL	Value of Statistical Life
VSLY	Value of a Statistical Life Year
VSTORM	Victorian State Trauma Outcomes Registry and Monitoring Group
VSTR	Victorian State Trauma Registry
VSTS	Victorian State Trauma System
WA DoH	Western Australia Department of Health
WHO	World Health Organization
WHS	Work Health and Safety
WIES	Weighted Inlier Equivalent Separation
WTP	Willingness-To-Pay
YLD	Years Lost due to a Disability
YLL	Years of Life Lost



## CHAPTER ONE: INTRODUCTION

Over the past four decades, fatalities on Victorian roads have fallen, reduced by the use of new technologies, improved infrastructure, the community's commitment to safety, sophisticated countermeasures and legislative change. Victorian governments through the road safety agencies have progressively introduced new road safety initiatives aimed at reducing road trauma, as well as making reforms to existing initiatives. Reductions in fatalities have been achieved consistently, with 2013 having the lowest road toll in the recorded statistics, with 242 deaths.<sup>1</sup> However, despite this impressive reduction, an area of increasing concern is crash related serious injury. This issue exists in both Victoria and elsewhere. Internationally, the focus of road safety has moved towards understanding and addressing serious injuries. This new focus has been driven by two factors: firstly, the less consistent reduction in serious injuries by comparison to fatalities; and secondly, the ongoing burden of serious injury on the community. It is against this international and domestic refocusing of road safety towards serious injury that the current Inquiry was received by the Committee.

Throughout the Inquiry process, the Committee identified three key themes. These themes were: the criticality of accurate, useable and accessible serious injury data, including the need for an appropriate serious injury definition; improving the use of evaluations in road safety policy to understand whether the interventions and countermeasures implemented to address road trauma are actually working, and the extent to which this is occurring; and refocusing road safety policy to place greater emphasis on serious injuries.

The first theme, serious injury data, was the subject of substantial investigation by the Committee as part of the *Inquiry into Motorcycle Safety*. The issues identified in that inquiry, and the recommendations made by the Committee, are substantially re-visited in this report. Chapters Two and Three deal with the issues affecting serious injury data, which include under-reporting and over-reporting, and the insensitivity of the current serious injury definition. According to evidence received by the Committee, there are over 5,000 serious injuries in Victoria.<sup>2</sup> However, this figure is based on the current definition of admitted to hospital, which provides minimal detail about the types of

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<sup>1</sup> Transport Accident Commission, 'Road Toll - Annual', viewed February 2014, <<http://www.tac.vic.gov.au/road-safety/statistics/road-toll-annual>>.

<sup>2</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 10; VicRoads, *Submission*, no. 31, 17 May 2013, p. 4.

injuries occurring on Victorian roads, their severity and their long-term impact in terms of disability and loss of function. This lack of detail, coupled with the issues caused by having police report on the seriousness of an injury, has made it difficult to determine how widespread the issue of serious injury is, and more importantly, whether such injuries have increased or decreased over time. The Committee believes that because the sophistication and robustness of policy responses to serious injury are wholly reliant on good crash and medical data, future improvements in Victorian road safety cannot be achieved unless these data issues are overcome.

The second key theme in this report is the importance of consistent, best practice evaluation of road safety countermeasures. Throughout the Inquiry, it became clear that such evaluations are lacking in Victoria. This, along with a limited understanding of the causal factors contributing to serious injury crashes, has prevented conclusive determinations about the real efficacy of different countermeasures and interventions. While the Committee began the Inquiry with the intention of making key findings and recommendations about the effectiveness of all road safety countermeasures, in many instances that was not possible. Instead, the Committee investigated ways to achieve best practice in the development and evaluation of future countermeasures, and in the overall management of long-term serious injury reductions.

The third key theme identified by the Committee is that achieving long-term serious injury reductions requires a greater focus on serious injuries in Victorian road safety policy. Much of the focus in road safety has been on reducing fatalities, and this has largely succeeded. However, serious injuries place a significant burden on the community in terms of treatment, pain and suffering and costs, and require greater recognition and targeted responses. The importance of doing this was recognised by government agencies such as the Transport Accident Commission, VicRoads, and Victoria Police. The Committee believes, however, that more needs to be done in this area.

In addition to these themes, there is a growing impetus to tackle road safety issues in a more holistic way, across government agencies and policy areas, and using different approaches. This is consistent with the Safe System approach, which has been employed by Victorian road safety agencies. Due to the rise in alternative forms of transport, in particular motorcycling and bicycling, and the challenges of further reducing road trauma, there is a clear need for the Victorian Government to integrate road safety policy into broader government objectives around health, justice, planning, transport, environment and education. This would require a clear shift away from the Government's traditional approach to road safety.

The Committee believes that large reductions in serious injuries can only be achieved if these key themes are addressed. Accurate road crash data and an improved data system will enhance the capacity of the Victorian Government, road safety agencies and the community to understand and monitor the size, nature and impact of serious injuries.

This understanding of road trauma will facilitate the development of targeted countermeasures and best practice evaluations of those countermeasures. Further, refocusing road safety towards serious injury, without reducing the focus on road fatalities, will contribute to Victoria improving the operation of its road network, in the most efficient and safest way possible. Together with the Safe System approach to road safety, the Committee's findings and recommendations are intended to provide a roadmap to achieve this goal.

The Committee wishes to highlight the complex and unique nature of this inquiry. This is due to a number of factors, specifically the highly technical areas addressed in Terms of Reference (ToR) (a) to (c), some of which fall outside the traditional road safety area. Additionally, the scope of many issues, particularly in relation to medical definitions of serious injury and the calculation of road crash costs, required the Committee to undertake substantial research to ensure its findings and recommendations were well-grounded and evidence-based. This complexity also required the Committee to seek the involvement of non-road safety stakeholders, such as economists, actuaries, insurers, medical and health experts, in order to fully investigate the areas covered by the Inquiry. The Committee believes engaging with such experts was opportune, given the growing recognition of the need to integrate road safety into other policy areas.

## **1.1 Inquiry process**

The Committee received the Inquiry's ToR in November 2012, which were advertised with a call for submissions in the *Herald Sun* and *The Age* newspapers in February 2013. A total of 37 submissions were received from government agencies, health institutions, road safety research and academic organisations, industry representative groups, and private individuals and companies (see Appendix A). Public hearings were held in Melbourne between July and October 2013, and in Sydney and Canberra in August 2013. A full list of public hearing participants is provided in Appendix B.

Many individuals and organisations contributed to this inquiry by making written submissions and participating at public hearings. The Committee is grateful to these people and organisations for generously sharing their time, expertise and ideas.

## **1.2 Report structure**

This final report comprises three parts. Part One comprises Chapters Two to Five and addresses ToR (b) and (c); Part Two includes Chapters Six and Seven and addresses ToR (a); and Part Three comprises Chapters Eight and Nine and addresses ToR (d) to (f).





## PART 1

Chapter 2: Road Crash Injury Definitions

Chapter 3: Injury Definitions

Chapter 4: A Best Practice Approach for Victoria

Chapter 5: Improving the Exchange of Data and Information Through Data Linkage



## CHAPTER TWO AT A GLANCE

### OVERVIEW

Chapter Two provides the background to Term of Reference (c) and is intended to be read in conjunction with Chapters Three and Four. Injury definitions are important in road safety policy. They ensure that road crash injuries are analysed consistently, and provide the basis for official statistics which are then used to inform policy development and decision-making. This chapter focuses on the role of injury definitions in road trauma, with an emphasis on the current road safety serious injury definition used in Victoria (admitted to hospital). The chapter also provides an overview of definitions used in the medical sector, for example in hospitals and in the Victorian State Trauma System.

Chapter Two makes a number of findings in relation to the usefulness and effectiveness of the Victorian road safety serious injury definition and the data derived from it as collected by Victoria Police. The definition is deemed problematic, mainly because it does not represent the seriousness of an injury, instead relying on the use of a resource, a hospital bed, as its basis. The Committee identified various issues with the definition including: legislative protections that restrict police from confirming the admission status of road crash patients; and the over- and under-reporting of injury data that is caused by both the limitations of the current definition and having police responsible for collecting injury statistics. The Committee's conclusion, and one shared by other Inquiry participants, is that there is clearly a need for change in the current approach to defining serious injury and the collection of serious injury data.

### KEY FINDINGS

Finding 1: The Victorian State Trauma Registry's major trauma definition sets the standard by which crash related serious injuries can be defined and identified.

Finding 2: The Committee believes that the current health legislative framework makes police confirmation of admission status difficult and haphazard.

Finding 3: The existing serious injury data collection in Victoria is likely to distort the true state of road trauma in Victoria.

Finding 4: The current approach to defining serious injury and having these injuries compiled through police statistics is problematic and does not represent best practice. There is clearly a need for change.

### RECOMMENDATIONS

Chapter Two does not include any recommendations.



## CHAPTER TWO: ROAD CRASH INJURY DEFINITIONS

Injury definitions play an important role in Victorian road safety, particularly when applied to road safety statistics, where they dictate how different injuries are categorised. In turn, road safety statistics are used to measure the performance of Victoria's roads and road safety initiatives against the objective of reductions in road injuries from year to year.

The most well-known injury definition in road safety is a 'fatality', compiled in the annual road toll. A regular feature in popular culture and the media, the road toll is used by road safety agencies and governments as a barometer of road safety performance. Fatalities are measured using a straightforward definition that is well-understood by the community. Other injury definitions, however, are not so well-understood. Among the current injury definitions used in Victorian road safety, the 'seriously injured' category is arguably the least understood definition. Indeed, the issues associated with this road trauma category were the subject of substantial investigation by this Committee as part of the *Inquiry into Motorcycle Safety*, the final report of which was tabled in December 2012.

This inquiry's terms of reference have provided the Committee with an opportunity to revisit the issues identified with the existing 'serious injury' definition, as well as to investigate alternative definitions. This focus on serious injury is one that is shared by other road safety and public health experts and governments internationally, with a growing recognition of the burden that non-fatal road injuries have on the community. That burden has increased as road safety measures, such as safer roads, safer vehicles and improved medical treatment, have increased the likelihood of surviving a road crash, while conversely resulting in an increase in the number of seriously injured people and an increase in the severity of their injuries. The key to understanding the burden of serious injuries, and determining how to reduce that burden, is the capacity to properly identify what a serious injury is according to an accurate and well-understood definition.

This chapter discusses the role of definitions in road trauma. It investigates the current Victorian definition of serious injury, medical definitions used by hospitals, current approaches to defining serious injury and the impacts and issues associated with these definitions. It then establishes the case for changing the current approach, by developing a best practice serious injury definition.

## 2.1 Role of definitions in road trauma data: Why are they important?

The targeted prevention of road trauma requires information and the basis for that information is data.<sup>3</sup> For policy makers in government, and those responsible for implementing prevention efforts in road safety agencies, data fulfils two elemental functions: firstly, it enables them to track the burden of trauma over time; and secondly, it provides a basis for intervening by introducing countermeasures to prevent future trauma. This is particularly important given that road trauma prevention is recognised as ‘highly politicised’ and therefore requires strong data and objective information, not anecdotal information, if it is to be effective.<sup>4</sup> Other regulatory purposes that road safety trauma data fulfils include:

- Setting and meeting reduction targets;
- Measuring the performance of safety countermeasures;
- Identifying areas or groups that need special attention (i.e. vulnerable road users);
- Researching and evaluating existing and proposed countermeasures;
- Allocating funding and other resources;
- Compensating those injured on the road; and
- Calculating the cost of road trauma for regulatory tasks such as Regulatory Impact Statements (RISs) and Business Cases (BCs).<sup>5</sup>

The primacy of good data in road safety has also been recognised internationally, with the World Health Organization (WHO) observing that ‘only by systematic and data-led management of the leading road injury problems will significant reductions in exposure to crash risk and in the severity of crashes be achieved’.<sup>6</sup>

While trauma data is a key component in road safety prevention, injury definitions are the screening tool by which that data is categorised and collected. The Committee heard throughout the Inquiry about the value of such definitions, without which it is difficult to establish the number of injured Victorians, the costs of those injuries and the efficacy of different countermeasures to help reduce those injuries. In particular, the Monash

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<sup>3</sup> R Kisser, et al., ‘Injury data needs and opportunities in Europe’, vol. 16, no. 2, 2009, p. 103.

<sup>4</sup> M M Peden, et al., *World report on road traffic injury prevention*, World Health Organization, Geneva, 2004, p. 8.

<sup>5</sup> **Note:** This list is not exhaustive and there are a broader range of policy purposes which statistical data fulfils. These were outlined in Chapter 2 of Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012, p. 18. See also Australian Bureau of Statistics, *A guide for using statistics for Evidence Based Policy*, Canberra, 2010, pp. 2-3.

<sup>6</sup> M M Peden, et al., *World report on road traffic injury prevention*, World Health Organization, Geneva, 2004, p. 8.

University Accident Research Centre (MUARC)<sup>7</sup> and the Netherlands Institute for Road Safety Research (SWOV)<sup>8</sup> indicated in their submissions that the analysis and investigation of other terms of reference in this inquiry, such as the appropriate methodology for identifying the cost of serious injury, could not be adequately dealt with unless an appropriate serious injury definition is established.

Issues surrounding the definition of serious injury have also garnered significant attention in local, interstate and international road safety policy circles. The need for better serious injury definitions has become critical over the last decade appearing in the road safety policies, programs and oversight bodies of the European Union (EU), the Organisation for Economic Cooperation and Development (OECD)<sup>9</sup> the since-replaced Australian Transport Council (ATC) and in this Committee's previous *Inquiry into Motorcycle Safety* report.<sup>10</sup>

In Victoria, a number of the previous and existing state road safety strategies have also sought to emphasise the importance of defining serious injury and to introduce new ways to do so. The superseded Victorian strategy, *Arrive Alive 2008-2017*, referred to an injury severity measure that involved comparing the number of hospitalisations lasting more than 14 days with hospitalisations of more than one day. In effect, the *Arrive Alive* strategy introduced a severity scale within the existing serious injury definition (that is admitted to hospital) in order to 'determine trends over time in the severity of injuries'.<sup>11</sup> The replacement of that strategy with the current Victorian strategy, *Victoria's Road Safety Strategy - Safe roads for all Victorians 2013-2022*, has moved away from that earlier approach. Instead, the existing serious injury definition appears to have been augmented with the introduction of a 'severe injury category' to cover injuries that are 'permanent and life-changing'.<sup>12</sup> At a national level, the *National Road Safety Strategy* (NRSS) produced by the ATC (which has since been replaced by the Standing Council on Transport and Infrastructure (SCOTI)), of which Victoria is a member, identified inconsistencies in both the definition of serious injury and collection of serious injury data across Australian states and territories. It recommended that:

*As a matter of priority, road transport agencies will work towards the adoption of nationally consistent road crash classification definitions and an improved national serious injury database. This will be essential for effective monitoring of progress towards the serious injury target.*<sup>13</sup>

<sup>7</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 8.

<sup>8</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

<sup>9</sup> See International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 13.

<sup>10</sup> See Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012, pp. 38-42, 58.

<sup>11</sup> State Government of Victoria, *Victoria's Road Safety Strategy: Arrive Alive 2008-2017*, Melbourne, 2008, p. 50.

<sup>12</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2012, p. 4.

<sup>13</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011-2020*, ATSB, Canberra, 2011, p. 33.

As is clear, the interest in both serious injury as a category of road trauma, and the definition in particular, has been at the forefront of Victorian, national and international road safety efforts over the last decade. It is against this background, coupled with the clear importance and role of data for informed road safety policy-making, that the Committee investigated Victoria's existing approach to defining serious injury and the need for an improved way to categorise road trauma.

## 2.2 Current practice in Victoria

### 2.2.1 Police collection of 'serious injury' data

In Victoria, Victoria Police is responsible for collecting details of all injury crashes which occur on Victorian roads.<sup>14</sup> This responsibility is coupled with a mandatory requirement to report a crash if it involves property damage and if the owner is not present, as well as those crashes that involve an injury.<sup>15</sup> It is important to note that the primary role of Victoria Police in attending crashes is 'investigation and enforcement', rather than the collection of data.<sup>16</sup>

#### 2.2.1.1 Admission to hospital is the basis for a serious injury in Victoria

The injury data collected by Victoria Police is categorised in one of four ways: fatalities, serious injuries, other injuries and not injured.<sup>17</sup> These categories are typically replicated in other Australian jurisdictions. A serious injury in Victoria is defined as an admission to hospital,<sup>18</sup> meaning that an admission is a proxy or surrogate for a serious injury.<sup>19</sup> This is consistent with the national definition set out in the NRSS.<sup>20</sup> The status of hospital admission requires police validation with serious injury data which is then compiled in the Victoria Police Traffic Incident System (TIS) under the following categories:

1. Checked - admitted;
2. Checked - not admitted;

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<sup>14</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 22; Victoria Police, *Submission*, no. 32, 21 June 2013, p. 16.

<sup>15</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 11.

<sup>16</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 16.

<sup>17</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 23.

<sup>18</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 265; Victoria Police, *Submission*, no. 32, 21 June 2013, p. 20.

<sup>19</sup> **Note:** There are a number of conditions that must be met for a road crash to be 'reportable'. For the purposes of Victoria Police and VicRoads reporting, a crash must meet the Australian Bureau of Statistics (ABS) guidelines for reporting and classifying road vehicle accidents. The three conditions set out in the guidelines are that: the reported crash was unpremeditated and resulted in death, injury or property damage; that these things occurred on a road devoted to public travel and that it involved a road vehicle. For more information refer to VicRoads, *Submission*, no. 31, 17 May 2013, pp. 22, and {Australian Bureau of Statistics, 1983 #558.}, provided by VicRoads to the Road Safety Committee during Melbourne public hearings, 6 March 2012, as part of the *Inquiry into Motorcycle Safety*.

<sup>20</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. viii.



3. Checked - not known (no longer used);
4. Not checked (no longer used); and
5. Enquiries pending.<sup>21</sup>

This serious injury definition is commonly referred to as a resource-use measure, as it measures the number of people that access a particular service (admission to hospital). However, TIS reports may also include some information about injury severity collected by attending police officers.<sup>22</sup> The TIS is primarily an administrative database as distinct from a policy development dataset. This distinction is important because it highlights that serious injury data collected by police is done so for administrative rather than policy development purposes.

### 2.2.1.2 Storing and sharing serious injury data

As the TIS is a decentralised data entry system, injury data is shared with the road safety agencies, VicRoads and the Transport Accident Commission (TAC), although they use it for different purposes.

VicRoads stores TIS injury data in its Road Crash Information System (RCIS) database, the primary function of which is to analyse and report crash statistics and inform road safety policy development, evaluation and research.<sup>23</sup> TIS data is assessed by VicRoads data coders who verify the data and add additional information such as spatial location of crashes.<sup>24</sup> According to MUARC, the RCIS holds the ‘official state road crash statistics which are then made available to the public’.<sup>25</sup> In its submission, VicRoads contextualised the difference between the TIS and the RCIS by observing that while the TIS is a data entry system, the RCIS is a reporting system.<sup>26</sup>

The TAC accesses TIS data in its capacity as the state insurer for transport (primarily road) accident compensation. According to its submission, the TAC has a ‘statutory entitlement to information from Victoria Police’, which includes crash information collected in the TIS. That entitlement operates in conjunction with the requirement under the *Transport Accident Act 1986* that those claiming accident compensation must have reported the accident to police in order to be eligible for compensation.<sup>27</sup> The TAC also has access to

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<sup>21</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 23.

<sup>22</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 6.

<sup>23</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 13.

<sup>24</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 22.

<sup>25</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 6.

<sup>26</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 22.

<sup>27</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013. See also section 127, *Transport Accident Act 1986* (Vic).

the RCIS data which it merges with TAC claims information for 'internal research purposes'.<sup>28</sup>

### 2.2.1.3 Serious injury data collection in other jurisdictions

Most Australian and international jurisdictions follow the approach of 'defining serious injury from road crashes based on hospital admission status'.<sup>29</sup> Further, the Victorian approach of police collecting serious injury data is one replicated in other Australian jurisdictions (albeit with some alterations)<sup>30</sup> as well as in at least 21 other countries,<sup>31</sup> including Great Britain (GB).<sup>32</sup> The VicRoads submission, which included a table of jurisdictions that record serious injury, noted that only Poland cross-checks police collected admission data with hospitals. In other jurisdictions, such as Sweden, GB and France among others, cross-checking occurs but not systematically.<sup>33</sup>

The reason for this approach appears to stem from the requirement commonly shared by police nationally, and internationally, to attend road crashes that involve an injury.<sup>34</sup> According to MUARC:

*The use of broad injury outcomes as recorded by police in reporting road crashes is common world-wide. Similarly, the definition of serious injury based on hospital admission status is commonly used albeit with some small variations. For example, in Great Britain, serious injury includes not only hospital admissions but also other injuries such as bone fractures and deep lacerations which may not have resulted in a hospital admission...In general, the basis for serious injury in most countries centres on hospital admission.*<sup>35</sup>

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<sup>28</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 13.

<sup>29</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 7; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 85.

<sup>30</sup> **Note:** In South Australia, the serious injury definition is admission to a non-emergency ward for a period of at least 24 hours (correspondence with the Committee, Tori Lindsay, Senior Research Officer, Centre for Automotive Safety Research, University of Adelaide, 21 March 2013). This same definition is used in Queensland by the Queensland Trauma Registry (QTR) (correspondence with the Committee, Jacelle Lang, Research Fellow, Acute Trauma Care Programme, CONROD, 26 March 2013). The Committee understands that NSW Police, who collect other injury data, do not currently have a definition for a 'serious injury' and therefore, do not collect serious injury data (correspondence with the Committee, Mick Logan, Inspector, NSW Traffic and Highway Patrol Command, 27 March 2013). Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 7.

<sup>31</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, pp. 13,19.

<sup>32</sup> Department for Transport (UK), 'Reported Road Casualties in Great Britain: notes, definitions, symbols and conventions', viewed February 2013, <<http://assets.dft.gov.uk/statistics/series/road-accidents-and-safety/reported-road-casualties-gb-notes-definitions.pdf>>.

<sup>33</sup> VicRoads, *Submission*, no. 31, 17 May 2013, pp. 27, citing an IRTAD report, Survey among IRTAD countries, 2010.

<sup>34</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 19.

<sup>35</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 7.

The International Traffic Safety Data and Analysis Group (IRTAD Group), which is part of the OECD, notes that in most countries the official statistics on injury severity are based solely on the assessment of the attending police officer. There is limited cross-referencing against hospital databases which also collect data, although this is mainly for medical purposes, rather than for road safety reporting.<sup>36</sup>

## 2.2.2 Medical data

While serious injury crash data is mainly collected by Victoria Police, medical databases also collate such data. This section outlines the types of data collected by Victorian hospitals, the Department of Health (DoH) and the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM).

### 2.2.2.1 Victorian Emergency Minimum Dataset

According to the DoH submission, the ‘Victorian Emergency Minimum Dataset (VEMD) contains demographic, administrative and clinical data detailing presentations at Victorian public hospitals with 24-hour Emergency Departments’.<sup>37</sup> The VEMD (as with other hospital datasets) uses an injury coding system, the *International Statistical Classification for Diseases and Related Health Problems, Revision 10, Australian Modification (ICD-10-AM)*<sup>38</sup>, to categorise injuries, albeit with a reduced range of codes compared to the Victorian Admitted Episodes Database (VAED).<sup>39</sup> VEMD statistics are reported by Victorian public hospitals using Victorian hospital performance data (referred to as the Performance Assessment Score or PAS) on a fortnightly basis, with annual statistics compiled after July each year.<sup>40</sup> The VEMD comprises data for both patients who appear at an emergency department and are then admitted (and whose injuries might be life-threatening) and for patients who are never admitted. The VEMD statistics by their very nature do not align with the current serious injury definition used by Victoria Police.

### 2.2.2.2 Victorian Admitted Episodes Dataset

The VAED is a minimum dataset containing demographic, administrative and clinical data for all admitted patients from Victorian public and private acute hospitals including rehabilitation centres, extended care facilities and day procedure centres. It contains information about admitted Victorian patients which is supplied by hospitals on a

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<sup>36</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 19.

<sup>37</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 14.

<sup>38</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 13.

<sup>39</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 14.

<sup>40</sup> See Department of Health, *Victorian Emergency Minimum Dataset (VEMD) User Manual, 18th Edition*, Melbourne, 2013, p. 5.

monthly basis once an admitted patient is discharged (referred to as a separation) from hospital.<sup>41</sup>

The DoH reports on the VAED on a financial year basis, with the data finalised by September each year. As with the VEMD, the VAED uses the ICD-10-AM coding system, and includes 190 data variables including diagnosis codes.<sup>42</sup> The VAED also includes a Weighted Inlier Equivalent Separation (WIES) variable which provides a relative measure of resource-use associated with the patient's stay in hospital under the DoH casemix funding model.<sup>43</sup>

The DoH considers admitted patient data to be important because it provides information on 'severe morbidity and on morbidity that involves high cost hospital care'.<sup>44</sup> Such data can also provide 'information on particular injuries that may not figure prominently in mortality data'.<sup>45</sup> In the context of road safety, the DoH submission noted that:

*Hospital admissions from road traffic crashes can be identified in the VAED using the External Causes of Morbidity and Mortality chapter of the ICD codes in the VAED... Importantly, the VAED includes persons injured in crashes regardless of whether a TAC claim has been made or whether the crash was reported to the police.*<sup>46</sup>

The importance of the VAED was noted by VicRoads, which observed that it is the data source with the highest number of serious injury records (based on the definition of admitted to hospital), allowing one to infer that it is the most complete data source for such injuries.<sup>47</sup>

### **2.2.2.3 The Victorian State Trauma Registry and Victorian Orthopaedic Trauma Outcomes Registry**

The Victorian State Trauma System (VSTS) is a world leading trauma system that has been in operation since 2000, and which coordinates pre-hospital and acute care across the state. All 138 trauma-receiving hospitals have a system level of designation.<sup>48</sup> At the centre of the system are the Major Trauma Services (MTS) based at The Alfred, the Royal

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<sup>41</sup> Department of Health, *Victorian Admitted Episodes Dataset (VAED) Manual, 23rd edition*, Melbourne, 2013, pp. 1, 10.

<sup>42</sup> Bruce Prosser, Director, Funding and Information Policy, Hospital and Health Services Performance, Department of Health, *Personal communication*, 16 February 2012. as cited in Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012, p. 21. The full list of data fields, including definitions, can be accessed at, [http://docs.health.vic.gov.au/docs/doc/8FE1035C83DD3307CA257C3600081822/\\$FILE/sect3\\_final\\_v1.pdf](http://docs.health.vic.gov.au/docs/doc/8FE1035C83DD3307CA257C3600081822/$FILE/sect3_final_v1.pdf)

<sup>43</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 13.

<sup>44</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 13.

<sup>45</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 13.

<sup>46</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 18.

<sup>47</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 35.

<sup>48</sup> B J Gabbe, et al., 'Patient perspectives of care in a regionalised trauma system: lessons from the Victorian State Trauma System', *The Medical Journal of Australia*, vol. 198, no. 3, 2013, p. 149.

Melbourne and the Royal Children’s hospitals.<sup>49</sup> The VSTS ‘facilitates the management of major trauma patients in Victoria, with the aim of reducing preventable death and permanent disability and improving patient outcomes by matching patient needs with the appropriate care’.<sup>50</sup> According to the DoH:

*A key element in the success of VSTS has been the development of the Victoria State Trauma Registry (VSTR). It not only monitors mortality rates but also has focused attention on the associated serious injury burden through its development of a methodology for measuring functional outcomes in non-fatal trauma patients. Post-discharge follow up of major trauma patients has documented the extent of both the more immediate loss of function due to injury and the impact of longer-term disability.<sup>51</sup>*

The VSTR dataset is both extensive in terms of medical information and comprises a focus on the incidence of trauma and the quality of trauma care.<sup>52</sup> The Victorian Orthopaedic Trauma Outcomes Registry (VOTOR), which focuses on orthopaedic injuries including spinal injuries, is a sentinel site registry to which four hospitals contribute data (The Alfred, the Royal Melbourne, the Geelong and Northern hospitals).<sup>53</sup> There is a subtle difference between the VSTR and the VOTOR, which was outlined by Professor Gabbe, Head of the VSTR:

*Th[e] [VOTOR] registry is a little bit more inclusive than the state trauma registry, which is focused on major trauma. Here, if you are admitted to hospital with an orthopaedic injury and you stay for more than 24 hours, then you are automatically included. The only exclusions we would have are pathological fractures. It is a very inclusive registry. We have been integrating it completely into the state trauma registry, but it is funded through a slightly different source; it is funded by the TAC.<sup>54</sup>*

Professor Gabbe added that the VOTOR:

*...has been collecting data since 2003, and it captures about 5000 cases a year. We follow up all of those patients again at 6 and at 12 months after injury, and we have now started doing 24-month follow-ups also. It has a multidisciplinary steering committee, and that has some very extensive clinical engagement from the orthopaedic community. As for the state trauma registry, we also link with the TAC and the deaths registry. In fact the two registries now share the same ethics approval. They share the same database, and we pooled a lot of the resources for the long-term*

<sup>49</sup> Department of Health, 'Victorian State Trauma System', viewed November 2013, <<http://www.health.vic.gov.au/trauma/>>.

<sup>50</sup> Department of Health, 'Victorian State Trauma System', viewed November 2013, <<http://www.health.vic.gov.au/trauma/>>.

<sup>51</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 3.

<sup>52</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 209.

<sup>53</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 208.

<sup>54</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 208.

*follow-up interviews. I just raise it because it is another particularly fantastic source of data about road trauma and serious road injury.*<sup>55</sup>

A unique feature of both registries is that they:

*...are the only trauma registries worldwide to capture any post-discharge outcomes and longer term burden of non-fatal injury. Other registries will link with their various death registries, and you can look at long-term mortality, but we are the only registries in the world that actually capture any information about long-term quality of life on a routine basis. We do about 1100 telephone interviews a month, which gives you a bit of an indication of the sort of scale of the operation.*<sup>56</sup>

An advantage of the registries is that they provide insights into the post-incident burden of injury by collecting functional outcomes data which includes data on disability and pain,<sup>57</sup> as well as on patients' capacity to return to work in the same workplace and in the same role they were in prior to the incident.<sup>58</sup> Further, the registries can, and have been used to compile Years of Life Lost (YLL), which is a component of Disability-Adjusted Life Years (DALYs), an important injury burden measure discussed in Chapter Three.<sup>59</sup> Interestingly, these registries are also linked to the TAC claims data, making it possible to look at the cost of serious road injury.<sup>60</sup>

The VSTORM, based at Monash University, is the custodian of the VSTR and the VOTOR and is considered, a 'world leader in data collection'.<sup>61</sup> In her presentation to the Committee, Professor Gabbe of the VSTR, explained the role of VSTORM:

*VSTORM itself is the Victorian State Trauma Outcome Registry and Monitoring Group. We are actually the group that holds the registries; we are really the custodians of the registries, not the registry itself. We were put in place as an independent entity for the analysis of data about the Victorian state trauma systems...*

*Our role is really to provide independent and objective analysis of the data that is contained in the registry that relates to the Victorian State Trauma System. We are really guided by a steering committee of expert clinicians, trauma service providers, funding stakeholders and researchers...We are really part of the Department of Health monitoring of serious road injury, if that makes sense...We are very much focused on monitoring of the state trauma system through the analysis of the data in*

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<sup>55</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 208.

<sup>56</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 209.

<sup>57</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 206.

<sup>58</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 206.

<sup>59</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 206.

<sup>60</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 207.

<sup>61</sup> Royal Australasian College of Surgeons, *Submission*, no. 18, 22 April 2013.

*the state trauma registry and also associated datasets. We are here to look at how effective that state trauma system has actually been in reducing preventable death and permanent disability in the state...We provide data directly to trauma services to help them do their continuous quality improvement...*<sup>62</sup>

#### 2.2.2.4 Victorian State Trauma Registry injury definition

The VSTR uses a 'major trauma' definition to categorise the most seriously injured patients, including those who have suffered a road crash injury. The major trauma definition was introduced following the *Review of Trauma and Emergency Services – Victoria 1999* report.<sup>63</sup> It is typically referred to as a threat to life based definition, and it uses a number of variables to categorise those patients who are the most seriously injured and in need of immediate care in a major trauma centre. It is based on the following parameters:

- *Includes potentially major and actual major trauma.*
- *Any patient of any age who meets any of the following criteria is counted in this category:*
  - *Death after injury*
  - *Admission to an Intensive Care Unit for more than 24 hours, requiring mechanical ventilation*
  - *Serious injury to two or more body systems*
  - *Injury Severity Score (ISS) greater than 12*
- *Urgent surgery for intracranial, intrathoracic, or intraabdominal injury, or for fixation of pelvic or spinal fractures.*<sup>64</sup>

The major trauma definition excludes certain injuries, such as very isolated eye injuries and isolated hip fractures among others.<sup>65</sup> Clearly, however, the types of injuries that qualify a patient as having suffered major trauma are quite substantial and therefore, should be seen as representing the most seriously injured patients treated in the Victorian hospital system.

**Finding 1:** The Victorian State Trauma Registry's major trauma definition sets the standard by which crash related serious injuries can be defined and identified.

<sup>62</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 205.

<sup>63</sup> Government of Victoria, 'Review of Trauma and Emergency Services – Victoria 1999', viewed October 2013, <[http://docs.health.vic.gov.au/docs/doc/BC6BAA609311B6B3CA257B67001B277C/\\$FILE/t2rev.pdf](http://docs.health.vic.gov.au/docs/doc/BC6BAA609311B6B3CA257B67001B277C/$FILE/t2rev.pdf)>, p. 4.

<sup>64</sup> Victorian State Trauma Outcome Registry and Monitoring group (VSTORM), *Victorian Motorcycle collisions 1 July 2005- 30 June 2011*, Melbourne, 2012. See also Government of Victoria, 'Review of Trauma and Emergency Services – Victoria 1999', viewed October 2013, <[http://docs.health.vic.gov.au/docs/doc/BC6BAA609311B6B3CA257B67001B277C/\\$FILE/t2rev.pdf](http://docs.health.vic.gov.au/docs/doc/BC6BAA609311B6B3CA257B67001B277C/$FILE/t2rev.pdf)>, p. 4

<sup>65</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 207.

## 2.3 Benefits of the current approach

The Committee identified several potential benefits of the current, police-led approach to collecting serious injury data and defining serious injury by reference to hospital admission. Broadly, these are: timely and efficient data collection; alignment and consistency with the NRSS definition for a national serious injury approach; readily available data that is provided to other road safety agencies; a definition which has been in continuous use for over two decades in Victoria (albeit with changes in the way that data has been collected by police),<sup>66</sup> making it easier to track changes over time; and it is a well-understood definition that can be used for public education and campaign purposes. Additionally, as noted by VicRoads, the current serious injury definition is also one that, irrespective of its limitations, has been found to provide ‘the best early indicator of crash severity’.<sup>67</sup>

In terms of timeliness, police operational requirements demand that a police officer create a TIS report before the end of their shift and complete that report within 28 days, unless a longer period is justified.<sup>68</sup> A series of business practices are used by police to ensure that crash data is completed in a timely manner (including the use of ‘chasers’ who identify missing data and assist with the completion of the TIS report).<sup>69</sup> According to VicRoads, statistical analysis has found that serious injury data contained in the TIS and RCIS datasets is ‘approximately 98% complete within four months of a crash occurring’.<sup>70</sup>

### 2.3.1 Improvements to police collected serious injury data

The Committee’s investigations into the merits or otherwise of the current approach to collecting and defining serious injury were aided by evidence provided by VicRoads and Victoria Police about improvements that are currently being made to Victoria Police’s collection of injury data. The mechanism through which these improvements are being made is the TIS Data Quality Working Group (the working group).<sup>71</sup> The working group, comprising representatives from Victoria Police, VicRoads, the TAC and WorkSafe Victoria, is aimed at ensuring data quality is maintained<sup>72</sup> and improved. The improvements made by the working group were outlined in the VicRoads submission:

- Training and supporting police in understanding the definition and the importance of checking hospital admission status (an improvement that is ongoing);

<sup>66</sup> Chris Brennan, Manager, Road Safety Coordination & Analysis, VicRoads, *Personal communication*, 5 December 2013.

<sup>67</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28.

<sup>68</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 25.

<sup>69</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 25.

<sup>70</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 25.

<sup>71</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28; Victoria Police, *Submission*, no. 32, 21 June 2013, pp. 23-24.

<sup>72</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28.



- Using TAC hospital claims files to confirm admission status of injured road users and adjusting TIS reports (manually) as required;
- Replacing the values in the ‘admitted to hospital’ data fields of ‘checked-not known’ and ‘not checked’ with ‘enquiries pending’ to improve the level of checking in relation to admission status; and
- Proactively returning TIS records with the ‘enquiries pending’ coding to the attending police officer for determination of admission to hospital status.<sup>73</sup>

Both Victoria Police and VicRoads believe these improvements should help increase the accuracy of reporting,<sup>74</sup> with VicRoads observing that the variability in serious injury data collected from 2010 onwards has already reduced.<sup>75</sup>

MUARC also suggested that the existing definition could be improved by validating police data against hospital data, which in the absence of a data arrangement with the DoH could be achieved by validating it against TAC claims information.

Another potential improvement to the TIS referred to by VicRoads is storing TAC claims data on it, which would allow data analysts to compare police confirmed hospital admissions data with TAC claims data. As a consequence, this could improve the accuracy of injury data. This enhancement has been the subject of a business case approval and was scheduled for implementation in 2013.<sup>76</sup>

Importantly, road safety agencies, including Victoria Police, have acknowledged that there is a need to improve the current injury definition.<sup>77</sup> The VicRoads submission also referred to attempts to improve the current definition, focusing on a workshop held in July 2010 to identify an appropriate injury definition. The workshop included representatives from road safety agencies, MUARC and the DoH.<sup>78</sup> A key recommendation from the workshop was that the current definition be retained.

## 2.4 Issues with the current approach

In spite of the improvements referred to in the previous section, the overwhelming evidence received by the Committee is that there are a myriad of issues and concerns associated with the existing serious injury definition. Those issues and concerns, thoughtfully detailed in submissions and witness testimony, have led to a consensus that

<sup>73</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28. See also Victoria Police, *Submission*, no. 32, 21 June 2013, p. 17.

<sup>74</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 17.

<sup>75</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28.

<sup>76</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28.

<sup>77</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 306.

<sup>78</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 28.

changes to the current definition are necessary, with many arguing for its replacement. Furthermore, the continuing feasibility of the current definition in Victorian road safety has been the subject of academic commentary outside of this Inquiry. For example, D'Elia and Newstead at MUARC in their paper, *Alternative measures of serious injury for national road safety strategy target setting*, concluded that:

*...it is clear that Police reported crash data on its own cannot be relied upon to provide an appropriate measure of serious injury for the monitoring of road safety performance and its use is possibly questionable in other analytical frameworks such as evaluation studies.<sup>79</sup>*

This section details the issues and concerns raised by stakeholders during the Inquiry, and which collectively support the above conclusion made by D'Elia and Newstead, among others. Generally, these issues and concerns fall into one of the following categories: the current definition is incapable of specifying the level of severity and therefore the seriousness of an injury; issues associated with current collection methods have led to inaccurate and incomplete records of serious injury; and the current measure does not support the development of road safety countermeasures, policies or tracking changes to road trauma over time. These categories are discussed further below.

#### 2.4.1 Injury severity

Throughout the Inquiry, the Committee came to understand that what constitutes a serious injury is subjective, imperfect<sup>80</sup> and context specific.<sup>81</sup> Arguably the leading issue with the current definition is that it lacks a severity scale, which has resulted in a lack of clarity around what injuries are deemed serious, and relies on police to assess injury severity. That subjectivity has previously been noted by this Committee as part of its investigations into data quality and accuracy issues for the *Inquiry into Motorcycle Safety*.<sup>82</sup>

The subjective nature of the definition was a central theme in witness testimony and submissions. Dr Martin Lum, Medical Director of Hospital and Health Service Performance at the DoH, noted

*We have been debating this at the road safety committee. It flagged that what is serious for one person is of different seriousness to another, and I guess at an agency level it is trying to understand what is the threshold of seriousness for the trauma practitioners who were interviewed previously. What is serious to them is probably*

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<sup>79</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 2.

<sup>80</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 57.

<sup>81</sup> Dr Martin Lum, Medical Director, Hospital and Health Service Performance, Department of Health, *Transcript of evidence*, 22 July 2013, p. 59.

<sup>82</sup> Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012, p. 40.

*quite different to someone else. For example, the police definition of a serious accident is a different threshold. There is some debate that is required to be able to come to a common understanding of what the characteristic of that seriousness is that you are wanting to describe.*<sup>83</sup>

Similarly, Professor James Harrison, Director of the Research Centre for Injury Studies, and Program Manager at the National Injury Surveillance Unit, at Flinders University described the subjectivity in distinguishing serious from severe injury, and the importance of clearly defining what is serious from what is not:

*What might at first glance appear to be the synonymous or near synonymous terms of ‘serious injury’ and ‘severe injury’ are terms that are used widely and frequently but very often without formal definition and if one is wanting to get into the territory in which the road safety sector has been a leader, measuring with a focus on the road toll, if one brings that same perspective to bear on non-fatal injury, one clearly needs to define very sharply what one is talking about.*<sup>84</sup>

Based on these witness observations, the emerging theme is that while the definition of serious injury appears to represent some measure of injury severity, it clearly does not. According to MUARC, for this reason the current measure cannot be relied upon.<sup>85</sup>

The Committee also notes that the serious injury definition proxy of admitted to hospital can capture a range of injuries, with vastly different threats to life and disability burden risks and outcomes. An example of this was provided by Professor Rebecca Ivers, Director of the Injury Division at the George Institute for Global Health:

*If someone has said that they are admitted to hospital, we code that as a serious injury. It could be shock. Someone could just have a scratch and be taken off in an ambulance and it is recorded as being a serious injury when in fact they get to hospital and they are discharged; they are not even admitted. That is an issue.*<sup>86</sup>

While Professor Ivers is based in New South Wales (NSW), these comments would arguably also apply to the Victorian context. The limited capacity of the current definition to differentiate between injury severities was also highlighted by Dr Liz De Rome, Senior Research Officer at Neuroscience Research Australia, in her presentation to the Committee:

*For years we have used hospitalisation as the basic definition — if somebody was admitted to hospital — but over the years, due to medical advances, someone who would have been hospitalised for a number of days a few years ago is sent home after treatment now. So it might look as if we are getting better at it, but it might also look*

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<sup>83</sup> Dr Martin Lum, Medical Director, Hospital and Health Service Performance, Department of Health, *Transcript of evidence*, 22 July 2013, p. 59.

<sup>84</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 366.

<sup>85</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 9.

<sup>86</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 142.

*as if it is the medicos who are getting better and we are still getting the same levels of those types of injuries. We do not know. You can have fractures, you can have severe lacerations or damage to the extremities, and it is not considered a serious injury because it is not life threatening and you will not be admitted.*<sup>87</sup>

That sentiment was also shared by Mr David Shelton, Executive Director of Strategy and Planning and the Road Safety Co-ordinator at VicRoads who added that:

*Whilst our current systems are very responsive under the current measure, the current measure is a surrogate for injury being admission to hospital, and it does not suitably act to differentiate between different levels of injury severity. It is, however, consistent with the current national definition, noting also that there is a commitment in the national road safety strategy to in fact work towards national measures of injury severity.*<sup>88</sup>

The commentary provided by Professor Ivers, Dr De Rome and Mr Shelton were also reiterated by other participants such as the Australian Road Research Board (ARRB),<sup>89</sup> Maurice Blackburn Lawyers<sup>90</sup> and the Road Safety Action Group Inner Melbourne (RSAGIM).<sup>91</sup> Associate Professor Stuart Newstead, the Associate Director of Injury Analysis and Data at MUARC, went further describing the current measure as ‘blunt’:

*One of the more specific problems I think we have in the way in which serious injury from road crashes is measured currently is that it is an incredibly blunt instrument. It tells you that a person was admitted to hospital, and that is the definition of a serious injury, but someone can be admitted to hospital to have a fractured wrist set in a cast and then be discharged a day later, or they can be admitted to hospital with major traumatic brain injury from which they will never recover and it will destroy their life. Currently we do not have the ability to differentiate between extremes of what is clearly a wide continuum of injury outcomes, and we really need to do that. We also have no idea of even what body region is involved in that injury.*<sup>92</sup>

An associated issue with the lack of a severity scale is the inability of the current definition to provide information about the long-term consequences (that is the outcomes) of road crash injuries.<sup>93</sup> MUARC’s submission made the following observations on this issue:

*For example, injuries requiring hospitalisations can range from a mild concussion requiring a day admission to hospital from which the patient will generally make a full*

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<sup>87</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 110.

<sup>88</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266.

<sup>89</sup> ARRB Group Ltd, *Submission*, no. 23, 26 April 2013, p. 3.

<sup>90</sup> Maurice Blackburn Lawyers, *Submission*, no. 26, 7 May 2013, p. 7.

<sup>91</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 9.

<sup>92</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 86.

<sup>93</sup> Maurice Blackburn Lawyers, *Submission*, no. 26, 7 May 2013, p. 7.

*recovery in a short time period to major traumatic brain injury that will leave the patient severely disabled and requiring high care for the rest of their life.*

*Clearly there are some injuries currently classified as serious that have a far greater consequence for the individual and society more broadly than others. In other words, the current definition of serious injury has low discriminatory power largely since it is based on information with a lack of any detail.<sup>94</sup>*

The issues identified in this section are not restricted to Victoria. The Committee also received evidence that other states have similarly questioned the ‘accuracy of their definitions and the classification of injury using the hospital admissions proxy recorded by police’, for example in NSW and Queensland.<sup>95</sup> Further, these issues extend to the United Kingdom (UK), with MUARC providing the following insights on the issues faced there:

*Like in Australia, concerns have also been expressed in other jurisdictions about the accuracy of police-reported serious injury. For example, in the UK, matching police-reported cases of hospital admission to official Hospital Episodes Statistics (HES) collected from the UK hospital system identified many discrepancies not only with police coded hospital admissions not appearing in the HES data, but also HES recorded admissions for those classified as minor injuries in the police data. These comparisons demonstrate the need to examine the definition of serious injury from road crashes and particularly the data systems which support its collection.<sup>96</sup>*

Internationally, a 2007 report, *Social and economic consequences of road traffic injury in Europe*, by the European Transport Safety Council (ETSC) demonstrated that injuries among EU member-states were misclassified by severity and that ‘official (police reported) road statistics were incomplete, inaccurate and biased’.<sup>97</sup>

#### 2.4.2 Issues associated with data collection methods

A key issue identified with the serious injury definition and collection of serious injury data is the current level of inaccuracy in police-collected data. Specifically, Inquiry participants identified the inability of police to correctly identify injury severity; administrative changes to the TIS and data collection protocols; and current legislative privacy obligations which restrict the capacity of police to confirm hospital admission status. Collectively, these issues are claimed to result in the under-reporting and misclassification of trauma data.

The Committee also wishes to highlight that there is a broader question about whether misreporting or under-reporting occurs because of a failure of people to report crashes to

<sup>94</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 10.

<sup>95</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, pp. 3-4; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 10.

<sup>96</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 7.

<sup>97</sup> R Elvik, et al., *Social and Economic Consequences of Road Traffic Injury in Europe*, European Transport Safety Council (ETSC), Brussels, 2007, pp. 9-12.

police, an issue identified in research.<sup>98</sup> However, in the absence of data or analysis as to the extent to which this occurs, it is not possible for the Committee to make further comment on this issue.

#### 2.4.2.1 Inability to identify injury severity

While police officers undertake training to carry out their duties at crash sites, they are not medically trained to identify injuries. According to both MUARC and the RSAGIM, police under or overestimate injury severity because they are not suitably trained to determine the level of severity.<sup>99</sup> Further, any injury assessments by police officers may be made on the basis of an on-scene assessment by unqualified personnel, and may not reflect what actually happens when the patient reaches hospital.<sup>100</sup> This type of misreporting, in terms of injury severity, is replicated internationally. The European Commission (EC) suggests that misreporting occurs because 'on the spot' assessments have commonly been used by police to determine injury severity.<sup>101</sup> In the United States of America (USA), researchers found that 'police were usually able to correctly identify those drivers who were killed or uninjured, but the levels of non-fatality injury were frequently misclassified'.<sup>102</sup> Similarly, in the UK, researchers compared police reports with hospital data and found that 'police-reported data alone could be very misleading'.<sup>103</sup>

Associate Professor Newstead at MUARC suggested to the Committee that this outcome could be explained by the very role given to police to report on serious injury:

*The more onus you put on a police force to define these things, the more chance the untrained medical person, as in a policeman who has no formal medical training generally, has the chance to misclassify these things. So I think there is an element of pragmatism in how serious injury is defined, and it has to be something that the police can reasonably define off their own bat.<sup>104</sup>*

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<sup>98</sup> E Amoros, J-L Martin and B Laumon, 'Under-reporting of road crash casualties in France', *Accident Analysis & Prevention*, vol. 38, no. 4, 2006, p. 630; European Commission, *Towards a Strategy on Serious Road Traffic Injuries - Frequently asked questions*, media release, European Commission, Brussels, 19 March 2013; The George Institute for Global Health, The University of Sydney, Presentation to Committee: 'Inquiry into Serious Injury', 5 August 2013, p. 5.

<sup>99</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 9; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 85.

<sup>100</sup> ARRB Group Ltd, *Submission*, no. 23, 26 April 2013, p. 3.

<sup>101</sup> European Commission, *Towards a Strategy on Serious Road Traffic Injuries - Frequently asked questions*, media release, European Commission, Brussels, 19 March 2013.

<sup>102</sup> C M Farmer, 'Reliability of police-reported information for determining crash and injury severity', *Traffic Injury Prevention*, vol. 4, 2003, pp. 38-44, cited in {McDonald, 2009 #567.}

<sup>103</sup> P.C Cryer, et al., 'Investigation of bias after data linkage of hospital admissions Data to police road traffic crash reports', *Traffic Injury Prevention*, vol. 7, 2001, pp. 234-241, cited in {McDonald, 2009 #567.}

<sup>104</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 85.

### 2.4.2.2 Changes to the Traffic Incident System and administrative changes to data collection protocols

Changes to the collection of data have been strongly identified as a culprit in the misclassification of serious injuries and under-reporting. The changes to police data collection methods, and their effect, were initially raised in the MUARC submission:

*...administrative changes to the recording of police crash data, and specifically the introduction of the TIS system, have only served to exacerbate the problem of inconsistency and inaccuracy.<sup>105</sup>*

Changes to the method for capturing injury levels and admission status occurred in 1989 and in 2005, with the transition from paper based police reporting to the implementation of the TIS reporting system.<sup>106</sup> The most recent changes were outlined by MUARC:

*Up until the end of 2005, crashes were reported by the use of the Victoria Police 510 form which had details about the people involved in the crash, the vehicles they were driving and crash circumstances. With the move to the Traffic Information System (TIS) at the end of 2005, use of the 510 form was abandoned and replaced by an in-station on-line reporting system. This did not change the basic items covered in the crash reports greatly. However, as noted in the previous section, it changed the consistency, and by implication the likely quality, of the data significantly. Anecdotally, police members applied a range of strategies for recording crash data at the scene including continued use of the 510 form or the use of simple notebooks. Inconsistency in methodology for at-scene documentation of crash information combined with the delay between attendance of the crash and entering into the on-line system are both likely to have led to data quality issues.<sup>107</sup>*

The impact of these changes was also highlighted in the MUARC submission:

*...a review of data in the new system which found that it is not possible to directly compare data in the old system with that in TIS and a major discontinuity in the serious injury data reported was noted...In response, Victoria Police has advised that since 2006 coding of serious injury changed again to being derived from a combination of taken and admitted to hospital with attempts to validate the hospital admission status through follow-up and other data sources.<sup>108</sup>*

The Committee also notes that this issue is likely to have an important impact outside of purely road safety policy development and monitoring, given the role of police reports in the Victorian transport accident compensation scheme. The Committee sought comment from Victoria Police about the issues arising from these changes to the collection of serious injury data. In its written response, Victoria Police acknowledged these issues and specifically referred to changes in counting rules and data collection practices that were

<sup>105</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 9.

<sup>106</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 24.

<sup>107</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 11.

<sup>108</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 8.

introduced with the *Arrive Alive* strategy in 2008, which meant that data collected after 2008 could not be compared with previously collected data.<sup>109</sup> According to Victoria Police, when the counting rules were changed, collecting practices were not improved.<sup>110</sup> As a consequence, by the third year of the Strategy, police-collected data could not be used to accurately measure whether serious injury had or had not increased over time. Accepting responsibility, Victoria Police stated that:

*...data capture practices and counting rules used by police between 2006 and 2010 overestimated the number of serious injury collisions.<sup>111</sup>*

Further, it remained unclear whether these practices, based on the revised definition set out in the *Arrive Alive* strategy, were settled across Victoria Police. Statistical analysis suggested that there was a level of inconsistency given that police data showed a constant downward trend whereas TAC collected admission data did not reflect the same trend. A possible explanation for the discrepancy was that TAC data was based on validated medical data relating to admissions whereas police data was not similarly validated.<sup>112</sup>

The issues arising from changes to police data collection methods are not unique to Victoria. Changes to police reporting methods also occurred in NSW when NSW Police decided to stop collecting serious injury data on police report forms in 1998. Similarly, it is acknowledged that Queensland has had data quality issues and long delays in processing and reporting of data from 2006, issues which remain unresolved.<sup>113</sup>

The Committee understands that a more recent change to Victoria Police's reporting requirements, outlined in both the TAC and MUARC submissions, is also likely to have worsened the situation.<sup>114</sup> The change, which came about as a result of the police *Upfront* and *TIS Reporting – Non-injury collisions* projects, saw the removal of the requirement to create a TIS report for non-injury crashes in situations where owners of damaged vehicles or property are notified prior to the end of a police officer's shift. Additionally, there is no requirement to create a TIS report where there is no possibility of identifying hit-and-run offenders.<sup>115</sup> Analysis undertaken as part of these projects found that 60 to 70% of TIS

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<sup>109</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>110</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>111</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>112</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>113</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 11.

<sup>114</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 8; Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 49.

<sup>115</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.



reports were made up of non-injury crashes where all parties were present. According to Victoria Police, it was found that non-injury crash data was not being used by any party that had access to TIS data and on that basis the requirement to collect this data was removed in order to ‘reduce the administrative burden for members and more effectively utilise police resources’.<sup>116</sup>

However, the changes to non-injury police reporting were cited by the TAC as problematic, and MUARC referred to it as highlighting the ‘fragility of the system by which Victorian road safety data is gathered’.<sup>117</sup> In its submission, the TAC expressed concern that it can no longer verify compensation claims, and that claimants injured in a crash are unable to comply with requirements under the *Transport Accident Act 1986*, which are preconditions for compensation.<sup>118</sup> According to the TAC, the potential to rectify under-reporting in the RCIS and by implication the TIS, by validating these against TAC claims, has now been lost.<sup>119</sup> That conclusion was also reached by MUARC, which provided the following observations on the police reporting methods in its submission:

*It is understood that for administrative efficiency reasons, Victoria Police recently decided not to enter information on non-injury crashes in TIS. It is understood that this has had a significant impact on the TAC’s ability to validate claim eligibility. In response the TAC has relaxed its requirement for a police crash report to be furnished with the claim. Where there had been potential in the system in the past to rectify the problem with the under-reporting of injury crashes in RCIS through a feedback loop via the TAC claims system, this potential has now been lost due to the recent administrative changes...Consequently, it seems that RCIS currently underestimates injury crash numbers.*<sup>120</sup>

As the RCIS is based on TIS reports, the problems with police-collected data could arguably extend, albeit to an unknown extent, to VicRoads Crash Stats data. This conclusion was made by MUARC, observing that:

*By its own description, there are potential problems with the completeness of police reported crash data held in RCIS. According to the CrashStats web site:*

*“When a crash record is processed within TIS, it is assigned a unique status such as ‘Draft[ ]’ or ‘Ready for Review’ or ‘Approved’. An ‘Approved’ incident means that the record has been finalised and is ready for coding and analysis by VicRoads. VicRoads can only process ‘Approved’ incidents and these records are subsequently loaded into CrashStats.”*

*Unfortunately, not all incidents are available within CrashStats. i.e. The data is ‘incomplete’. Various reasons for this include:*

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<sup>116</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>117</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 13.

<sup>118</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 49.

<sup>119</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 49.

<sup>120</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 13.

- *an incident has not yet been approved by Victoria Police, perhaps due to ongoing investigation and/or prosecution via the courts.*
- *an incident has been approved but cannot be processed by VicRoads, due to incorrect and/or missing information.*
- *the incident record has been returned to Victoria Police for amendment.*<sup>121</sup>

Victoria Police accepts that the changes to non-injury reporting have had an impact on the TAC compensation scheme. Specifically, Victoria Police stated that prior to the changes made to non-injury reporting there was 'a higher probability of locating a report that corresponded to claims where the injury becomes apparent at a much later stage to the collision incident'.<sup>122</sup> Since the change, the TIS Business Support Unit (TIS BSU) has found that police members referred to by TAC claimants in their compensation claim may have 'insufficient or no information of the collision',<sup>123</sup> although police are required to have sufficiently detailed notes in the daybook or patrol return record.<sup>124</sup> Victoria Police also indicated there has been an increase of approximately 31% in the number of TAC claims where the client has been advised to re-report the collision with Victoria Police.<sup>125</sup> There have been on average some 50 requests per month for missing TIS reports, with an increase of 176% in the number of claims with no corresponding police report in the period between January 2011 and January 2012.<sup>126</sup> The result of these changes is that the 'TAC now pays claims without a TIS report based on the client's information only'.<sup>127</sup>

### 2.4.3 Legislative privacy obligations: Confirming admission status

The current serious injury reporting framework requires police officers to follow up a TIS report where they have been unable to confirm an injured person's hospital admission status. This requirement, which was outlined earlier in the chapter, is characterised by an 'enquiries pending' coding in the TIS. Throughout the Inquiry, it remained unclear whether confirmation of admission status was sought by police immediately after a patient was transported to hospital by ambulance, or whether it mainly occurred within the 28 day period provided to police to complete the TIS report, or both. Indeed, it was suggested to the Committee that:

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<sup>121</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 12.

<sup>122</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>123</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>124</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>125</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>126</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>127</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

*...there is generally some effort by the police to follow up on that serious injury classification, the admission to hospital, through follow-up with the hospital or the patient themselves, but that has varied over time.*

*...consistency in the system is always a problem. There has also been variance in the willingness of the police and in fact the ability of the police to follow up people who might be admitted to hospital.<sup>128</sup>*

This issue, however, is secondary to the inability of police to confirm an injured person's admission status with the relevant hospital. The Committee was advised by both Victoria Police and the DoH that this limitation was due to legislative requirements which prohibited, on privacy grounds, hospital staff from providing police with information about a patient's admission status.<sup>129</sup> In its submission, MUARC also commented on the issues faced by police in obtaining access to hospital data:

*A further issue that is reported to have affected the accuracy of police reporting of serious injury in Victoria is the ability of police to verify hospital admission status of road crash victims. Police have reported increasing problems with hospitals not being willing to confirm patient admission status for crash reporting when asked by police, allegedly due to reasons of privacy.<sup>130</sup>*

At the public hearings in Melbourne, Associate Professor Newstead from MUARC expanded on these comments:

*In recent times the police have actually been reporting that this is getting more and more difficult, because ideally they go to a crash, record the people who have been involved and say, 'Yes, they've been taken off in an ambulance to hospital', and they attempt to follow up with the hospital where that patient has been admitted. Now frequently the hospital is saying, 'Sorry. It's a privacy issue; we can't tell you'. So the police have no method of validating that hospital admission at all. Even though Victoria Police has all sorts of statutory rights to information, they cannot find that out, so the ability to validate that has become quite difficult in many instances. I will say that the agencies do work together and have tried to rectify this, and we will see some evidence of that in the future.<sup>131</sup>*

To ascertain the extent that these issues firstly affect data collection and secondly, are based on actual rather than assumed privacy issues, the Committee sought comment from both the DoH and Victoria Police. Assistant Commissioner Robert Hill of Road Policing Command at Victoria Police explained that there was a level of variability in the

<sup>128</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, pp. 85-86.

<sup>129</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 58; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 8; Victoria Police, *Submission*, no. 32, 21 June 2013, p. 19.

<sup>130</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 8, 11.

<sup>131</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 86.

responses of hospitals to police requests.<sup>132</sup> In preparing its response to the Committee's questions, Victoria Police sought examples from police officers who had not been provided with information from hospitals upon request. In the examples provided, information requests had not been granted by The Alfred Hospital (on 14 occasions), the Royal Melbourne Hospital (on five occasions), and the Western General Hospital (on one occasion).<sup>133</sup> On these occasions, the hospitals advised the requesting police officers that a warrant would be required for the release of such information.<sup>134</sup>

The legislative basis prohibiting the release of such information is the *Health Services Act 1988* and the *Health Records Act 2001*. According to Victoria Police, although there is, ostensibly, an ability to disclose information for the purposes of law enforcement under the *Health Records Act* (health privacy principle 2.2(j)), section 141 of the *Health Services Act* does not allow the provision of admission information for a law enforcement purpose because it does not prescribe this purpose.<sup>135</sup> On this basis, Victoria Police concluded that the current legislative framework and policy does not expressly allow the 'communication of personal information from health services to police for law enforcement purposes'.<sup>136</sup>

According to Victoria Police, the impact of this issue is that 'motor vehicle collision investigations are impeded from the time of the collision onwards'. In order to rectify it, Victoria Police proposed to the Committee that section 141 of the *Health Services Act* be amended to allow police to receive appropriate health information, and require health services to cooperate with police when seeking such information.<sup>137</sup>

In response to the Committee's questions on this matter, the DoH drew on legal advice and accepted that the current legislative framework, which is intended to protect the privacy of individuals' health information, does not provide the necessary authorisation to allow police to collect admissions data, from hospital staff. Mirroring Victoria Police's response, the DoH raised the possibility of developing new regulations to allow the release of information 'within health privacy principle 2.2(l)'.<sup>138</sup> Mr Shelton from VicRoads also provided commentary on the issue of confirming admission status:

*In regard to data exchange and timeliness, we recommend that there be work, particularly with the Department of Health, to enable Victoria Police to check on*

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<sup>132</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>133</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>134</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>135</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>136</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>137</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

<sup>138</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

*admission status. It is particularly important under the current definition of 'serious injury' that admission status be known and reported promptly to allow us to keep a timely check on data. There is a need also to examine opportunities to link with Department of Health data and police crash data to better understand serious injury.<sup>139</sup>*

**Finding 2:** The Committee believes that the current health legislative framework makes police confirmation of admission status difficult and haphazard.

#### 2.4.4 Effect of the issues associated with the current approach in Victoria: Under-reporting

The combined effects of the issues afflicting police defined and collected serious injury data have had three distinct impacts: firstly, they have led to police under-reporting or over-reporting road injury cases; secondly, the under-reporting and over-reporting has had a detrimental effect on Victoria's capacity to measure and assess road trauma and road safety performance; and thirdly, it has inhibited policy attempts to design and implement new countermeasures, as well as research attempts to evaluate them. In some respects these impacts overlap with one another. For example, the inaccuracy, incompleteness or under-reporting of injury data also has a consequential impact on the development of countermeasures. For the purposes of clarity, the Committee has dealt with each of these issues separately, but notes it is important to view these impacts as interrelated and overlapping.

A common theme in the evidence from government and non-government Inquiry participants was that the current approach to defining and collecting serious injury data has led to issues in the reported data.<sup>140</sup> Specifically, the Committee notes there were issues with both under- and over-reporting. For example, the ARRB submission outlined its experience with under-reporting of data:

*Many crashes go unreported, resulting in an underestimation of the number of crashes and any crash rates derived from this figure...ARRB's work in developing road safety strategies for local governments has indicated that local hospital databases contain up to three times as many motorcycle injuries as does the VicRoads database for the same period.<sup>141</sup>*

<sup>139</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266.

<sup>140</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266; Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 371; Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>141</sup> ARRB Group Ltd, *Submission*, no. 23, 26 April 2013, p. 3.

In the context of over-reporting, MUARC researchers Hoareau et al reported in 2006 'that serious injury as derived from police-reported crash data was over-reported and that the over-reporting generally increased over time'.<sup>142</sup>

The Committee notes that the most commonly cited examples of misreporting data under the current approach involved cycling and motorcycling injury crashes. Citing research findings and their own experiences, Inquiry participants overwhelmingly concluded that police reporting of cycling injuries had led to a high level of under-reporting. The RSAGIM remarked that:

*A key concern of RSAGIM is the potentially high level of under reporting of injuries to vulnerable road users, particularly cyclists. Garrard et al (2010) found that "the number of police-reported serious cyclist injuries is substantially lower than the number of hospital-reported serious injuries. This finding is consistent with other Australian studies. One of the primary reasons for the difference is likely to be that CrashStats data is focused on on-road accidents, whereas many cycling injuries occur on bike paths and cycleways."*<sup>143</sup>

A similar sentiment was shared by Mr Shelton of VicRoads who explained that:

*There are also some known levels of under reporting, particularly as it relates to cycling. This occurs particularly where police are not in attendance or it is not brought to their attention that injuries have occurred, but there have been admissions to hospital as a result of crashes on roads.*<sup>144</sup>

Professor Harrison of Flinders University also elaborated on the incidence of cycling under-reporting by drawing attention to police attendances at cycling crashes:

*...there has been a tradition in the past of a police-based measure at the crash scene being something like including the cases that the police at the scene thought were going to be admitted to hospital...that has been problematic, partly because bicycle-only crashes tend not to get police attendance as much as crashes involving motor vehicles.*<sup>145</sup>

Research by Balfous et al also noted that this experience was not unique to Victorian road safety. That research, based in NSW, 'found that the majority of NSW cyclist crashes were not recorded in police records and for the crashes that had been recorded, the detail on injury severity was too limited'.<sup>146</sup> Mr Shelton of VicRoads, also suggested that these issues, particularly as they apply to motorcyclists and cyclists, are replicated nationally

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<sup>142</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 9.

<sup>143</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 5.

<sup>144</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 265.

<sup>145</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 371.

<sup>146</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 5.

and internationally.<sup>147</sup> For example, a 2007 European Transport Safety Council (ETSC) report found ‘that there was a lower level of reporting for bicycle injuries than for injuries in other road user groups’.<sup>148</sup> Further, a peer-reviewed research paper of police reported casualty crashes in the Rhone County, France, found that crashes involving cyclists were .75 times less likely to be reported when compared to other road users.<sup>149</sup>

Apart from cycling, research undertaken in New Zealand (NZ) aimed at identifying the level of under-reporting by police found that ‘less than two thirds of all hospitalised vehicle occupant traffic crash victims were recorded by police’.<sup>150</sup> This finding reaffirmed earlier NZ research into the under-reporting of road crashes by police.

In France, researchers have found that that ‘any study based on police crash data may be quite misleading’, rendering obsolete the use of such data in research.<sup>151</sup> In Sweden, a long-established road safety leader, for every road death there are 23 survivors who require hospital treatment, but only eight of those seriously injured are recorded by police.<sup>152</sup>

**Finding 3:** The existing serious injury data collection in Victoria is likely to distort the true state of road trauma in Victoria.

The effect of police under-reporting or over-reporting cannot be understated. As has already been noted by the Committee, police-derived crash statistics are central to measuring the performance of road safety initiatives, assessing whether trauma reduction targets in road safety strategies have been met, and allocating public resources. Mr Shelton of VicRoads made a similar point in his presentation to the Committee:

*I think there is no doubt in the community’s mind that its members want to avoid serious long-term outcomes or being killed in a road crash, but we need to define what they are, and the current measure does not do that. The community’s expectation is that we invest in those things that best address those things that they are most trying to avoid, which currently we are not measuring.*<sup>153</sup>

<sup>147</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, pp. 265-266.

<sup>148</sup> R Elvik, et al., *Social and Economic Consequences of Road Traffic Injury in Europe*, European Transport Safety Council (ETSC), Brussels, 2007, pp. 9-12.

<sup>149</sup> E Amoros, J-L Martin and B Laumon, 'Under-reporting of road crash casualties in France', *Accident Analysis & Prevention*, vol. 38, no. 4, 2006, p. 630.

<sup>150</sup> J Alsop and J Langley, 'Under-reporting of motor vehicle traffic crash victims in New Zealand', *Accident Analysis & Prevention*, vol. 33, no. 3, 2001, p. 353.

<sup>151</sup> E Amoros, J-L Martin and B Laumon, 'Under-reporting of road crash casualties in France', *Accident Analysis & Prevention*, vol. 38, no. 4, 2006, p. 627.

<sup>152</sup> A Ersson, (Swedish Transport Administration), 'Set targets for serious injuries reduction in Europe (presentation)', viewed August 2013, <<http://www.etsc.eu/documents/Progress%20in%20reducing%20serious%20injuries%20Asa%20Ersson.pdf>>.

<sup>153</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

Accurate road crash data is also essential to building the case for new initiatives and countermeasures, a point also made by Mr Shelton:

*Of course accuracy in our data is important to know whether we are on track with our strategies to reduce road trauma, but also the detail of data is important to understand what sorts of countermeasures we need to address, particularly to bring down road trauma.*<sup>154</sup>

MUARC commented in its submission on the adverse effect that incomplete and misreported serious injury data has on measuring the effectiveness of the road strategy:

*As a consequence of the on-going changes to the serious injury definition and crash data systems, trends in the serious injury measure over time, the key outcome measure of performance in the Victorian road safety strategy (Victorian Government, 2013), may not reflect real serious injury trends even by the current definition of hospital admission and may not reflect the effectiveness of the strategy.*<sup>155</sup>

There was agreement among Inquiry participants that existing serious injury data is not of great use when developing countermeasures or evaluating their effectiveness due to its inaccuracy. MUARC stated in its submission:

*Lack of detail in the data currently used to derive Victoria's measure of serious injury from road crashes has also caused problems in the research context. These problems are particularly acute in research focusing on road safety countermeasures that target particular human body regions or injury types.*

*Road safety research is increasingly focused on specific injury outcomes related to particular body regions to measure robust associations between road safety countermeasures and injury outcomes. The current measure of serious injury used in Victoria and the data from which it is derived are becoming increasingly inadequate to service this need. Furthermore, as shown by MUARC's side airbag study, reductions in serious injury risk attributable to certain countermeasures are not necessarily being reflected in the current measure of serious injury.*<sup>156</sup>

At the public hearings, Associate Professor Newstead of MUARC added that:

*...clearly the measure we have now does not reflect serious injury in a very detailed manner. If in fact the countermeasures we have out there now are really targeting only the minor end of the serious injury scale we have, we are still missing a burden on society. We need to understand within even a hospital admission those things that create long-term disability or almost a high probability of death and tailor the countermeasures that we are putting out there on the road to address those with*

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<sup>154</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 265.

<sup>155</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 8.

<sup>156</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 10-11.



*more priority than they perhaps have from the current measure. I think the real reason behind needing that measure is so that we can better target it.*<sup>157</sup>

The RSAGIM also noted this issue in its submission, stating that:

*Clearly the failure to accurately define and measure injury severity reduces the ability of other road safety professionals to analysis crash trends and determine effective countermeasures.*<sup>158</sup>

At public hearings, the Committee was provided with specific examples where data issues had limited researchers' capacity to assess countermeasures. The first was provided by Associate Professor Newstead of MUARC:

*Recently at MUARC we did an evaluation of the effectiveness of side airbag systems in vehicles. We said 'We really want to know about head injuries, thorax injuries and upper body injuries, which these airbags are designed to protect. If we look at the police definition of serious injury, we have no idea what body region was injured and we have no idea of the severity of that injury'. So that caused us to look further afield to enhance our database.... But clearly the instrument we had at our disposal was a very blunt instrument and really not very sensitive.*<sup>159</sup>

Another example provided by MUARC related to research evaluating bicycle helmet laws:

*As an example, in an evaluation of the effectiveness of Victoria's bicycle helmet wearing law introduced in 1992 (Newstead et al, 1994; Carr et al, 1995), use of police-reported serious injury data proved inadequate to properly assess the impact of the legislation. Instead the analysis focused on both TAC claims data and hospital admissions data from the Victorian Admitted Episodes Database[sic] (VAED) in order to be able to identify the impact of the legislation specifically on head injury rates amongst bicyclists.*<sup>160</sup>

Further, MUARC indicated that the current measure's insensitivity makes it difficult to identify which countermeasures are working well in eliminating certain types of injuries, or reducing their severity (for example traumatic brain injuries), because it treats all injuries which involve an admission as being fundamentally the same.<sup>161</sup>

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<sup>157</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

<sup>158</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 10; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013.

<sup>159</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 86.

<sup>160</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 10.

<sup>161</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 86.

The impact of injury data issues on countermeasure evaluations also extends to expenditure, as it is not currently possible to identify the most cost-effective and therefore, appropriate countermeasures to fund.<sup>162</sup>

## 2.5 Discussion

The overwhelming consensus that the Committee identified among Inquiry participants and in the research literature is that the current serious injury definition is inadequate and no longer capable of helping Victoria succeed in further reducing road trauma. This consensus is supported by the continuous identification of issues with road safety data as collected by police, nationally and internationally. The Committee acknowledges the efforts of Victoria Police in conjunction with VicRoads and the TAC to improve the operation of the TIS reporting system, data collection methods and the validation of hospital admission statuses. Nevertheless, the current serious injury definition remains flawed, and these weaknesses are compounded by the current legislative framework that restricts hospitals from providing police to safeguard private, patient admission details.

The issues associated with the current definition affect every aspect of road safety: the expenditure of funds, the targeting of countermeasures, the assessment of the regulatory framework, and the measurement of progress. Further, the capacity of the current definition to provide the Victorian Government, road safety agencies and researchers with information about the extent and nature of road trauma is limited, as is its capacity to assess the performance of existing countermeasures or inform the development of new ones. The Committee believes that the comments made by Assistant Commissioner Robert Hill are illustrative of the broader need to change the way serious injury is defined in Victoria.

*Certainly it is evident to all concerned that we need to rethink the definition of a serious injury collision. At the moment we need to differentiate between someone who might be admitted to hospital with a sprained shoulder or something similar as opposed to someone who has received life-changing injuries. This work needs to be done as a matter of urgency...We need to appreciate, and Victoria Police does, that your policing methodology will change if you are focused on trying to reduce road fatalities or alternatively you are trying to reduce serious injuries occurring on our road system.*<sup>163</sup>

The need for change is a view shared by the Committee. The evidence is both persuasive and clear. In particular, the Committee believes that change is needed if Victoria is going to achieve national and local injury reduction targets and the more ambitious, long-term objective of reducing fatalities and serious injuries to zero.

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<sup>162</sup> Professor Mark Stevenson, Director, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

<sup>163</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 306.

The issues associated with road safety data, from the point of collection, analysis, definition and use, have already been the subject of substantial investigation by this Committee in the *Inquiry into Motorcycle Safety* report. The Committee views the issues raised by participants in the current Inquiry as expanding on the issues addressed in the findings and recommendations in its previous report. The Committee also reaffirms the finding by Elvik, Høy, Vaa and Sørensen, in *The Handbook of Road Safety Measures*, that the ‘reporting of road accidents in official statistics are incomplete and biased’.<sup>164</sup> Clearly, a wholesale change is needed to the way injuries are defined and injury data is collected in Victoria. The Committee’s recommendations for change are outlined in Chapter Four.

**Finding 4:** The current approach to defining serious injury and having these injuries compiled through police statistics is problematic and does not represent best practice. There is clearly a need for change.

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<sup>164</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, p. 47.



## CHAPTER THREE AT A GLANCE

### OVERVIEW

Chapter Three provides an overview of the different methods for defining serious injury, and the different roles and purposes they serve. Definitions for serious injury can fall into one of three different categories, resource-use, threat to life and burden of disease, and each is outlined in the chapter. Particular attention is given to threat to life measures, which measure the likelihood of death arising from different injuries, and the burden of disease measures, which try to assess the disability and loss of quality of life arising after an injury. In addition to these, the chapter also looks at injury definitions used in the occupational health and safety and transport accident compensation areas, to assess their efficacy for use in road safety.

This chapter, along with Chapter Two, provides the foundation for the Committee's recommendations for a new approach to defining and reporting serious injury, which is outlined in Chapter Four.

### KEY FINDINGS

Finding 5: Resource-use measures, including those that include a time period to better denote the seriousness of a hospital admission, are problematic because they do not reflect the actual severity of injuries suffered in a road crash. That conclusion is shared internationally. However, such measures are not intended to fulfil that purpose, instead providing government and road safety agencies with data on hospital and police resources allocated to road trauma.

Finding 6: The use of maps to translate the *International Statistical Classification for Diseases and Related Health Problems, Revision 10, Australian Modification* to an Abbreviated Injury Scale is problematic, produces un-validated outcomes and should not be used as a surrogate for proper analysis and coding by trained coders.

Finding 7: It is clear that Disability-Adjusted Life Years can be used to calculate the burden of injury from road trauma, and might therefore be capable of being applied systematically in Victorian road safety.

Finding 8: Disability-Adjusted Life Years (DALY) weightings currently exist and could be used to analyse road trauma. New DALY weightings are being developed which will better reflect Victorian health outcomes.

Finding 9: At present, the Committee does not believe that the legislated compensation definitions are appropriate for road safety reporting needs.

**RECOMMENDATIONS**

Chapter Three does not include any recommendations.

## CHAPTER THREE: INJURY DEFINITIONS

Throughout the Inquiry process, the Committee received various proposals from Inquiry participants about how to improve Victoria's road safety injury data system. In assessing the merits of these proposals, the Committee considered a number of factors, including the purpose of the data's use in monitoring trends; supporting research and evaluation; assessing the performance of road safety agencies, the road system and road safety countermeasures; and targeting resources and expenditure in a way that maximises injury reductions. The Committee also noted participants' suggestions for appropriate ways to define serious injury.

In its presentation to the Committee, the Transport Accident Commission (TAC) provided an overview of the general principles that a serious injury definition/measure would, ideally, be based on. These principles resonated with the Committee because of the way they framed the objective of a serious injury measure and the parameters of such a measure. According to the TAC, a serious injury measure should:

- *[Be] objective, understandable and easily explainable[;]*
- *Adequately related to [the] consequences of [being] injur[ed], importantly [the] threat to life and impairment [outcomes;]*
- *Balance data availability, accuracy, timeliness, coverage and economy, whilst meeting practical needs[;]*
- *Not discriminat[e] between people in terms of demographic and socioeconomic circumstances[; and]...*
- *[Be] consistent with interstate and international practices.<sup>165</sup>*

This chapter deals with the substantive matter of selecting an injury definition to categorise seriousness, drawing from the suggestions outlined above. It provides an overview of the different roles and purposes that injury definitions fulfil, and of the current national project aimed at identifying the most appropriate serious injury definition. It also outlines the different types of measures that can be used to track serious injuries, discussing the merits and the weaknesses of each one.

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<sup>165</sup> Transport Accident Commission (TAC), Presentation to Committee: 'Serious Injury Inquiry ', 11 September 2013., slide 15

Given the broader relevance of serious injury outside of the road safety context, the Committee consulted widely with non-road safety and medical areas of policy and regulation to identify other types of serious injury definitions (in occupational health and safety and transport accident compensation legislation). These injury definitions are also outlined in this chapter. Overall, this chapter and Chapter Two provide the foundations for the Committee's recommendations for a new approach to defining serious injury, proposed in Chapter Four.

### 3.1 Injury definitions fulfil different roles, different purposes

The use of injury definitions is in part dependent on their intended use and in part on the available data collection systems (discussed later in this chapter), as noted by Dr Martin Lum, Medical Director of Hospital and Health Service Performance at the Department of Health (DoH):

*The important thing is to understand the reason and rationale for why they are designed and what the limitations are of the design of those specifications so that when you do the linkages you are drawing the right conclusions when you are interrogating that linked data. I think that is an important perspective.<sup>166</sup>*

Dr Lum's perspective was re-iterated in the Monash University Accident Research Centre (MUARC) submission, which noted that 'approaches to defining serious injury vary according to the perspective taken – societal, health care system, road transport system, injured individual'.<sup>167</sup>

The question of the serious injury definition's intended use has been at the forefront of the Committee's thinking on this issue. For example, the type of measure useful for public education campaigns requires clarity and, arguably, simplicity if it is to convey or support a particular road safety message. This measure, however, would differ from that used by clinicians to identify improvements in trauma treatment practices.

The Committee is also aware that different types of injury definitions are likely to lead to different assessments of trauma. The TAC presentation to the Committee illustrated this. It referred to a case study where different injury definitions were applied to the same injuries to highlight the differences in the way these injuries would be treated and categorised. The four injury definitions included a threat to life definition using the Maximum Abbreviated Injury Scale (MAIS) 3+ (as used in the European Union (EU)); a TAC 'cost of compensation' measure comprising injuries that cost over \$52,378; a resource-use measure using acute hospitalisations of more than 14 days as the contingent condition; and a TAC 'degree of impairment' that includes injuries resulting in an

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<sup>166</sup> Dr Martin Lum, Medical Director, Hospital and Health Service Performance, Department of Health, *Transcript of evidence*, 22 July 2013, p. 57.

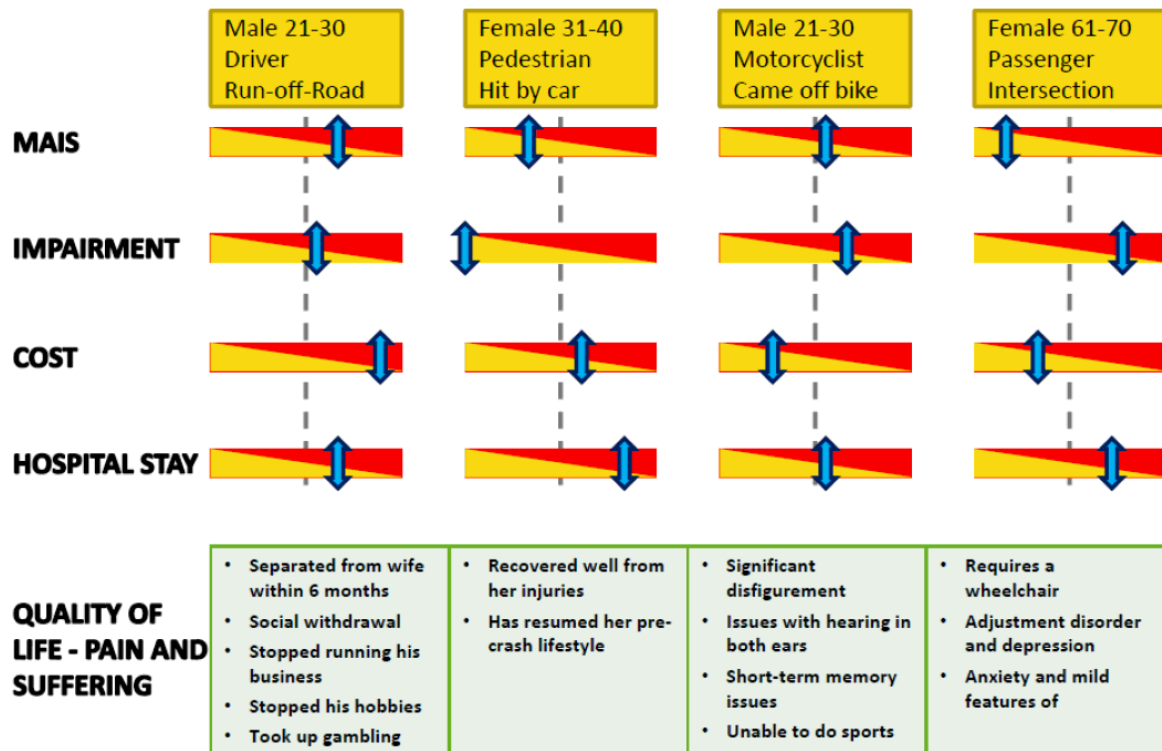
<sup>167</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 14.



impairment of 30% or more. The TAC also added a quality of life loss/pain and suffering measure.<sup>168</sup> In the case study, each of these definitions was applied to four different TAC claim examples as reproduced below in Diagram 1.

**Diagram 1: Transport Accident Commission claims case studies<sup>169</sup>**

### Consequences of Injury – TAC claims case studies



It is clear from the diagram that when each measure is applied to each of the cases, there is a strong variability in the severity levels. Only in the first case have the criteria for all measures been met (signified by arrows on the right hand side of the vertical dotted line), despite all the cases having symptoms of suffering from a serious injury. Mr Michael Nieuwesteeg, the Research Manager of Road Safety and Marketing at the TAC, observed that while the person at the far right of the diagram had a low threat to life score, they had substantial impairment or a lifelong burden from the injury.<sup>170</sup> Conversely, because of their age, the costs were reduced because they had a lower life expectancy and therefore would require less compensation.<sup>171</sup>

<sup>168</sup> Alan Woodroffe, Senior Manager Policy, Service and Review, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 315; Transport Accident Commission (TAC), Presentation to Committee: 'Serious Injury Inquiry', 11 September 2013., slide 12.

<sup>169</sup> Transport Accident Commission (TAC), Presentation to Committee: 'Serious Injury Inquiry', 11 September 2013.

<sup>170</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 316.

<sup>171</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 316.

The clear conclusion from the TAC case study is that different definitions will measure injuries differently and each definition may provide a different permutation that policy makers would find useful. That was the sentiment shared by Mr Nieuwesteeg:

*So there are four different measures and four different results.*

*The clear result from this analysis is that there is no single measure that we can rely on. Some people are going to be considered serious by one measure, others by a different measure.*<sup>172</sup>

### 3.2 Attempts to develop a national 'serious injury' definition

As indicated in the previous chapter, the question of what is the most appropriate serious injury definition is one that has also occupied road safety agencies and researchers in other States and Territories. As part of its investigation, the Committee identified a number of initiatives aimed at establishing a new serious injury definition, reflecting the growing interest in replacing the current measure. In particular, the Committee notes a national project to harmonise the serious injury definition commenced in 2011.<sup>173</sup> The basis for this project was the *National Road Safety Strategy*, a point highlighted by Dr Gary Dolman, Head of Bureau at the Bureau of Transport, Infrastructure, Transport and Regional Economics (BITRE), during his appearance before the Committee:

*We consider that a common definition of 'serious injury' is currently a missing link in measuring and reporting in road accidents and road safety in Australia. Fundamentally, it would be very difficult for Australia to effectively monitor progress towards the current National Road Safety Strategy target of a 30 per cent reduction in serious injury until we have that consistent definition agreed and being reported on by all jurisdictions.*<sup>174</sup>

In terms of the project's progress, Dr Dolman explained:

*In June 2010 all jurisdictions agreed in principle that there should be a common definition adopted, which is 'confirmed admitted to hospital', irrespective of the length of stay. This is the same definition that has been adopted by the Australian Institute of Health and Welfare in their series, which has been reporting on national road injuries since 2001. We commend Victoria for using that definition already, and we note that New South Wales and the ACT are also in the process of moving towards that common definition.*<sup>175</sup>

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<sup>172</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 316.

<sup>173</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 135.

<sup>174</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 166.

<sup>175</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 166.

This work appears to have gained momentum in some jurisdictions, with Professor James Harrison, Director of the Research Centre for Injury Studies, and Program Manager at the National Injury Surveillance Unit for Flinders University, noting to the Committee that Victoria and others had begun working towards the BITRE confirmed admission definition.<sup>176</sup>

In her presentation to the Committee, Ms Margaret Prendergast, the General Manager of Policy and Regulation at Centre for Road Safety, Transport for NSW, provided a non-Victorian jurisdictional view of the importance of a national definition:

*What we really need is a well-defined agreed national definition of 'serious injury'. New South Wales has been seeking this for two years because we knew we needed to reinstate collection, therefore we needed the rest of the country to come on board and say, 'What are we going to reinstate?'. Two years ago we worked in the national group with all the other states and came up with 'confirmed admitted to hospital'.<sup>177</sup>*

*You could have 'admitted to hospital', but unless you can confirm it, it is not true data. That is why the 'confirmed' went in front. Other states are saying that 'confirmed' is even difficult to validate, so it could be 'admitted to hospital' or 'confirmed'; we are running with 'confirmed'.<sup>178</sup>*

The difficulties in creating a harmonised serious injury definition, albeit based on the existing Victorian definition, were also highlighted by Dr Dolman and Ms Prendergast.<sup>179</sup> In particular, Ms Prendergast indicated that attempts to create a single definition had slowed because of the divergent approach taken by different jurisdictions:

*In terms of validating, the Bureau of Infrastructure, Transport and Regional Economics has had a look at that and realised that there are anomalies in how each state collects. To some degree we are comparing apples with bananas. Our preference is to follow Victoria; as the second largest state it is really important that we look at Victoria as a model. At the moment we are just using 'confirmed admitted to hospital'. We know that other states use it by time frame — admitted for 24 or indeed 48 hours. Other states are doing what we used to do, which is to just tick a box on the front of a form and you do not really ever know how many injuries are truly serious unless you link them at the other end. Our aim is to get a definition, but in the interim we are just running with 'confirmed admitted to hospital' because there are other states that said they could not do the time period. We are really looking to the Department of Infrastructure and Transport in Canberra to help us broker a definition*

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<sup>176</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 371.

<sup>177</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

<sup>178</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 135.

<sup>179</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 166; Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

*that will be acceptable to all states and give us a level playing field for comparison, and they are working on that.*<sup>180</sup>

Despite these ongoing attempts to establish a national definition, the situation in Victoria, and elsewhere, remains unchanged. It is against this backdrop, that the Committee analysed different types of injury definitions that could be employed by the Victorian Government to replace the existing measure.

### 3.3 Measures for defining serious injury

#### 3.3.1 Resource-use measures

Resource-use measures are those where an injury definition is based on the use of different resources.<sup>181</sup> As discussed in Chapter Two, this type of measure is what Victoria currently uses to measure serious injury, and is based on hospital use, for example the number of people admitted to hospital or presenting to an emergency department. In its submission, MUARC defined a resource-use measure as follows:

*Resource use measures are based around the simple premise of counting the number of people utilising a health resource. The current measure of serious injury by counting the number of hospital admissions is an example of a health resource measure. Variations on this measure can include measures set around length of stay in hospital, presentation at an emergency department and any other measure that can be made by observing usage of an aspect of the health system.*<sup>182</sup>

Other variations may also include visits to GP clinics and the use of other health services such as rehabilitation.<sup>183</sup> An example of a longer period of stay can be found in Western Australia (WA), which uses a stay of more than one day as the trigger for counting a person as being admitted to hospital and therefore seriously injured.<sup>184</sup> Nevertheless, this type of definition does not differentiate between trauma types.<sup>185</sup>

The strengths and weaknesses of this type of measure were outlined in the previous chapter and are expanded on here. In particular, the MUARC submission included a useful summary of the advantages and disadvantages of resource-use measures:

*In general, measures relating to resource use are popular because they are relatively simple to calculate (notwithstanding the problems noted in the Victorian road safety*

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<sup>180</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

<sup>181</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 89.

<sup>182</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>183</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 89.

<sup>184</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>185</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 89.

*data systems) and they provide a reasonable, albeit somewhat coarse, indication of injury severity. They have some significant weaknesses however including the potential of being affected by hospital admission policy and changes to funding models and the previously noted problem of often being non-specific with a wide variety of injury outcomes often encompassed within a single resource use measure. This means that in some instances trends in serious injury measured from resource use may vary over time with no underlying change in real injury rates whilst at other times the measure might be invariant to real changes in certain important injury types.<sup>186</sup>*

Further, some jurisdictions have attempted to increase the sensitivity of resource-use measures so they better reflect injury severity, the most obvious example being attempts to impose minimum time limits to admissions (as in WA) by basing the serious injury definition on a minimum number of hospital days, typically 14. Despite these attempts, the measure remains problematic. This sentiment was expressed by the DoH in its submission:

*Similarly, the use of the length of hospital stay as a proxy measure of serious injury is problematic. Apart from the concern that the choice of a given length of stay may be seen to be arbitrary, any such measure is likely to be at odds with established models of service delivery that differentiate between the acute and sub-acute care needs of patients. For example, initial acute admissions for serious injury resulting from road traffic accidents may be for less than 14 days but be immediately followed by a prolonged admission for rehabilitation care. Alternatively admissions for less serious injury may equal or exceed 14 days as a result of other complicating or co-morbid conditions or patient circumstances, unrelated to the road traffic accident.<sup>187</sup>*

Similarly, at an international level, a report by the *High-level group on road safety consultation on the development of the injuries strategy*, citing the EU-funded *SafetyNet* project, indicated that the most commonly used definition of serious injury among EU member-states was ‘length of stay at hospital’. This approach was deemed as a ‘sub-optimal way of defining a serious injury since it is likely to be significantly influenced by clinical practices, and the availability and organisation of hospital services rather than by the level of road safety.’<sup>188</sup>

Nevertheless, there are some who believe that applying time limits to resource-use measures can enhance their sensitivity. For example, Mr David Shelton, the Executive Director of Strategy and Planning and the Road Safety Coordinator at VicRoads, noted in his appearance before the Committee:

*We have started monitoring the 14-day stay in hospital as another surrogate of severe injury. It is not an indicator of the permanency of disability or the long-term*

<sup>186</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>187</sup> Department of Health, *Submission*, no. 30, 14 May 2013, pp. 22-23.

<sup>188</sup> Jeanne Breen Consulting, '2nd Working Document: Next steps in the development of the injuries strategy – Final: November 2012', viewed October 2013, <[ec.europa.eu/transport/road\\_safety/pdf/injury\\_next\\_steps.pdf](http://ec.europa.eu/transport/road_safety/pdf/injury_next_steps.pdf)>, p. 9.

*disability that people might suffer, but it is an improvement over the simple status of whether people are injured or not. That is a figure that we draw from the TAC's data.*<sup>189</sup>

**Finding 5:** Resource-use measures, including those that include a time period to better denote the seriousness of a hospital admission, are problematic because they do not reflect the actual severity of injuries suffered in a road crash. That conclusion is shared internationally. However, such measures are not intended to fulfil that purpose, instead providing government and road safety agencies with data on hospital and police resources allocated to road trauma.

The Committee is also cognisant of the issue identified by participants that admission practices can differ among hospitals and may change over time, making longitudinal analysis problematic. Professor Belinda Gabbe, Head of the Victorian State Trauma Registry (VSTR), provided an example of the type of change that can occur over time:

*To give you a good example, a number of years ago we looked at foot fractures and foot fracture admissions — obviously this was related to the orthopaedic registry — and we saw a massive increase in admissions to hospital for foot fractures. It is not really because there are more of them occurring in the general population; it is simply because surgeons got new methods for managing those patients and were more likely to admit them so they could operate on them, whereas previously that clinical approach was not available. The threshold for when a patient is hospitalised or not hospitalised will change over time, depending on clinical practice. I think that is fair to say.*<sup>190</sup>

In many respects changes in admissions practices are inevitable; a product of both administrative changes and improvements in treatment.

### 3.3.2 Threat to life measures

Essentially, threat to life measures reflect the probability of a patient dying from the injuries they have sustained.<sup>191</sup> An advantage of all threat to life measures is that they are less likely to be influenced by hospital admission practices (although this depends on pre-hospital practices and care)<sup>192</sup> and the ongoing data collection issues associated with resource-use based measures.<sup>193</sup>

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<sup>189</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266.

<sup>190</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 213.

<sup>191</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>192</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>193</sup> Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 119.

There are several serious injury definitions based on a threat to life measure, including the Abbreviated Injury Scale (AIS), the Injury Severity Score (ISS), the International Classification of Disease-based Injury Severity Score (ICISS) and the Maximum Abbreviated Injury Scale (MAIS), each of which is discussed below.

### 3.3.2.1 International Classifications of Diseases coding and Survival Risk Ratios

In order to understand threat to life measures, it is necessary to outline how these measures rely on the International Classification of Diseases (ICD) and Survival Risk Ratios (SRRs). The Australian Bureau of Statistics (ABS) describes the ICD as the international standard classification for epidemiological purposes designed to promote international comparability in the collection, processing, classification and presentation of causes of death statistics.<sup>194</sup> It is used extensively in Australia by statistical bodies such as the ABS and in hospitals.<sup>195</sup>

The ICD is also referred to as a ‘general purpose classification of diagnoses and related matters for health conditions. It includes a range of diagnostic codes that characterise the nature of the injury and the external causes of injury’.<sup>196</sup> According to VicRoads, the ICD supports the ‘systematic recording, analysis, interpretation and comparison of morbidity data’.<sup>197</sup> In Victoria, the ICD is applied to all admitted hospital cases with the coding information contained in the Victorian Admitted Episodes Dataset (VAED).<sup>198</sup> While the ICD on its own does not contain an explicit severity scale,<sup>199</sup> it forms the basis of some threat to life measures, such as the ICISS. There are two ICDs, ICD-9 and ICD-10 (the most recent update), with Australian hospitals, including those in Victoria, using the latter coding.<sup>200</sup> The ICD-10 uniquely comprises Australian amendments to suit local requirements, and is referred to as the ICD-10 Australian Modification (ICD-10-AM).

The ICD coding system is used as a basis for SRRs, which are described as a ‘database-specific point estimates of survival associated with each injury categorised in the ICD’.<sup>201</sup>

<sup>194</sup> Australian Bureau of Statistics, *Causes of Death, Australia, 2010 – Explanatory notes*, Canberra, Document 3303.0, 2012, p. 5.

<sup>195</sup> Australian Bureau of Statistics, *Causes of Death, Australia, 2010 – Explanatory notes*, Canberra, Document 3303.0, 2012, p. 5.

<sup>196</sup> Expert Group on Injury Severity Measurement, 'Discussion document on injury severity measurement', viewed January 2014, <<http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf>>.

<sup>197</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 47.

<sup>198</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 13; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 89.

<sup>199</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 13.

<sup>200</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 13; Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 277.

<sup>201</sup> J.W Meredith, P.D Kilgo and T Osler, 'A fresh set of survival risk ratios derived from incidents in the National Trauma Data Bank from which the ICISS may be calculated', *Journal of Trauma* vol. 55, no. 5, 2003.

The SRR is assigned to a single injury,<sup>202</sup> and provides an estimate of the probability of death ranging from 0 (no chance of survival) to 1 (100% chance of survival).<sup>203</sup> A serious injury would usually be defined as a score of 3 or more on the AIS or a SRR equal to or less than 0.941.<sup>204</sup> SRRs are derived for each injury code by dividing the number of patients who survive the code by the total number of patients that display the code.<sup>205</sup> Detailed descriptions of injuries or ICD-10-AM coding are therefore required in order to assign an AIS or SRR,<sup>206</sup> and a sufficiently large representative trauma population is required in order to provide meaningful SRRs.<sup>207</sup> It should also be noted that, in addition to detailed descriptions, other supporting evidence is also required to accurately code injuries using the AIS, including radiology reports and operative reports among others.<sup>208</sup>

### 3.3.2.2 Abbreviated Injury Scale

The AIS is an 'internationally agreed tool that describes the severity of injury for each of the nine regions for the body'.<sup>209</sup> The AIS was developed by the Association for the Advancement of Automotive Medicine (AAAM) with the primary role of aiding crash investigations.<sup>210</sup> It is seen to 'represent the threat to life associated with the injuries rather than the comprehensive assessment of the severity of the injuries'.<sup>211</sup> 'The AIS has two components: (1) the injury descriptor which is a unique numerical identifier for each injury description; and (2) the severity score'.<sup>212</sup> When the AIS is applied to a road crash patient, a scale is used that rates the injury from 1-6 (1 = minor; 2 = moderate; 3 = serious; 4 = severe; 5 = critical; and 6 = maximum). Where there is not enough information to assign a value, a code of 9 (not specified) is applied.<sup>213</sup> According to MUARC, 'an AIS 1 injury will generally not require hospital treatment, whereas an AIS 6

<sup>202</sup> **Note:** The Committee understands that it is possible to apply multiple SRRs to patients with multiple injuries. See G Henley and J E Harrison, *Injury Severity Scaling: A comparison of methods for measurement of injury severity*, Australian Institute of Health and Welfare (AIHW), Canberra, 2009, p. 3.

<sup>203</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 4.

<sup>204</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 4.

**Note:** The reference to a probability of death of at least 5.9% appears in a number of research articles examined by the Committee. See S Chong, W Du and J Hatfield, 'Trends in the incidence of hospitalisation for injuries resulting from non-traffic crashes in New South Wales, July 1998 to June 2007', *Medical Journal of Australia*, vol. 193, no. 10, 2010, p. 223.

<sup>205</sup> J.W Meredith, P.D Kilgo and T Osler, 'A fresh set of survival risk ratios derived from incidents in the National Trauma Data Bank from which the ICISS may be calculated', *Journal of Trauma* vol. 55, no. 5, 2003.

<sup>206</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 4.

<sup>207</sup> J.W Meredith, P.D Kilgo and T Osler, 'A fresh set of survival risk ratios derived from incidents in the National Trauma Data Bank from which the ICISS may be calculated', *Journal of Trauma* vol. 55, no. 5, 2003.

<sup>208</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

**Note:** There is also a weighting of information for AIS coding that coders are trained to use. Essentially this weighting is used to rank medical sources of information.

<sup>209</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 26.

<sup>210</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>211</sup> Actuaries Institute, *Submission*, no. 16, 19 April 2013, p. 4.

<sup>212</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>213</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 4.



injury is almost certainly fatal.<sup>214</sup> MUARC also noted in its submission that the scores assigned to different injuries are derived from medical consensus and it therefore requires detailed medical information about the injury.<sup>215</sup> Importantly, ‘as trauma patients commonly have more than one injured body part, the severity score for the most severe injury is often used – this is termed the Maximum AIS (‘MAIS’).<sup>216</sup>

The AIS is used in Victoria by the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), and underpins the major trauma definition used in the VSTR. Professor Harrison of Flinders University referred to its use in the VSTR in his presentation to the Committee, noting that the registry comprises a high cut-off point for injuries, with injuries meeting the AIS 3 and above threshold as high threat to life cases.<sup>217</sup>

The following benefits surrounding the use of the AIS were identified by the Committee from the research literature:

- Trauma surgeons and the trauma system are familiar with the AIS methodology;
- It is consistent with international recommendations by the International Road Traffic and Accident Database (IRTAD) for an international ‘serious injury’ definition;<sup>218</sup>
- It is the most widely used severity score based measure;<sup>219</sup> and
- It is considered an ‘industry standard in terms of coding injuries’.<sup>220</sup>

Further, the Committee notes that the AIS is already used in road safety in Victoria, with the TAC advising that it is a key component in ‘complex risk models used by the TAC to identify factors that contribute to the likelihood that a particular vehicle or licence holder will be involved in a claim, and to predict the cost of a claim or severity of injury’.<sup>221</sup>

The Committee also received evidence about the weaknesses of the AIS, with a key issue being that it does not reflect the combined effects of multiple injuries.<sup>222</sup> According to the Organisation for Economic Co-operation and Development’s (OECD) International

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<sup>214</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 15, citing Stephenson et al (2003).

<sup>215</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>216</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>217</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 369.

<sup>218</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 369.

<sup>219</sup> Expert Group on Injury Severity Measurement, ‘Discussion document on injury severity measurement’, viewed January 2014, <<http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf>>, p. 7

<sup>220</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>221</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 318.

<sup>222</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

Transport Forum, this weakness is explained by fact that the AIS was originally developed for crash investigation analyses with the intention of providing:

*...researchers with a simple numerical method for ranking and comparing injuries by severity and to standardise the terminology used to describe the injuries.*<sup>223</sup>

In his presentation to the Committee, Associate Professor Stuart Newstead, Associate Director for Injury Analysis and Data at MUARC, provided a more general explanation of the weaknesses of the AIS:

*One of the problems that has been noted with the AIS scale is how to calculate it. [The] AIS can be calculated [either] by direct coding of injury by an AIS professional who is trained to AIS code — and they will code an AIS code for each injury, which includes the body region, the type of injury and the severity within that score, and then the severity can be taken out of that score — or you can in fact derive AIS codes by mapping what we call ICD codes. When you are admitted to hospital the hospital staff code your injuries according to the International Classification for Diseases. It is an internationally accepted injury-coding system. There are various modifications — various versions. In Australia we use ICD-10. In the US they still use the previous version, ICD-9, and in fact we make some modifications in our Australian system to talk about injury causation as well.*<sup>224</sup>

In correspondence with the Committee, Professor Gabbe of the VSTR explained that this purported weakness of the AIS, that it cannot deal with multiple injuries, is an ‘oversimplification’ of the matter. Professor Gabbe indicated that individual AIS codes are applied to all injuries, following which individual codes are used to determine whether multiple injuries should be considered. Further, in the context of coding AIS, Professor Gabbe suggested that the only validated way of doing this was to use specialised coders. Further, she explained that the AAAM recommends that AIS not be coded by using mapping software.<sup>225</sup>

The AIS, as with other threat to life measures, is also seen as having a limited capacity to support estimations of disability outcomes.<sup>226</sup> The Committee understands that because of these limitations, the ‘AIS has undergone many revisions and several scoring systems have also been developed to overcome these shortcomings, including some derived from

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<sup>223</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 26.

<sup>224</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 89.

<sup>225</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>226</sup> **Note:** While there is limited empirical data supporting the predictive capacity, the 2005 revision of the AIS included a consideration of its ability to predict functional impairment or disability. See Expert Group on Injury Severity Measurement, 'Discussion document on injury severity measurement', viewed January 2014, <<http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf>>, pp. 11-12

the AIS'.<sup>227</sup> These derivatives, such as the ISS, though based on the AIS, are being used to overcome AIS limitations so that researchers and policy makers have a better understanding of the severity of injuries.<sup>228</sup> Further, the Committee was made aware of at least one example of the AIS being used to compile burden of injury values. The WA Government's Office of Road Safety referred to this Swedish example in its submission:

*An example of work in this area includes the estimation of the risk of permanent medical impairment in road traffic crashes conducted in Sweden by Folksam Research, the Karolinska Institutet and the Swedish Road Administration. In this research, Swedish insurance claim data was used to assign a risk of permanent medical impairment to different AIS levels and body regions. This table could then be used to predict the number of people with permanent medical impairment as a result of a crash based on the AIS-2005 coding of their injuries after the crash. These projections [have] been used by the Swedish Road Administration to prioritise initiatives taken by road system designers and vehicle manufacturers to reduce the level of permanent impairment in the population.*<sup>229</sup>

The Committee understands, however, that mapping AIS to impairment using AIS-2005 in the way described above is likely to occur by using an inbuilt Functional Capacity Index which according to Professor Gabbe of the VSTR, is an un-validated method.<sup>230</sup> Mapping between these datasets and coding systems appears to be extremely problematic, and would not be appropriate for monitoring trauma, including that caused by road crashes.<sup>231</sup>

Another disadvantage of the AIS (and one shared by the ICISS which is outlined below) is that it has limited utility to measure longitudinal changes. This is because changes in clinical care will alter clinical outcomes and therefore, the threat to life. The result, as highlighted by Professor Gabbe is that 'your odds of surviving an injury now compared to 10, 15 or 20 years ago are much better', which makes injury monitoring over time difficult.<sup>232</sup>

An issue seldom discussed during the Inquiry, with the exception of the MUARC submission and by Professor Gabbe in her appearance before the Committee, is the cost and administrative burden posed by the AIS. Professor Gabbe stated:

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<sup>227</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 15.

<sup>228</sup> Expert Group on Injury Severity Measurement, 'Discussion document on injury severity measurement', viewed January 2014, <<http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf>>.

<sup>229</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>230</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>231</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>232</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 213.

*The other problem is that the AIS was built for specific people with specific training to capture that information, it is not routinely collected by the hospitals and it is quite expensive to collect. The maps that exist from ICD to the AIS are not very good.*<sup>233</sup>

This commentary is replicated elsewhere in the relevant literature, with Osler, Glance and Bedrick noting in their chapter for the text, *Current therapy of trauma and surgical critical care*, that AIS scoring is expensive, and therefore is done only in hospitals with a zealous commitment to trauma.<sup>234</sup>

Lastly, a number of stakeholders highlighted to the Committee the difficulty in applying AIS scores to the ICD-10-AM coded data in the VAED. According to VicRoads, the AIS and its derivative scores (ISS and the New Injury Severity Score (NISS)) can be applied to the VAED but they require complex mapping processes and computer programming to convert codes for the injury diagnosis into an injury severity score. Crucially, predictive power is lost at each step of the mapping process.<sup>235</sup> A further complication is that there is no system to directly map ICD-10-AM injury coding (which is what is used in the VAED) to AIS scores, although there is mapping software that does so for ICD-9-CM. While it may be possible to map backwards, that is to map ICD-10-AM codes into ICD-9-CM codes and then convert these to an AIS or AIS derivative score, some code specificity would be lost and there are some ICD codes that may not correlate to an AIS injury classification. VicRoads expressed concern that any scores derived using coding would be subject to error, may be inaccurate, and would be considered a conservative measure of injury severity.<sup>236</sup> The concerns of VicRoads in relation to mapping were also shared by MUARC<sup>237</sup> and Professor Gabbe of VSTR.<sup>238</sup> However, MUARC also accepted that this situation will change in the future, once updated maps are created that can convert ICD-10 to AIS.<sup>239</sup> In contrast, Professor Gabbe disagreed that maps would improve in the future to allow mapping between ICD-10 to AIS:

*What doesn't change is that you are mapping one system to a fundamentally different system. This cannot be overcome really and error will always be high. Mapping is fraught with error. My hope is that ICD-11 will be more conducive to AIS mapping as they are building in elements of the AIS to the ICD 11<sup>th</sup> revision.*<sup>240</sup>

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<sup>233</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 213.

<sup>234</sup> T Osler, L Glance and E Bedrick, *Injury Severity Scoring: Its Definition and Practical Application*, Saunders/Elsevier Company, Philadelphia, 2008. Chapter 3 found in J Asensio and D D Trunkey, *Current therapy of trauma and surgical critical care*, Elsevier, 2008, p. 12.

<sup>235</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 47.

<sup>236</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 47.

<sup>237</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 19.

<sup>238</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>239</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 91.

<sup>240</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

Further, Professor Gabbe cautioned that deriving AIS codes by mapping ICD codes was not a validated way to code AIS, and had arisen as an adaptation to deal with a lack of resources and trained coding staff.<sup>241</sup>

**Finding 6:** The use of maps to translate the *International Statistical Classification for Diseases and Related Health Problems, Revision 10, Australian Modification* to an Abbreviated Injury Scale is problematic, produces un-validated outcomes and should not be used as a surrogate for proper analysis and coding by trained coders.

### 3.3.2.3 Injury Severity Scores

The ISS is based on the AIS, and essentially calculates a score by squaring and adding together the highest AIS scores for three of the six most severely injured body regions.<sup>242</sup> The premise underpinning the ISS was to develop a measure that could provide a single severity score for patients with multiple injuries.<sup>243</sup>

Professor Russell Gruen, Director of the National Trauma Research Institute at Alfred Health, advised the Committee that the ISS has been a ‘standard way of talking the same language across all trauma centres that have used it worldwide, and that number has been increasing.’<sup>244</sup> In Victoria, the ISS has been used for two decades. Professor Gruen also informed the Committee that:

*Where Victoria has deviated from most other states and countries in the world is that it has designated major trauma to include a certain ISS score that is greater than 15, plus some other criteria. There is good reason for that.*<sup>245</sup>

In correspondence with the Committee, Professor Gabbe of VSTR explained that Victoria has since 2010 used an ISS threshold of 12 based on AIS 2005 (as well as subsequent updates) in its major trauma definition.<sup>246</sup> Associate Professor Michael Fitzgerald, Director of the Trauma Service at Alfred Health, added to this evidence contextualising the historical use of the ISS in Victoria:

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<sup>241</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>242</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 26; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16; Office of Road Safety WA, *Submission*, no. 24, 30 April 2013., unnumbered

<sup>243</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 16, citing Baker et al 1974.

<sup>244</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 43.

<sup>245</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 43.

<sup>246</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

*We developed this classification in the early 1990s. Once we had this standardised nomenclature to describe injury and the likelihood of survival — that was part of the strategy that Frank McDermott's groups did in the mid-1990s, 1995 or 1996 — this idea of preventable or potentially preventable death was not a matter of opinion of a few crusty professors around the table...But that was one of the problems — there was a lot of subjectivity in management. If you said the person was potentially survivable prior to the mid-1990s, people could become quite indignant about it because they felt that it was a subjective opinion. But once we had this injury severity score based on an anatomical injury scale, then Stephen Cordner and Frank McDermott were able to say, 'Look, this person, based on this large cohort, has an 85 per cent chance of survival'. You can plot survival against likelihood of survival, and the outliers that are a couple of standard deviations outside are expected survivors. Irrespective of your opinion, based on the injuries that they have sustained and their likelihood of survival against a large cohort, you can then determine whether your system is functioning well or functioning poorly, because you can then determine the number of preventable or potentially preventable deaths.*<sup>247</sup>

The Committee understands that the ISS is seen as providing a better nexus between the overall severity of injuries and the probability of survival, when compared to other measures such as the AIS or the MAIS.<sup>248</sup> An additional benefit is that it allows researchers, policy makers and others to use the same approach to define serious injury.<sup>249</sup>

The ISS also has a number of disadvantages, including those relating to the AIS, as it is derived from it. In addition, a key disadvantage of the ISS is its inability to account for multiple injuries to the same body region, which as a consequence limits the total number of contributing injuries to three and may omit other significant injuries altogether.<sup>250</sup> A different, but related issue is that trauma victims may have fewer than three injuries to different body regions, making the final ISS score less effective. This limitation becomes compounded when one body region has multiple, serious injuries, but other body regions have less serious injuries. As noted by Olser et al:

*By considering less severe injuries, ignoring more severe injuries, and ignoring many injuries all together, the ISS loses credible information.*<sup>251</sup>

Further, but perhaps of limited relevance to Victoria, is that because the 'ISS relies on coding of the severity of injuries by anatomical region of the body, which is a somewhat complex task', only well-developed countries have developed ISS coded trauma.<sup>252</sup>

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<sup>247</sup> Associate Professor Mark Fitzgerald, Director, Trauma Service, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 43.

<sup>248</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>249</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 43.

<sup>250</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 16, citing O'Keefe et al (2001).

<sup>251</sup> T Osler, L Glance and E Bedrick, *Injury Severity Scoring: Its Definition and Practical Application*, Saunders/Elsevier Company, Philadelphia, 2008. Chapter 3 found in J Asensio and D D Trunkey, *Current therapy of trauma and surgical critical care*, Elsevier, 2008, p. 12.

### 3.3.2.4 New Injury Severity Score

The NISS is a modification of the ISS, which was developed to address the issue of patients suffering from multiple injuries in the same body region.<sup>253</sup> According to the MUARC submission:

*[The NISS] is very similar to the ISS except it scores the three most severe AIS scores regardless of their body region location, therefore, multiple injuries within a body region can be accounted for in the calculation of a NISS. The change from ISS to NISS [is] aimed at increasing the predictive value of the index and simplifying its calculation.*<sup>254</sup>

According to research provided to the Committee, the NISS can better predict survivability and ‘is a more accurate predictor of post injury organ failure than the ISS’.<sup>255</sup>

### 3.3.2.5 Maximum Abbreviated Injury Score

The MAIS is also based on the AIS, and essentially calculates a single value to reflect the maximum threat to life. The computation of the MAIS is straightforward: it comprises the maximum AIS scores for each body region.<sup>256</sup> For example, if a patient had a head and chest injury, and each injury was scored as an AIS three and a four respectively, the MAIS would be a four using the chest injury AIS as the maximum.

The MAIS is considered to be ‘informative and administratively convenient’<sup>257</sup> and provides information on injury severity. However, several weaknesses were identified in the evidence presented to the Committee. Like the AIS, it is unable to provide information on disability or long-term impairment and lost quality of life.<sup>258</sup> Further, it cannot identify the interaction between co-morbidities (pre-existing illnesses) and injury, a situation outlined by Professor Gabbe of the VSTR:

*What we find is that we get a lot of major trauma patients whose injuries may not be particularly severe but because they were sick prior to injury — they had comorbidities prior to injury and then on top of it a relatively moderate head injury*

<sup>252</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 43.

<sup>253</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 16, citing Osler et al (1997), Breneman et al (1998), and Balogh et al (2000).

<sup>254</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>255</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>256</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 26.

<sup>257</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 113.

<sup>258</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 113.

*and something else — they actually do need the care of a major trauma service because they become complex patients to deal with.*<sup>259</sup>

Mr Peter Schofield, Manager of Road Safety Strategy and Partnerships at VicRoads, expressed his concern with the MAIS in his appearance before the Committee:

*The issue with an MAIS is that it only reflects injury, or the most severe injury, to one body region, which is not what we want.*<sup>260</sup>

This sentiment was echoed by Dr Liz De Rome, Senior Research Officer at Neuroscience Research Australia, who commented that:

*I do not think it contributes much. If you look at vulnerable road users, a vulnerable road user does not have a shell around them. If you are a car occupant, your single most serious injury will be from the direction of impact, and it will be to a part of your body; you are restrained and you are not thrown around. With vulnerable road users — bicycles, motorcycles, pedestrians — if they are hit by a moving vehicle, they are thrown all over the place, their body is wrenched and there are multiple injuries all over the place. None of them might be a single high-impact force to a particular organ, so they do not rate as a 5 or a 6, but their life is ruined. It is quality of life that I am going with.*<sup>261</sup>

### *International uses of Maximum Abbreviated Injury Scale*

In spite of these concerns, the European Union (EU) selected the MAIS as the default serious injury definition for road trauma among its member-states.<sup>262</sup> In particular, the EU selected the MAIS 3+ level as the threshold on the basis that it is the level at which injuries would have long-term consequences or damage.<sup>263</sup>

The adoption of the MAIS 3+ definition by the EU followed the publication of an IRTAD Group study which found that the MAIS 3+ definition should be used as the default definition internationally.<sup>264</sup> The IRTAD Group suggested this measure would help address issues such as those identified in Victoria regarding police collection and validation of serious injury data and the lack of a severity scale in the hospital admission proxy. According to the Netherlands Institute for Road Safety Research (SWOV), the EU adopted the MAIS 3+ definition because of the inability of some member-states to use ICISS,

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<sup>259</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, pp. 212-213.

<sup>260</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 277.

<sup>261</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 113.

<sup>262</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

<sup>263</sup> European Commission, *Commission staff working document - On the implementation of objective 6 of the European Commission's policy orientations on road safety 2011-2020 - First milestone towards an injury strategy*, Brussels, 19 March 2013, p. 7.

<sup>264</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.



making cross-country comparisons difficult.<sup>265</sup> The Committee also sought comment from VicRoads and MUARC as to why the EU adopted the MAIS 3+ definition. Mr Shelton of VicRoads stated:

*On the rationale as to why the Europeans have gone for MAIS, I do not know specifically the answer to this, but I suspect it is quite strongly what is most conveniently available to them. Just as here the most conveniently available data might be ICISS, in Europe I understand it is the AIS data.*<sup>266</sup>

Similarly, Professor Mark Stevenson, the Director of MUARC, explained that:

*...we are aware that Europe has introduced that, but there are pragmatics around the MAIS as well as to why they might introduce that across a whole array of countries that have variations in coding and classification compared with, say, a country like Australia, which is pretty much standardised. We have been using ICD. We have our own Australian modifications to the ICD, and it is a much more sophisticated outcome measure.*<sup>267</sup>

Mr Hafez Alavi, Senior Data Analyst at the TAC, also noted the introduction of the MAIS 3+ definition in the EU, but expressed caution about its current usefulness:

*The issue I wanted to raise is that we talked to one of the committee members who is giving advice to the European Union road safety council. They have not evaluated this interim measure of serious injury — MAIS. Ongoing they are evaluating different measures, and they talked to us at the Brisbane conference about us maybe needing to consider different measures. In our submission we echoed some of the arguments that MUARC raised for adopting ICISS. We might suggest that MAIS and ICISS should be evaluated in Australia to see which one is the better choice in the Australian context.*<sup>268</sup>

The European Commission (EC) believes the MAIS will provide it with an objective, reliable basis for data collection, backed by high levels of validity.<sup>269</sup> It argues that the MAIS will help it overcome reliability issues associated with the police collection of data and arbitrary diagnoses, and because the MAIS is already embedded within some of the hospital systems of EU member-states it will not require the development of new systems.<sup>270</sup> It is also believed that a commonly used definition that is medically derived

<sup>265</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

<sup>266</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267.

<sup>267</sup> Professor Mark Stevenson, Director, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 96.

<sup>268</sup> Hafez Alavi, Senior Data Analyst, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, pp. 326-327.

<sup>269</sup> European Commission, *Commission staff working document - On the implementation of objective 6 of the European Commission's policy orientations on road safety 2011-2020 - First milestone towards an injury strategy*, Brussels, 19 March 2013, p. 7.

<sup>270</sup> European Commission, *Commission staff working document - On the implementation of objective 6 of the European Commission's policy orientations on road safety 2011-2020 - First milestone towards an injury strategy*, Brussels, 19 March 2013, p. 7.

will ensure a more accurate identification of the magnitude of road trauma; facilitate identification and development of effective interventions to reduce road trauma; and allow monitoring and evaluation of targets and international benchmarking within the EU.<sup>271</sup>

### 3.3.2.6 International Classification of Disease-based Injury Severity Score

Throughout the Inquiry, the ICD Injury Severity Score (ICISS) was the most cited and proposed serious injury measure among participants. In the road safety arena, the ICISS is used by the Australian Institute of Health and Welfare (AIHW), which undertakes research on serious injuries caused by land transport crashes. In its analyses, the AIHW uses the ICISS to define injuries with a high threat to life.<sup>272</sup> The ICISS estimates the probability of death for each ICD injury diagnosis code, giving patients a score between zero and one.<sup>273</sup> In order to arrive at an ICISS, the method calculates the Survival Risk Ratio (SRR) for each individual diagnosis, using linked death records.<sup>274</sup>

As mentioned earlier in this chapter, an SRR is the ‘the proportion of cases with a certain injury diagnosis in which the patient does not die, or in other words, a given SRR represents the likelihood that a patient will survive a particular injury’.<sup>275</sup> MUARC advised in its submission that ‘each patient’s final ICISS score (survival probability) is calculated by multiplying the probabilities of surviving each of their injuries individually.’<sup>276</sup> The SRRs are then used in setting a threshold which can be used to classify hospital admissions as being either serious or non-serious.<sup>277</sup>

An important distinction between the ICISS and other injury severity scores, such as the AIS, is the way in which it is formulated. This distinction was outlined in the MUARC submission:

*The previously described injury severity scores are all consensus-derived as they are based on the severity score of the Abbreviated Injury Scale (AIS) which was assigned by clinical experts. The International Classification of Disease Injury Severity Score (ICISS) is data-derived and, in contrast to the classifications mentioned previously, is*

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<sup>271</sup> Jeanne Breen Consulting, '2nd Working Document: Next steps in the development of the injuries strategy – Final: November 2012', viewed October 2013, <[ec.europa.eu/transport/road\\_safety/pdf/injury\\_next\\_steps.pdf](http://ec.europa.eu/transport/road_safety/pdf/injury_next_steps.pdf)>, p. 9

<sup>272</sup> J E Harrison and J G Berry, *Serious injury due to land transport accidents, Australia, 2005-06*, Australian Institute of Health and Welfare, Canberra, 2008, p. 48.

<sup>273</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, pp. 90, citing Osler et al, (1996).

<sup>274</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 241.

<sup>275</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>276</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>277</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16; Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

*based on the actual average fatality rate for a specified injury calculated using a given large trauma database.<sup>278</sup>*

As with the other measures, there are identified advantages with the ICISS, including:

- It is seen as being less influenced by artefact<sup>279</sup> (or the undesirable alteration of data);
- Scores derived from ICD coding provide a reasonable estimate of injury severity;
- It can account for multiple injuries;
- It is not dependent on a specific version of the ICD codes;
- Scores can be calculated directly from the injury codes contained in a given dataset; and
- It can be applied retrospectively.<sup>280</sup>

Further, the ICISS is said to be a better predictor of survival than the ISS.<sup>281</sup> Mr Nieuwesteeg of the TAC also provided the Committee with an overview of the benefits of the ICISS in the context of how it compares to the MAIS:

*We think it [the ICISS] has more advantages in Australia. It has fewer problems than MAIS and it is more precise. MAIS has six associated categories and it has some limitations. But MAIS is useful also, and we used it in our analysis and it has helped us because you can say that those with a 4 plus are more serious than those with a 2 plus.<sup>282</sup>*

Associate Professor Stuart Newstead of MUARC added that:

*...researchers found that ICISS probably correlates better with the threat to life across multiple injury areas than the MAIS particularly. I think that is an important point because, particularly in road crashes, generally it is not just one injury sustained. There are quite often multiple injuries, and you need to reflect the total burden of those injuries on the person and their threat to life.*

The ICISS is also viewed as comprising the additional benefits of being able to compare Victoria with other jurisdictions and track trauma in a way that allows benchmarking. This is because the ICISS is also being considered for use in other jurisdictions including WA, NSW and the Northern Territory. According to MUARC, this will allow for the ‘pooling of

<sup>278</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>279</sup> Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 119.

<sup>280</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>281</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 16-17, citing Osler et al, (1996).

<sup>282</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 326.

mortality and morbidity data to produce regular local updates of the required SRRs'.<sup>283</sup> The Committee was also informed that these benefits might be undermined if Victoria was to implement a different threat to life measure. For example, in his presentation, Associate Professor Newstead of MUARC contrasted the benefits of aligning with other jurisdiction with the risks of not doing so:

*If Victoria came on board, you would have a large part of the country covered, and that is another issue I think needs to be contemplated. If we go out on a limb and do something else, how do we fit into the national road safety picture then? Because we are involved in national strategies and support national strategies, we measure ourselves against other jurisdictions. If we do something different, that is going to be more difficult, so ultimately I think what you want is a national adoption of any new system to do this so we can all compare ourselves on an equal basis.*<sup>284</sup>

The ICISS is also considered to have an advantage over the AIS and its derivatives because of its ability to translate ICD codes into a severity score. The Committee was informed that there are translation maps for ICD to ICISS, including one generated by MUARC which maps for Victorian VAED data.<sup>285</sup> Drawing on MUARC's experience in coding both the AIS and ICISS, Associate Professor Newstead advised the Committee on the benefits of ICISS:

*One of the problems I identified with AIS coding is that when you are aggregating it to form the ISS it is very difficult to work out how different injuries interact with each other for the outcome we are talking about, which is the probability of death. In response to that, we have gone to what we call the ICD-based injury severity score, which is a direct translation from an ICD code to what we call a 'survival risk ratio', which is, for every individual injury, the probability of a death occurring when someone has had that injury. They are calculated by looking at injuries sustained by people and looking at the mortality data associated with that and then calculating a rate between the two things, so it is a bit more direct than the translation from ICD to AIS to ISS. The other thing they believe is that the ICISS score is much easier to develop a translation map for — you can develop local translation maps much more easily. They also believe that it better represents the multiple burden of multiple injuries across many body regions on the likelihood of mortality. I think it is seen as perhaps even more preferable than the ISS system — this new ICISS system. The ability to generate local maps is a real attraction, and a number of jurisdictions around Australia actually either have or are generating those maps currently for ICISS.*<sup>286</sup>

However, the Committee notes that while there are advantages in mapping ICISS within and among Australian jurisdictions, a separate issue exists in making international

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<sup>283</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 26; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 9.

<sup>284</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 93.

<sup>285</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 91.

<sup>286</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

comparisons with the EU, which would require the translation of ICISS into MAIS. Mr Shelton of VicRoads noted that:

*There are some sophisticated tools to map between these two datasets. There are losses in translation between one dataset to the other. Whilst it is feasible, I think substantial work would need to be done to allow us, if we were to adopt ICISS, to make direct comparisons to the Europeans with their MAIS 3+.*<sup>287</sup>

A further issue, and one discussed in section 3.3.2.2, is the appropriateness of using mapping to translate data coded using different injury measures (for example translating AIS scores into ICISS scores). Specifically, such efforts are likely to produce substantial inconsistencies and are not a recommended approach for comparing different threat to life measures.

The Committee is aware of attempts to apply the ICISS to Victorian VAED data, with the VicRoads submission referring to a project that mapped Victorian VAED data and applied the ICISS to that data by Monash University's Victorian Injury Surveillance Unit (VISU). Using a set of SRRs from 2003, the VISU applied these to ICD-10-AM data and generated an ICISS for each admission.<sup>288</sup> The injury threshold used by the VISU was an ICISS of less than or equal to 94.1%, 'meaning the injured person had a probability of death (when admitted) of at least 5.9%'.<sup>289</sup> A set of hospitalisation and severity figures using Victorian admissions data for the period from 2007-2011 and 2011/2012 was collated which VicRoads included in its submission.<sup>290</sup> While this exercise clearly illustrates the capacity of the VAED to calculate an ICISS for each case, VicRoads noted limitations with the SRRs used by the VISU. Specifically, VicRoads advised that the Australian SRRs are out of date and may not be accurate for Victoria.<sup>291</sup> Several Inquiry participants also made this observation, as well as other comments on the limitations and issues with calculating SRRs, particularly around the current readiness of using the ICD codes to derive a severity score. Professor Gruen of Alfred Health advised the Committee that:

*...there are certainly moves around the world to try to apply ICD coding — and everybody in hospitals gets coded to diagnoses and procedures — and [to] see if that can accurately do the work of the injury severity score that we talked about before. There is a lot of work going on in that space. I do not know whether we are actually convinced that it can do that yet.*<sup>292</sup>

<sup>287</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267.

<sup>288</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 49.

<sup>289</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 16.

<sup>290</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 49.

<sup>291</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 49.

<sup>292</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 47.

The issue with outdated SRRs as outlined by VicRoads, was also raised in the MUARC submission:

*Numerous limitations or problems with direct estimation using ICISS have also been documented. SRRs generated in one country may not be applicable to another due to different health care systems, and SRRs within countries, or even within areas in countries, may become less reliable due to changes in case outcomes over time. Further limitations of the ICISS include: inclusion of only deaths which occur in hospital could make severity estimates unreliable; the inability to identify individuals who underwent more than one separation within a given study period could result in an overestimation of survival; and, exclusion of non-injury diagnoses means comorbidity<sup>293</sup> is not taken into consideration.<sup>294</sup>*

The submission also stated that:

*While the application of published SRRs to the VAED to define serious injuries is a more direct process than applying the AIS, the limitations with the direct method of calculating SRRs need to be considered and addressed. Namely, the published Australian SRRs are outdated, and may not necessarily be accurate for Victoria. Furthermore, inclusion of comorbidity and mortality outcomes would markedly improve the performance of ICISS. VISU used the published SRRs to generate ICISS as a measure of injury severity because it was the most readily available method and was applicable to the VAED. This does not necessarily mean it is considered the best measure of injury severity.<sup>295</sup>*

In order to overcome these issues, MUARC advocated regularly updating SRRs in order to account for changes in survival over time and to overcome the issues identified in the above point.<sup>296</sup> However, the Committee also notes the evidence provided by Professor Gabbe of the VSTR that even if SRRs are updated and tailored to reflect the Victorian admissions population, changes to SRRs over time would make longitudinal comparisons of SRRs and therefore road trauma statistics difficult. She informed the Committee that the:

*...ICISS is based on a probability of survival linked to a diagnosis, and as clinical practice improves, that probability will change over time. Whatever your probability is, or your SRRs or SSRs, or whatever the terminology they used 10 years ago, it would not be relevant 10 years later. If you are looking at change over time, you have to be a little bit cautious about that.<sup>297</sup>*

Further, the calculation of SRRs for the purposes of calculating an ICISS is unable to identify 'individuals who have undergone more than one hospital separation within the

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<sup>293</sup> Refer also to A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 9.

<sup>294</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>295</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 20.

<sup>296</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 20.

<sup>297</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 212.

period considered, which can result in an overestimation of cases in relation to the number of deaths'.<sup>298</sup> Moreover, poorly coded ICD codes can have a detrimental effect on SRRs and therefore ICISS estimates.<sup>299</sup>

The Committee was also made aware of another limitation with the calculation of SRRs, which MUARC researchers D'Elia and Newstead consider to be 'major'<sup>300</sup> and refers to the independence of data from which SRRs are calculated. The researchers noted that outcomes from other injuries in cases involving multiple trauma cases may influence a particular injury code, which would have a compounding effect on the SRRs for that code.<sup>301</sup> Further, SRRs can lack external validity (that is validity achieved by reference to the use of SRRs in other populations), although D'Elia and Newstead claimed that Australian and New Zealand based SRRs have good external validity.<sup>302</sup>

As with the AIS, the ICISS also has costs and administrative burdens associated with coding. Adjunct Professor Diana Rosman, the Program Manager of the Data Linking Branch at the WA Department of Health referred to these when she appeared before the Committee:

*An analyst is spending a fair bit of time getting that right. Linked death records are then required to calculate the survival risk ratios that go into the ICISS. There are a lot of things that have to be rigorously tested. The ICISS is not something you can generate immediately once somebody leaves hospital. It takes time because you need the coded hospital record. Specialised people make that ICD coding out of what the doctor writes on the record; that takes time. Then an analyst needs to apply certain formula to generate the severity scores. Currently there is some work being done in New Zealand on the ICISS — and others have also published on it — and we are working on some refinements to that right now.<sup>303</sup>*

Mr Shelton of VicRoads also referred to the resource implications of using ICISS, which he indicated was of concern to some jurisdictions:

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<sup>298</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 9.

<sup>299</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 10.

<sup>300</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 9.

<sup>301</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 9.

<sup>302</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 9.

<sup>303</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 241.

*The response I have had from Western Australia, for example, is that whilst they are very interested in ICISS, they are cautious about the potential resource impacts of that. I would imagine that if it is an issue for one jurisdiction, it may be an issue for others. It simply indicates, I think, that we are somewhat at the cutting edge here in actually contemplating new measures. Whilst I think there is a balance between what is convenient and readily available, there is a cost to that, and we need to ensure that we adopt an appropriate approach that balances both cost and outcomes.*<sup>304</sup>

Apart from the issues associated with the SRRs and their computation, the Committee identified an additional limitation. This relates to the ICISS having limited utility in predicting the burden of injury, a point explained by Professor Gabbe of the VSTR:

*The ICD-based ICISS is a particularly good use of ICD data to look at the prediction of mortality. It is only for mortality, so if you were looking at burden of non-fatal injury, it is not your measure of choice. It is a very good predictor of mortality... ICISS only comes into play for hospitalised patients. It is probably not relevant outside of hospitalised cases.*<sup>305</sup>

The Committee notes, however, that this may equally apply to other threat to life measures.

### 3.3.3 Burden of disease measures

As part of its evidence gathering for the Inquiry, the Committee came to understand the role of burden of disease measures in calculating the functional outcomes and disability<sup>306</sup> of road crash patients. These measures combine information on the burden of illness or injury from mortality and morbidity into a single measure, as well as incorporating the effects of illness on both the quantity and quality of life.<sup>307</sup> Overall, the burden of disease measure calculates the gap between current health status and an ideal situation where there is an absence of disease and disability.<sup>308</sup>

The usefulness of burden of injury measures is that they can provide policy makers with information about the outcomes of road trauma in the community. It is argued that

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<sup>304</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 278.

<sup>305</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 212.

<sup>306</sup> **Note:** A disability results from the interaction between persons with impairment (including those who have long-term physical, mental, intellectual or sensory impairments) and attitudinal barriers that hinder their full and effective participation in society on an equal basis with others (See United Nations, *Convention on the Rights of Persons with Disabilities*, 2006). Refer also to UN Enable, 'Frequently Asked Questions (FAQs)', viewed February 2014, <<http://www.un.org/esa/socdev/enable/faqs.htm>>. See also S Sann, et al., 'Road crash and long term disabilities: Implications for policy and its implementation in Cambodia', Paper presented at the *Australasian Road Safety Research, Policing & Education Conference*, Brisbane, 2013.

<sup>307</sup> D Hendrie and T.R Miller, 'Assessing the burden of injuries: competing measures', *Journal of Injury Control and Safety Promotion*, vol. 11, no. 3, 2004, p. 194.

<sup>308</sup> Department of Human Services, *Victorian Burden of Disease Study: Mortality and Morbidity in 2001* State Government of Victoria, Melbourne, 2005, p. 1; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.



currently there is limited knowledge about the long-term impact of road trauma on individuals and the broader community post hospital treatment and rehabilitation phases.<sup>309</sup> In its submission, the WA Government’s Office of Road Safety referred to a potential issue of not having such information:

*...if the post hospital care phases of treatment are a significant burden and they have not been adequately documented, there is a concern that the current estimates of the burden of injury may underestimate the true effect of road trauma on the community.*<sup>310</sup>

It also advised that having such information would allow further investigation about road trauma such as:

*...determining the number of people affected; the extent and rate of recovery after discharge from hospital; the degree of and length of impairment associated with specific injuries; estimating the demand for rehabilitation services and tertiary care due to road trauma; the impact of the crash and treatment location on cost and access to services.*<sup>311</sup>

The importance of burden of injury measures was also well-illustrated by the evidence received from Professor Russell Gruen of Alfred Health:

*We are realising, with the data the Victorian system collects, that the hospital is not the end of the saga for the patient and that actually the outcomes for patients who are severely injured, even two years afterwards, are really still quite poor for many of them. Only a quarter at two years have had complete functional recovery, a quarter have not returned to work, one in five reports moderate to severe ongoing pain two years after their major injury and they still have quite high levels of disability.*<sup>312</sup>

Burden of injury measures can be viewed as encompassing both threat to life and long-term injury outcomes, and are highly valuable as threat to life measures do not provide information on long-term disability and functional outcomes for patients.<sup>313</sup> This point was illustrated by Dr De Rome of Neuroscience Research Australia:

*Almost all injuries to the extremities — the arms and legs — are scored as a 1 [using threat to life measures], as minor. You can have some very severe and debilitating injuries in the extremities, but under that system, because it is not a threat to life it is not regarded as severe.*<sup>314</sup>

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<sup>309</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>310</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>311</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>312</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 39.

<sup>313</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 21; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>314</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 110.

In contrast, burden of injury measures are most useful in explaining what happens to people after treatment irrespective of whether they met a threat to life threshold. As Associate Professor Newstead of MUARC explained to the Committee:

*One thing we talk about is threat to life; it is the instantaneous threat, if you like, of dying from those injuries. What they do not often talk about is the long-term burden you might get. You might, for example, lose four fingers off a hand in a road crash. It is not necessarily going to be a big threat to life, but it is going to be a major imposition on you for the rest of your life, particularly if you are a concert pianist, for example — your career is over. So there is another set of injury outcome measures being considered to talk about what the burden of that injury is over that person's life.<sup>315</sup>*

Overall, there are three measures used to estimate the burden of injury, using routinely collected epidemiological data.<sup>316</sup> These are: Disability-Adjusted Life Years (DALYs) and Quality-Adjusted Life Years (QALYs), both of which are estimated directly from ICD injury codes, and the Functional Capacity Index (FCI), which is based on the AIS.<sup>317</sup> Arguably, the DALYs and QALYs are the two leading or well-known burden of disease measures. Given their prominence in the literature and evidence provided by Inquiry participants, they are the focus of this discussion on burden of injury measures.

### 3.3.3.1 Disability-Adjusted Life Years

Arguably, the DALY is the most accepted burden of injury measure. Developed by the World Health Organization (WHO), and first introduced in 1993, a DALY represents 'the loss of health due to injury from an ideal or reference state'.<sup>318</sup> As explained by Associate Professor Newstead of MUARC, a DALY:

*...looks at an injury, and if that injury is a lifelong injury, it looks at the distance from the time you sustain the injury to the time you die or it looks at the time you sustained the injury to the time you can fully recover from that injury and then adds up the total time as the injury burden.<sup>319</sup>*

A DALY is considered to be one lost year of 'healthy life'.<sup>320</sup> Professor Harrison of Flinders University explained that the DALY is intended to provide a single summary measure that:

*...takes account both of shortening of life due to deaths due to road injury (or any other injury) before a person might otherwise have died, but it also takes account of*

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<sup>315</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>316</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>317</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>318</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>319</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>320</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

*diminution of quality of life resulting from persisting disability due to an injury, and uses a method to combine both of those dimensions into a single measure.*<sup>321</sup>

The calculation of a DALY has several components, with DALYs ‘accrued across a population for a disease or health condition’ by combining the Years of Life Lost (YLL) as a result of premature mortality and the YLL as a result of disability (YLD).<sup>322</sup> The YLL is the sum difference between the life expectancy at the age at which death occurred and the age of the person at death for each fatality summed over all fatal crashes.<sup>323</sup>

In order to calculate the burden of different diseases and injuries, there are agreed disability weights for each. These weights measure the severity of different conditions that result from disease and injury.<sup>324</sup> Their purpose is to inform researchers and policy makers about the average duration of the injury or disease in question until remission or death, and in doing so, provide an estimate of the average expected remaining lifetime specific to age at injury.<sup>325</sup>

A disability weight is also a reflection of the percentage amount that a disability inhibits ones’ daily capacity.<sup>326</sup> For example, a severe injury using the DALY method may be weighted as having a 0.8 functional limitation whereas a mild injury might be weighted 0.1.<sup>327</sup> Disability weights work in tandem with ‘life expectancy tables’, which set out the length of time an injury will take to recover from or the period of time one would live with that disability, until death.<sup>328</sup> In Australia, the ABS produces regular life expectancy tables.<sup>329</sup> Clearly, because of these calculations, a patient’s age largely influences the total number of YLL and DALYs when calculating the outcomes of trauma.<sup>330</sup>

The computation of disability weights was originally undertaken by an expert panel that rated different injuries and diseases.<sup>331</sup> However, the Committee understands that this

<sup>321</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 366..

<sup>322</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>323</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17.

<sup>324</sup> Institute for Health Metrics and Evaluation, *The Global Burden of Disease: Generating Evidence, Guiding Policy*, IHME, Seattle, Washington, 2013, p. 13.

<sup>325</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 20.

<sup>326</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>327</sup> D Hendrie and T.R Miller, 'Assessing the burden of injuries: competing measures', *Journal of Injury Control and Safety Promotion*, vol. 11, no. 3, 2004, p. 198. See also Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>328</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>329</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 20.

<sup>330</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>331</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 234.

approach has since changed, with disability weights being validated against preference survey responses from people who are asked to make social value judgments.<sup>332</sup> Valuing DALY weights in this way replicates the approach to calculating disability weights in the QALYs. For this reason, QALY are viewed as the similar measure to a DALY.<sup>333</sup> There are issues surrounding the survey methodology used to compile QALY, and now DALY, weights and these are discussed further in section 3.3.3.3.

The Committee notes that DALYs have been used in the road safety policy area before, albeit generally from a health policy and research perspective.<sup>334</sup> Two relevant studies looking at burden of injury using DALYs were the *2001 Victorian Burden of Disease Study*, and the *Global Burden of Disease Study 2010*, both of which included an analysis of DALYs resulting from road transport crashes. In particular, the Victorian study found that injury measures such as DALYs can provide a substantially different picture from that provided by traditional mortality statistics.<sup>335</sup> It quantified the top 20 causes of burden of disease by DALYs, determining that road traffic accidents were the 12<sup>th</sup> cause of burden for males and the 19<sup>th</sup> for females.<sup>336</sup> In the 15-34 age group, and using 2001 data, the study found that road traffic accidents were the second highest cause of DALYs in males and the 9<sup>th</sup> for females.<sup>337</sup>

The *Global burden of Disease Study 2010* also assessed the impact of road trauma in terms of DALYs, using the more recent derived disability weightings.<sup>338</sup> For road safety, it reported that DALYs caused by road transport injuries have been regularly increasing, with them being the 10<sup>th</sup> highest cause of DALYs worldwide.<sup>339</sup>

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<sup>332</sup> Refer to J A Salomon, 'Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010', *The Lancet*, vol. 380, no. 9859, 2012., for a more comprehensive explanation of the changes to the 2010 studies disability weightings

<sup>333</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 234.

<sup>334</sup> For example, refer to S Dhondt, et al., 'Health burden of road traffic accidents, an analysis of clinical data on disability and mortality exposure rates in Flanders and Brussels', *Accident Analysis & Prevention*, vol. 50, 2013, pp. 659-666.

<sup>335</sup> **Note:** The wide-ranging study used the Years of Life Lost (YLL) and DALYs, among others, to provide a comprehensive assessment of the health status of the Victorian population. It quantified the contribution to the 'burden of disease' of mortality, disability, and impairment, from 175 diseases injury and risk factors into a single indicator, the DALY. See Department of Human Services, *Victorian Burden of Disease Study: Mortality and Morbidity in 2001* State Government of Victoria, Melbourne, 2005, pp. 1-2.

<sup>336</sup> Department of Human Services, *Victorian Burden of Disease Study: Mortality and Morbidity in 2001* State Government of Victoria, Melbourne, 2005, p. 68.

<sup>337</sup> Department of Human Services, *Victorian Burden of Disease Study: Mortality and Morbidity in 2001* State Government of Victoria, Melbourne, 2005, p. 70.

<sup>338</sup> J A Salomon, 'Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010', *The Lancet*, vol. 380, no. 9859, 2012, p. 2129.

<sup>339</sup> S Sann, et al., 'Road crash and long term disabilities: Implications for policy and its implementation in Cambodia', Paper presented at the *Australasian Road Safety Research, Policing & Education Conference*, Brisbane, 2013., citing Murray et al, 2012

**Note:** In addition to these increases, some research suggests that the total number of DALYs might be linked to a relatively small number of injured people. A study by Haagsma, Polinder and Lyons et al (2012), undertaken in the

As part of its investigations, the Committee identified the use of DALYs in Swedish road safety policy to assess the health impacts and costs of the road transport sector.<sup>340</sup> The Swedes also realised the need to associate road injury or burden outcomes with the moniker ‘serious’. A new injury term, very severe injury (RPMI 10%), was established for the purposes of monitoring road trauma, which is based on personal injury that causes permanent medical impairment of health equivalent to a medical impairment of 10% or more (RPMI 10%).<sup>341</sup> This target sits aside another definition, severe injury (RPMI 1%), which is based on a medical impairment of 1%. The Swedish Transport Administration (Trafikverket) believes that introducing the new RPMI 10% target will allow both types of impairment (1% and 10%) to be systematically monitored and allow, in future, target reductions for the higher impairment definition.<sup>342</sup> Both these definitions are, conceptually, burden of injury measures, albeit without reference to DALY or QALY methodologies.

**Finding 7:** It is clear that Disability-Adjusted Life Years can be used to calculate the burden of injury from road trauma, and might therefore be capable of being applied systematically in Victorian road safety.

### 3.3.3.2 Applying Disability-Adjusted Life Years to road safety

A consistent finding among participants and in the literature reviewed by the Committee was that the DALY is internationally recognised as an appropriate burden of injury measure.<sup>343</sup> In particular, the WHO is highly supportive of the use of DALYs, especially in its capacity to overcome the limitations of translating health data into policy analysis and development.

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Netherlands, Thailand and South Africa, found that 1-2% of injuries resulted in lifelong impairment. It was these injuries which accounted for 68-76% of the total years of life with a disability. The authors of the study concluded that ‘the majority of the lived experience of disability through injury was the experience of people with life-long impairment’. See J A King, et al., ‘Understanding injury-related disability in non-Western societies can contribute to more effective road safety policies and programs’, Paper presented at the *25th ICTCT Workshop*, Hasselt, 2012., slide 4

<sup>340</sup> K Lindström, *Health impact assessment and public health costs of the road transport sector – Results from two projects*, Swedish Road Administration, Borlänge, 2009, pp. 36-40,108.

<sup>341</sup> Trafikverket (Swedish Transport Administration), *Analytic report Review of Interim Targets and Indicators for Road Safety in 2010-2020*, Borlänge, 2012, pp. 21-22.

<sup>342</sup> Trafikverket (Swedish Transport Administration), *Analytic report Review of Interim Targets and Indicators for Road Safety in 2010-2020*, Borlänge, 2012, pp. 21-22.

<sup>343</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 366; Professor Mark Stevenson, Director, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 96; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 93.

For some Inquiry participants, the DALY represents the most appropriate burden of injury measure for road safety,<sup>344</sup> although there are issues that require redress in order for this to occur. Further, in the research literature, DALYs are recognised as playing an important role in benefit-cost and cost-effectiveness analyses, a role currently used in the health policy area.<sup>345</sup> DALYs are also used to calculate the costs, albeit non-monetary cost, of injury.<sup>346</sup> This advantage is cited by the WHO as one of the main benefits of using burden of injury measures, and in particular the DALY. The WHO also identified the capacity of DALYs to help overcome the limitations of health data, which are seen as being:

*...extremely difficult to translate into policy for [three reasons]: [firstly], health data from routine statistics or epidemiological studies may be fragmented, concentrate on fatal health outcomes, or only be partially available; [secondly], studies which investigate particular conditions may overestimate mortality, largely because several coexisting diseases may contribute to and compete for the cause of death; [and lastly], traditional statistics often do not permit direct comparisons of the cost-effectiveness of different health treatments. Estimating the burden of disease [e.g. by using DALYs] helps overcome some of these problems.*<sup>347</sup>

The Committee believes that these benefits extend to health data relevant to road crash patients.

The DALY is also viewed as an inexpensive, efficient but 'broad-brush' approach to estimating disease burden and the impact of interventions. MUARC's submission concluded that 'the use of the measure by the WHO has given it credibility and a wide acceptance with the measure being applied in many countries including Australia to support policy development by federal and state governments'.<sup>348</sup>

A number of issues with the potential use of DALYs in Victoria were also brought to the Committee's attention. The first key issue is that Victoria lacks its own disability weights, and would therefore have to rely on weights calculated in other jurisdictions. This issue alone raised many concerns about the usefulness of the DALY, in particular the way it is defined and measured.<sup>349</sup> Further, in spite of the changes to the computation of DALY weights as part of the *Global Burden of Disease Study 2010*, these weights suffer from the

<sup>344</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267; Professor Mark Stevenson, Director, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 96; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 17; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 93.

<sup>345</sup> World Health Organization, 'Burden of disease: what is it and why is it important for safer food?', viewed September 2013, <[http://www.who.int/foodsafety/foodborne\\_disease/Q&A.pdf](http://www.who.int/foodsafety/foodborne_disease/Q&A.pdf)>.

<sup>346</sup> M Potter-Forbes and C Aisbert, *Injury costs: A valuation of the burden of injury in New South Wales 1998-1999*, UNSW Injury Risk Management Research Centre, Sydney, 2003, p. xv.

<sup>347</sup> World Health Organization, 'Burden of disease: what is it and why is it important for safer food?', viewed September 2013, <[http://www.who.int/foodsafety/foodborne\\_disease/Q&A.pdf](http://www.who.int/foodsafety/foodborne_disease/Q&A.pdf)>.

<sup>348</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 18.

<sup>349</sup> J A Salomon, 'Common values in assessing health outcomes from disease and injury: disability weights measurement study for the Global Burden of Disease Study 2010', *The Lancet*, vol. 380, no. 9859, 2012, p. 2129.

same limitations of all other disability weights, in that they are relevant only to a single injury. This limits the use of DALYs in road trauma where multiple injuries are common.<sup>350</sup>

Further, the Committee notes issues with some of the approaches used in Global Burden of Disease (GBD) studies to generate disability weights. In the latest GBD study, for example, the expert panel drew on surveys, among other methods, whereby participants were asked to rate different health states that typically result from a particular type of injury (or disease). The survey responses contributed to the expert panel's establishment of disability weights. There is a concern, however, that as survey participants often have not experienced the health states they are asked to value, their values are likely to differ considerably from those who have experienced the health states in question. Further, there is also a concern that the standard health state descriptions in the surveys do not provide an adequate reflection of the impact of injuries. Studies have shown that disability weights produced through panel studies underestimate injury burden when compared to those generated from prospective cohort studies of injured participants.<sup>351</sup>

The MUARC submission observed that some academic debate surrounds the definition of a DALY and noted that using WHO derived disability weights in Victoria has been questioned.<sup>352</sup> Likewise, the VicRoads' submission also cautioned that DALYs would require appropriate validation in the road safety context.<sup>353</sup> That caution was echoed by MUARC researchers D'Elia and Newstead who concluded that non-fatal burden of injury measures such as DALYs still require appropriate validation, especially prior to use within the road safety context.<sup>354</sup>

The Committee heard that in applying the DALY to road trauma data in Victoria, it may be necessary to initially adopt the existing international weights but eventually develop local weights. This was suggested by Associate Professor Newstead of MUARC:

*From our perspective...we will probably need to either bite the bullet and say we will adopt the global burden of disease study maps for disability weights — and we could do that in the first instance and ultimately develop our own maps through the data sources we have through the Department of Health and TAC to actually have a local system eventually. The good thing about these is that as long as you have the underlying ICD codes you can always back-map everything to a new system, so you can retrospectively change the system to meet whatever you have decided you will do*

<sup>350</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>351</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>352</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 18.

<sup>353</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 50.

<sup>354</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 5.

*currently. If you end up with a new map, you can recalculate everything and reuse it that way, so it is quite flexible in that way.*<sup>355</sup>

The Committee notes that an advantage of initially using internationally developed weights is that Victoria would align with an internationally accepted methodology and approach to developing and applying DALYs, which would allow international comparisons.<sup>356</sup>

A project aimed at dealing with the weaknesses of the GBD Study 2010 weightings is underway which will include Victoria specific data. Professor Gabbe of the VSTR is leading the Injury-VIBES project, which is being funded by the National Health and Medical Research Council (NHMRC). The Committee understands the project is pooling injury outcomes data from cohort studies in the UK, NZ, the Netherlands, the USA and the VSTR and VOTOR covering 40,000 injured patients in order to develop alternative disability weights, disability durations and groupings of diagnoses.<sup>357</sup> The disability weights, which will be partly based on Victorian disability data, will include disabling injuries arising from multiple trauma patients, such as those involved in road crashes. Professor Gabbe told the Committee that in addition to the Injury-Vibes project, the VSTORM has recently developed disability weights for the major trauma population based on the VSTR data.<sup>358</sup> These weightings have been used to calculate DALYs for road trauma in Victoria over the past decade.<sup>359</sup>

**Finding 8:** Disability-Adjusted Life Years (DALY) weightings currently exist and could be used to analyse road trauma. New DALY weightings are being developed which will better reflect Victorian health outcomes.

Another issue associated with the use of DALYs relates to age, which has both ethical and policy implications. While a DALY weight is fixed for a given injury (because each injury diagnosis group has a specific weighting), younger patients will accumulate greater YLD and DALY figures. In contrast, older patients will have lower YLD and DALY figures because they will live with the outcome of that injury for a lesser period of time. In this context, it is suggested that the use of DALYs by governments could distort the injury picture by

<sup>355</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 93.

<sup>356</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>357</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013. See also Injury-Vibes, 'Improving the measurement of non-fatal injury burden; validating the GBD methods', viewed March 2013, <<http://www.injuryvibes.monash.org.au/>>. And refer to B J Gabbe, et al., 'Validating and Improving Injury Burden Estimates Study: the Injury-VIBES study protocol', *Injury Prevention*, 2013.

<sup>358</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>359</sup> See B J Gabbe, et al., 'Reduced Population Burden of Road Transport-Related Major Trauma After Introduction of an Inclusive Trauma System', *Annals of Surgery*, 2014.



prioritising interventions that are aimed at younger victims who have accrued more YLD and DALYs. The ethical implication is whether the use of the DALY would, to some extent, result in the same disabling injuries being treated differently purely on the basis of the age of the injured patient. At a policy level, using the DALY as a basis for expending road safety funds or developing new countermeasures could lead to interventions that discriminate against older road users in favour of younger road users.<sup>360</sup>

Associate Professor Newstead of MUARC discussed these ethical considerations in his presentation to the Committee:

*The thing with DALY is that it has social imperatives, essentially, because what it naturally does is reduce potentially the focus we might have on older road users, for example...for two people of different age groups who have the same injury with a lifetime burden, the DALY weight for the younger person is always going to be higher than the DALY weight for the older person because the length of life they have left is much shorter. That becomes a political imperative because if you are saying, 'Okay, Mr 80-Year-Old, we are valuing you less in the road trauma system than you, Mr 20-Year-Old', that is a political decision...Ultimately you could potentially do other things or manipulations, but in reality I guess the burden on society for a younger person being lost is in terms of productivity — and this comes out when we talk about injury costings and forgone income et cetera. That burden is actually notionally captured in that way anyway. Certainly it needs a bit more thought before you implement it as a state or even national standard.<sup>361</sup>*

The last issue identified with the use of DALYs is the length of time needed to calculate them, making it a measure that would take some time to compile. Professor Harrison of Flinders University explained:

*If you are interested...in timely measures, then if you have to wait for each case to reveal whether that person is going to get better or not, over several years, you cannot have a timely measure, based directly on follow-up of those individuals.<sup>362</sup>*

Associate Professor Fitzgerald of Alfred Health, in response to a question from the Committee on the length of time to calculate a DALY, indicated the importance of taking the necessary time to do this:

*We agree with what you say, that two years is relatively premature. We thought initially, when we were going to six months, we were doing a great job. Then we realised that in fact the disability lasts for a lot longer, and the community burden and the burden the patient carries is of a significantly longer duration.<sup>363</sup>*

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<sup>360</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 26-27.

<sup>361</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 93.

<sup>362</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 368.

<sup>363</sup> Associate Professor Mark Fitzgerald, Director, Trauma Service, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 44.

Instead, Associate Professor Fitzgerald suggested that:

*The supposition is that if you have not recovered in five years and you are left with this disability, it is unlikely that you are going to improve. We think two years is a bit premature.*<sup>364</sup>

The VSTORM is experienced in the time needed to compile DALYs as a result of its role in monitoring trauma through the VSTR and the Victorian Orthopaedic Outcomes Registry. In his appearance before the Committee, Professor Harrison of Flinders University described the process as ‘almost unique globally in terms of following up on everybody who meets the inclusion criteria and who survives a discharge from hospital via telephone interviews, which are very sophisticated and held over 6, 12 and 24 months’.<sup>365</sup> The Committee understands that the VSTORM has the capacity to undertake DALY analysis and apply it to cases held in these registries. The Committee notes that while it can take several years for the functional outcome of injuries to become clear, the computation of DALYs can be done relatively quickly after patients are admitted to hospital, so long as disability weights exist and are applied.<sup>366</sup> Professor Gabbe of the VSTR advised that this process was recently used to compute DALYs for road trauma using VSTR cases and disability weights.<sup>367</sup>

### 3.3.3.3 Quality-Adjusted Life Year

The QALY is another burden of injury measure used by health economists and is quite similar to a DALY.<sup>368</sup> In terms of regulatory, research and policy uses, QALYs can be used to compare the effectiveness of different types of medical interventions and treatments for a given disease. For example, QALYs can be used to compare a treatment that has a substantial impact on health quality and no effect on life expectancy with a different treatment that results in no change in health quality but a longer life expectancy. QALYs can also be combined with information on the costs of alternative treatments and medical programs to assess their cost-effectiveness in an effort to achieve a more

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<sup>364</sup> Associate Professor Mark Fitzgerald, Director, Trauma Service, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 44.

<sup>365</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 368.

<sup>366</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>367</sup> See B J Gabbe, et al., 'Reduced Population Burden of Road Transport-Related Major Trauma After Introduction of an Inclusive Trauma System', *Annals of Surgery*, 2014; B J Gabbe, et al., 'Validating and Improving Injury Burden Estimates Study: the Injury-VIBES study protocol', *Injury Prevention*, 2013.

<sup>368</sup> M Freeman III, J K Hammitt and P De Civita, 'On Quality Adjusted Life Years (QALYs) and environmental/Consumer safety evaluation', viewed June 2013, <[http://www.rff.org/rff/Events/Valuing-Health/upload/5396\\_1.pdf](http://www.rff.org/rff/Events/Valuing-Health/upload/5396_1.pdf)>, pp. 1-2; Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, pp. 228-229.

efficient utilisation of medical resources.<sup>369</sup> In turn, 'resources can be allocated to programs that show lower cost per QALY relative to other programs.'<sup>370</sup>

The Committee understands that a QALY measures different states of health. As individuals move through different health stages, each stage has a different value attached to it.<sup>371</sup> Health, in terms of QALYs, is defined as the value-weighted time which refers to life years weighted by their quality-accumulated over a period of time to yield a QALY.<sup>372</sup> For example, using a metric of 0 to 1, different states of health are assigned a health state preference or 'utility' value from 1.0 (full health) to 0 (death).<sup>373</sup> The amount of time an individual spends in a given health state<sup>374</sup> is then multiplied by the health state preference value to calculate the QALYs gained.<sup>375</sup> A QALY can be viewed as a measure that takes into account the quantity and quality of life generated by healthcare interventions.

The calculation of a QALY depends on the type and design of the survey used, and is an area that was identified as highly complex by the Committee. In its simplest form, respondents are given information about different health states including symptoms, pain levels and the degree of impairment among others.<sup>376</sup> They are then asked to assign a

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<sup>369</sup> M Freeman III, J K Hammitt and P De Civita, 'On Quality Adjusted Life Years (QALYs) and environmental/Consumer safety evaluation', viewed June 2013, <[http://www.rff.org/rff/Events/Valuing-Health/upload/5396\\_1.pdf](http://www.rff.org/rff/Events/Valuing-Health/upload/5396_1.pdf)>, pp. 1-2

<sup>370</sup> M Freeman III, J K Hammitt and P De Civita, 'On Quality Adjusted Life Years (QALYs) and environmental/Consumer safety evaluation', viewed June 2013, <[http://www.rff.org/rff/Events/Valuing-Health/upload/5396\\_1.pdf](http://www.rff.org/rff/Events/Valuing-Health/upload/5396_1.pdf)>; M.C Weinstein, G Torrance and A McGuire, 'QALYs: The Basics', *International Society for Pharmacoeconomics and Outcomes research (ISPOR), Value in Health*, vol. 12, 2009, p. S5.

<sup>371</sup> M.C Weinstein, G Torrance and A McGuire, 'QALYs: The Basics', *International Society for Pharmacoeconomics and Outcomes research (ISPOR), Value in Health*, vol. 12, 2009, p. S5.

<sup>372</sup> M.C Weinstein, G Torrance and A McGuire, 'QALYs: The Basics', *International Society for Pharmacoeconomics and Outcomes research (ISPOR), Value in Health*, vol. 12, 2009, p. S5.

<sup>373</sup> Department of Health (Commonwealth), 'Return on investment in needle and syringe programs in Australia: report', viewed November 2013, <<http://www.health.gov.au/internet/publications/publishing.nsf/Content/illicit-pubs-needle-return-1-rep-toc~illicit-pubs-needle-return-1-rep-5~illicit-pubs-needle-return-1-rep-5-2>>. Section 5.2 Quality-Adjusted-Life-Years (QALYs)

<sup>374</sup> **Note:** For an example of how a QALY can be calculated, refer to A J Krupnick, *Valuing Health Outcomes: Policy Choices and Technical Issues*, RFF Report, Washington D.C., 2004, p. 23.

<sup>375</sup> Department of Health (Commonwealth), 'Return on investment in needle and syringe programs in Australia: report', viewed November 2013, <<http://www.health.gov.au/internet/publications/publishing.nsf/Content/illicit-pubs-needle-return-1-rep-toc~illicit-pubs-needle-return-1-rep-5~illicit-pubs-needle-return-1-rep-5-2>>, Section 5.2 Quality-Adjusted-Life-Years (QALYs)

<sup>376</sup> M Freeman III, J K Hammitt and P De Civita, 'On Quality Adjusted Life Years (QALYs) and environmental/Consumer safety evaluation', viewed June 2013, <[http://www.rff.org/rff/Events/Valuing-Health/upload/5396\\_1.pdf](http://www.rff.org/rff/Events/Valuing-Health/upload/5396_1.pdf)>, p. 3. Note: There are a number of approaches used to develop these weights, including time-tradeoff and standard gamble. See the Freeman et al reference above and M Freeman III, J K Hammitt and P De Civita, 'On Quality Adjusted Life Years (QALYs) and environmental/Consumer safety evaluation', viewed June 2013, <[http://www.rff.org/rff/Events/Valuing-Health/upload/5396\\_1.pdf](http://www.rff.org/rff/Events/Valuing-Health/upload/5396_1.pdf)>; M.C Weinstein, G Torrance and A McGuire, 'QALYs: The Basics', *International Society for Pharmacoeconomics and Outcomes research (ISPOR), Value in Health*, vol. 12, 2009, p. S6. The Committee notes that there is a large body of research dealing with this area, and these references are intended to provide a basic insight into these survey approaches.

weight or numerical value between 1 and 0 to each health state that reflects its perceived utility, relative to states of perfect health and of death.<sup>377</sup>

The Committee received limited information about the advantages and disadvantages of QALYs, as compared to DALYs, although there were two general themes in the evidence. Firstly, QALYs are difficult to distinguish from DALYs; and secondly, because the methodology used to calculate DALYs and QALYs is similar, they can be viewed as interchangeable, and therefore share the same benefits and, presumably the same weaknesses. Professor Phillip Clarke from the Centre for Health Policy, Programs and Economics at the University of Melbourne, informed the Committee that:

*To some degree the commonalities between these methods are greater than their differences...<sup>378</sup> But I would not see any difference between DALYs and QALYs.<sup>379</sup>*

A similar sentiment was shared by Dr De Rome of Neuroscience Research Australia, although she expressed a preference for QALYs over DALYS.<sup>380</sup> Conversely, Associate Professor Newstead expressed MUARC's preference for DALYs, as they were seen to be less subjective:

*Of the threat-to-life measures we have reviewed, the one that seems to have the best scientific basis is the disability-adjusted life year. I think the quality-adjusted life year is probably the most reasonable alternative to that, but it is a little bit more subjective: how do you accurately measure quality of life lost.<sup>381</sup>*

Clearly subjectivity in survey responses would have an impact on the calculation of QALYs more generally. Given the changes in the way that DALYs are calculated, the Committee believes the subjectivity levels of QALYs are also likely to be replicated in DALY weights. There are additional issues associated with QALYs, which reside in the realm of expert academic research. Briefly, these include the question of discounting, and that questions of equity and fairness are not 'incorporated quantitatively into the conventional QALY approach', other than the assumption that each QALY across individuals is given equal weight.<sup>382</sup>

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<sup>377</sup> M Freeman III, J K Hammitt and P De Civita, 'On Quality Adjusted Life Years (QALYs) and environmental/Consumer safety evaluation', viewed June 2013, <[http://www.rff.org/rff/Events/Valuing-Health/upload/5396\\_1.pdf](http://www.rff.org/rff/Events/Valuing-Health/upload/5396_1.pdf)>, p. 3

<sup>378</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 229.

<sup>379</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 234.

<sup>380</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 113.

<sup>381</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 96.

<sup>382</sup> M.C Weinstein, G Torrance and A McGuire, 'QALYs: The Basics', *International Society for Pharmacoeconomics and Outcomes research (ISPOR), Value in Health*, vol. 12, 2009, p. S9.

### 3.3.4 Legal definitions of serious injury

Outside of resource-use, threat to life and burden of injury based definitions, there are two categories of statutory definitions for serious injury. These definitions, which are found in the Occupational Health and Safety (OH&S) and transport accident compensation areas, are considered to be hybrid definitions. That is because they borrow elements from resource-use, threat to life and burden of injury measures, and use these to create their own thresholds for defining a serious injury for the purpose of compensation claimants. Importantly, psychological injury is included in the transport accident compensation definition and such injuries can therefore meet the threshold of seriousness in this area.

#### 3.3.4.1 Occupational Health and Safety

In the OH&S area, the Victorian *Occupational Health and Safety Act 2004* imposes duties on employers and employees. These duties most acutely apply when an ‘incident’ occurs in the course of employment, which is defined as a circumstance that causes a person’s death, admission to hospital or requiring immediate medical treatment for a range of injuries including amputation and serious head, eye or spinal injuries among others.<sup>383</sup>

It is important to note that the OH&S legislation, and therefore its definition of seriousness, can apply to road crash injuries if the crash occurs in the course of a person’s employment. The Committee understands that when this occurs, the person is compensated under the occupational health compensation scheme and not the transport accident scheme.<sup>384</sup>

In addition to the Victorian OH&S legislation, Safe Work Australia’s *Model Work Health and Safety (WHS) Act* includes a serious injury definition. The model law was developed in 2009 as part of the Council of Australian Governments (COAG) national harmonisation project to create consistent OH&S laws across Australia.<sup>385</sup> The law, which does not have legal force unless a jurisdiction enacts it through its own parliamentary and legal processes, was developed by Safe Work Australia with the acceptance of all Australian jurisdictions to adopt it, subject to minor variations.<sup>386</sup> The model WHS Act defines ‘serious injury or illness’ as follows:

*S. 36 What is a serious injury or illness*

<sup>383</sup> See s. 37 *Occupational Health and Safety Act 2004* (Vic); Safe Work Australia, *Submission*, no. 14, 18 April 2013, pp. 8-9.

<sup>384</sup> Maurice Blackburn Lawyers, *Submission*, no. 26, 7 May 2013, pp. 9-10.

<sup>385</sup> Safe Work Australia, ‘Model Work Health and Safety Act’, viewed July 2013, <<http://www.safeworkaustralia.gov.au/sites/swa/model-whs-laws/model-whs-act/pages/model-whs-act>>; Safe Work Australia, ‘Model Work Health and Safety Laws’, viewed July 2013, <<http://www.safeworkaustralia.gov.au/sites/swa/model-whs-laws/pages/model-whs-laws>>.

<sup>386</sup> Safe Work Australia, ‘Model Work Health and Safety Act’, viewed July 2013, <<http://www.safeworkaustralia.gov.au/sites/swa/model-whs-laws/model-whs-act/pages/model-whs-act>>.

*In this Part, serious injury or illness of a person means an injury or illness requiring the person to have:*

- a. *Immediate treatment as an in-patient in a hospital, or*
- b. *Immediate treatment for:*
  - i. *the amputation of any part of his or her body, or*
  - ii. *a serious head injury, or*
  - iii. *a serious eye injury, or*
  - iv. *a serious burn, or*
  - v. *the separation of his or her skin from an underlying tissue (such as degloving or scalping), or*
  - vi. *a spinal injury, or*
  - vii. *the loss of a bodily function, or*
  - viii. *serious lacerations, or*
- c. *Medical treatment within 48 hours of exposure to a substance.*<sup>387</sup>

The model law mirrors exactly the Victorian OH&S Act definition of an incident to which the legislation applies, although it also includes medical treatment for exposure to a substance. It is evident that both of these OH&S laws comprise resource-use and burden of injury measures, but they do not include an explicit severity scale. However, it could be construed that certain injury categories such as de-gloving, serious head injuries and lacerations may be viewed as meeting the standard of seriousness expressed in the AIS and ICISS definitions, albeit without the explicit medical severity values used by both.

### **3.3.4.2 Transport Accident Act**

Transport accident compensation legislation in Victoria includes a multi-faceted serious injury definition for the purposes of not-at-fault common law compensation. The *Transport Accident Act 1986* (Vic) (the TAA) definition was described by the TAC as acting as a 'gateway' for common law compensation.<sup>388</sup> Mr Alan Woodroffe, the Senior Manager of Policy Service and Review at the TAC, characterised the definition as:

*...a combination of factual and subjective issues, so as a test of serious injury it is unusual in that context because effectively it asks, 'Is the consequence of this injury serious for that person?', rather than using a simple objective measure of, say, impairment or something else.*<sup>389</sup>

Section 93 of the TAA defines serious injury in one of four ways or limbs:<sup>390</sup>

1. a serious long-term impairment or loss of a body function;

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<sup>387</sup> Safe Work Australia, *Submission*, no. 14, 18 April 2013, pp. 10-11.

<sup>388</sup> Alan Woodroffe, Senior Manager Policy, Service and Review, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, pp. 315-316.

<sup>389</sup> Alan Woodroffe, Senior Manager Policy, Service and Review, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 315.

<sup>390</sup> Alan Woodroffe, Senior Manager Policy, Service and Review, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, pp. 314-315.

2. permanent serious disfigurement;
3. severe long-term mental or severe long-term behavioural disturbance or disorder;<sup>391</sup> and
4. loss of a foetus.<sup>392</sup>

In Victoria, a person can access an impairment benefit if they have more than 10% impairment.<sup>393</sup> If they meet this threshold, a patient is deemed to be seriously injured as per the definition of ‘serious’ set out in section 93 of the TAA. Those patients who suffer full body impairment (calculated by adding all the injuries suffered by a patient and assessing them using the American Medication Association guidelines for the evaluation of permanent impairment) of 30% or higher are deemed to be seriously injured.<sup>394</sup> That threshold is quite high according to Maurice Blackburn Lawyers with the majority of patients qualifying under the other limbs of the definition.<sup>395</sup>

A patient that has not met the 30% threshold may be able to access compensation if the TAC considers their injury to be serious and consents to the claim, or if a Court finds they have suffered a serious injury. In these circumstances, a patient needs to satisfy a narrative test<sup>396</sup> which requires an ‘analysis of the pain/suffering and/or loss of earning capacity consequences and consideration of the permanency of the injury’.<sup>397</sup> Mr Malcolm Cumming, Principal at Maurice Blackburn Lawyers, contextualised the narrative test noting that it drew heavily from judicial interpretation of the statutory definitions, and included an assessment of an ‘individual’s circumstances and the consequences of an injury for that person’.<sup>398</sup>

The definition used in the TAA was described by Maurice Blackburn Lawyers as setting a ‘very high level beyond the level of what is considered to be a serious injury in ordinary

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<sup>391</sup> **Note:** During the writing of this report, amendments were made to the *Transport Accident Act 1986*, which further defined a ‘severe long-term mental or severe long-term behavioural disturbance or disorder’. Specifically, the amendment inserted 93(17A). This section requires a person to have suffered a ‘severe long-term mental or severe long-term behavioural disturbance or disorder’: (1) for a continuous period of three years; and (2) that they have a recognised mental illness or disorder caused by the transport accident; and (3) that they display symptoms that have not responded, or substantially failed to respond to known effective clinical treatment provided by a registered mental health professional who is registered under the Health Practitioner Regulation National Law to practice (other than a student); and (4) they have severely impaired function with symptoms causing clinically significant distress and severe impairment in relationships and social and vocational functioning. The insertion of this new subsection has therefore, provided additional parameters to the scope of what constitutes a ‘serious injury’ under the TAA and may have an impact on pre-existing case law. The amendments were contained in the *Transport Accident Amendment Act 2013* (no. 71/2013) and were assented to on 19 November 2013.

<sup>392</sup> S. 93(17) *Transport Accident Act 1986* (Vic).

<sup>393</sup> S. 47(1) & (2) *Transport Accident Act 1986* (Vic).

<sup>394</sup> See S. 46A *Transport Accident Act 1986* (Vic): Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, pp. 2-3.

<sup>395</sup> Malcolm Cumming, Principal, Maurice Blackburn Lawyers, *Transcript of evidence*, 10 September 2013, p. 248.

<sup>396</sup> Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, pp. 2-3.

<sup>397</sup> Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, pp. 2-3.

<sup>398</sup> Malcolm Cumming, Principal, Maurice Blackburn Lawyers, *Transcript of evidence*, 10 September 2013, p. 248.

language’,<sup>399</sup> and one that made it inappropriate to adopt for road safety purposes. The Law Institute of Victoria (LIV) also supported this view in its submission.<sup>400</sup>

According to the LIV submission, there are very few patients who qualify as seriously injured under the TAA. For the 2011/12 financial year, the TAC received 19,002 claims, of which 945 were common law settlements for persons who met the serious injury definition. The LIV cautioned that there was an additional group of claimants who met the serious injury definition, but who did not pursue a common law claim and were therefore not counted.<sup>401</sup> Nevertheless, these figures, which were confirmed by the Committee,<sup>402</sup> clearly highlight the high threshold and seriousness of injury that the TAA imposes for the purposes of accident compensation.<sup>403</sup>

The LIV went on to identify the potential of using TAC claims data to track trauma, but suggested that using the permanent impairment threshold in the TAA would be ‘inappropriate’ and ‘would unnecessarily understate the true impact of road trauma on the Victorian community and economy’.<sup>404</sup>

In the Committee’s view, the TAA definition, as well as those in the OH&S legislation outlined above, borrow elements from the resource-use, and burden of injury measures, and arguably, may also be construed as containing a threat to life element, but without a severity scale. However, these laws are specifically tied to regulatory functions and compensation purposes and are therefore not appropriate for use in defining road related trauma more generally. Nor are they the appropriate basis on which to form the foundation for a road injury data collection, collation and reporting system.

**Finding 9:** At present, the Committee does not believe that the legislated compensation definitions are appropriate for road safety reporting needs.

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<sup>399</sup> Maurice Blackburn Lawyers, *Submission*, no. 26, 7 May 2013, p. 10.

<sup>400</sup> Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, p. 3.

<sup>401</sup> Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, p. 3.

<sup>402</sup> See Transport Accident Commission (TAC), *2012 Annual Report* East Melbourne, 2012, pp. 4, 11.

<sup>403</sup> Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, p. 3.

<sup>404</sup> Law Institute of Victoria, *Submission*, no. 25, 2 May 2013, p. 6.



## CHAPTER FOUR AT A GLANCE

### OVERVIEW

Chapters Two and Three established the foundation for a new approach in the way serious injury data is defined and collected. This chapter outlines the Committee's views on the best way to define crash related serious injury and to improve the collection and reporting of injury data. Under the new model proposed by the Committee, a serious injury would be defined by reference to a threat to life measure based on the 'major trauma' definition used in the Victorian State Trauma System. Due to the recognition of the burden of injuries from road trauma, the Committee also recommends the use of Disability-Adjusted Life Years (DALYs) to measure that burden in the future. Together with the retention of the existing admission to hospital, and other injury definitions (e.g. fatalities), the proposed tiered trauma definition structure is expected to more accurately and comprehensively capture the incidence of injuries from road crashes, their severity and long-term outcomes.

The chapter also deals with the responsibility for collecting and reporting injury data. In contrast to the current approach, the Committee proposes that the Department of Health and the Victorian State Trauma Outcomes Registry and Monitoring Group be made responsible.

### KEY FINDINGS

Finding 10: No single injury definition or measure can meet every policy and research need.

Finding 11: Victorian health data is comprehensive, allowing all threat to life measures and Disability-Adjusted Life Years to be compiled using existing data and existing data collection methods.

Finding 12: It is necessary to retain the existing 'admission to hospital' proxy for the purposes of national consistency, adherence with the *National Road Safety Strategy* and as a statistical measure that can be used by decision and policy-makers and for operational reasons.

### RECOMMENDATIONS

Recommendation 1: That the Victorian Government adopt a tiered trauma definition structure comprising the following categories, in ascending order of seriousness:

(a) Fatalities;

(b) Major trauma patients;

- (c) Disability-Adjusted Life Years;
- (d) Admitted to hospital;
- (e) Attended an emergency room; and
- (f) Not injured.

Recommendation 2: That the current 'serious injury' definition used in Victoria be renamed 'admitted to hospital'.

Recommendation 3: That the classification guidelines used by the Victorian State Trauma Outcomes Registry and Monitoring Group to code road crashes be amended so that they align with the definition of a 'road' and 'road related area' as set out in the *Road Safety Act 1986*.

Recommendation 4: That the Victorian State Trauma Outcomes Registry and Monitoring Group and the Victorian State Trauma Committee be given responsibility for the monitoring of changes to Disability-Adjusted Life Years and Years of Life Lost values and their updating as needed.

Recommendation 5: That the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) undertake a 12 month trial using Disability-Adjusted Life Years (DALYs) to measure the burden of injury in road trauma patients who have met the 'major trauma' definition as used in the Victorian State Trauma Registry. The trial should involve patients from all road user categories (pedestrian, bicyclist, motorcyclist, passenger and freight vehicles), with trial outcomes submitted to the Minister for Roads once completed. An assessment by VSTORM of DALYs for use in road safety should also be conducted, with input from road safety agencies.

Recommendation 6: That the Victorian Government establish a *Road Safety Trauma Definitions Committee* chaired by the responsible Minister, with secretariat support provided by the Victorian State Trauma Outcomes Registry and Monitoring Group steering committee. The Committee should comprise representatives from road safety agencies, the Department of Health, the commissioners for privacy and health records, and other relevant stakeholders. Its role will be to identify, assess, and make recommendations on the most suitable serious injury definition based on a threat to life measure and a burden of injury measure. This Committee should assess the ability of each of the recommended measures to be mapped or compared against other threat to life measures; its utility in countermeasure development; and its capacity to monitor trends, over time. This Committee is to provide its findings and recommendations to the Ministerial Council for Road Safety within 12 months of this report being tabled.

Recommendation 7: That Victoria, through the Standing Council on Transport and Infrastructure, raise the harmonisation of injury definitions, using the Victorian approach as a possible national model.

Recommendation 8: That the Department of Health collect and collate the following quarterly and yearly trauma statistics for those injured in a road crash:

- (a) The number of emergency room presentations; and
- (b) The number of patients admitted to hospital.

Recommendation 9: That the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) be responsible for collecting and collating the following quarterly and yearly trauma statistics for those injured in a road crash:

- (a) The number of major trauma patients as per the VSTORM definition of a major trauma; and
- (b) The number of Disability-Adjusted Life Years and Years of Life Lost.

In order to be made responsible, the Department of Health is to direct the VSTORM to undertake this new reporting role.

Recommendation 10: That the quarterly and yearly statistics compiled by the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) and the Department of Health (DoH) are provided to the following entities for the purposes of developing road safety policy, monitoring the burden of road crashes, undertaking research, and for public education purposes:

- (a) The Ministers for health, roads, justice and the responsible Minister for the Transport Accident Commission (TAC);
- (b) Road safety agencies comprising the TAC, VicRoads and Victoria Police; and
- (c) In the case of the VSTORM collected data, the DoH.

The statistics collected by the VSTORM and the DoH should include analyses of gender, age and road user group.

Recommendation 11: That the Department of Health publish the total number of road crash patients who attend an emergency room, and those who are admitted, on a quarterly and annual basis.

Recommendation 12: That the Victorian Government direct VicRoads and the Transport Accident Commission to publish the trauma statistics produced by the Victorian State Trauma Outcomes Registry and Monitoring Group and the Department of Health on their websites and in a yearly publication.

Recommendation 13: That the Victorian Government amend the work program of the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) to include the monitoring and reporting of road crash trauma as described in Recommendations 3, 4, 5, 9 and 10, and provide any additional resources to VSTORM to complete these tasks.

Recommendation 14: That Victoria Police reintroduce the collection of non-injury crash statistics.

## CHAPTER FOUR: A BEST PRACTICE APPROACH FOR VICTORIA

Throughout its investigations, the Committee developed the view that Victorian Government road safety agencies and researchers require a range of measures to analyse, assess and track road trauma and the performance of countermeasures intended to reduce it. There was a strong consensus in the evidence that no single definition will achieve every road safety need, with experts advising the Committee that recommending a single measure or a ‘one-size fits all’ approach to defining serious injury would be problematic.<sup>405</sup> For example, in discussing appropriate measures of injury severity, Dr Martin Lum, Medical Director of Hospitals and Health Services Performance at the Department of Health (DoH), observed that:

*You are not going to have one perfect classification system for injuries, because there are many different ways that you want to look at it.*<sup>406</sup>

Similarly, Maurice Blackburn Lawyers stated in its submission that no single measure will capture all serious injury cases:

*In conclusion, no single definition – even a multifaceted definition – will capture all ‘true’ cases of serious injury. We believe it is important to carefully consider the appropriate criteria for serious injury and to ensure these are sufficiently broad, such that as many ‘true’ cases of serious injury are captured within the definition as possible, and the true cost of serious injury can be best measured.*<sup>407</sup>

In his appearance before the Committee, Professor James Harrison, Director of the Research Centre for Injuries Studies and Program Manager of the National Injury Surveillance Unit at Flinders University pointed out that any serious injury definition would lack the absoluteness of the fatality definition and that attempting to find a measure that provides exact serious injury figures should not be the overall objective:

*Road deaths are few enough and well defined in terms of outcome...to make it feasible to measure to the exact number. You know how many road deaths meeting your definition there were in Victoria last year and the year before and so on. My*

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<sup>405</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 21; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 92.

<sup>406</sup> Dr Martin Lum, Medical Director, Hospital and Health Service Performance, Department of Health, *Transcript of evidence*, 22 July 2013, p. 57.

<sup>407</sup> Maurice Blackburn Lawyers, *Submission*, no. 26, 7 May 2013, p. 10.

*reality check advice is: do not expect that to apply to serious injury, partly because they are more numerous and partly because there is not such a sharp dividing line between what is included and what is not. While you can employ an approach to serious injury that will come up with a specific number, you could easily spend more time than it is worth on worrying about the exact numbers, at least at this stage of development, rather than coming up with something that is fit for purpose, that is based enough on the information systems that you already have so that it does not cost too much. I am suggesting that, on reflection, an exact number may not be absolutely essential for the purposes you are on about.<sup>408</sup>*

The conclusion reached by many Inquiry participants was that a multi-layered definition was needed to identify seriousness. In its submission, the Actuaries Institute noted the importance of being able to define the seriousness of the injury at the initial, acute phase of recovery, and the long term recovery stage of the injury.<sup>409</sup> Further, Mr Michael Nieuwesteeg, Research Manager of Road Safety and Marketing at the Transport Accident Commission (TAC), advised the Committee of the many choices available for defining serious injury:

*In considering what a serious injury measure might look like, there are many choices available. We would suggest that a range of measures is appropriate because, as we have demonstrated, there is no one measure that we can rely on to cover all people fairly. We think that it needs to be objective as much as possible, understandable and easily explainable. It should be adequately related to the consequences of the injury. We nominated the most important ones as threat to life and impairment. Quality of life, pain and suffering, cost and resource use we think in some sense derive from those threat to life and impairment measures.<sup>410</sup>*

The advantages of using different definitions for different purposes was also raised by Dr Lum from the DoH:

*...each type of definition set...is designed around specific purposes to measure something from a specific perspective...With an injury, you might want to look at the threat [to] life of their injury at a point in time. You might want to see what the outcome is. So the ICD is kind of like a measure of the injury from that perspective. There might be also another perspective: when you have someone with an injury right in front of you, what is their physical risk right at that moment? So you do need to have multimodal classification systems for trauma.<sup>411</sup>*

Taking a different perspective, Associate Professor Stuart Newstead, Associate Director of Injury Analysis and Data at the Monash University Accident Research Centre (MUARC)

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<sup>408</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 367.

<sup>409</sup> Actuaries Institute, *Submission*, no. 16, 19 April 2013, p. 4.

<sup>410</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 317.

<sup>411</sup> Dr Martin Lum, Medical Director, Hospital and Health Service Performance, Department of Health, *Transcript of evidence*, 22 July 2013, p. 57.

outlined the potential effects of employing different injury measures in assessing countermeasures outcomes:

*You probably need at least a threat to life measure, and you probably also need a long-term outcome measure to go with it. I suspect that you probably need to monitor both of them because they both probably react differently to different countermeasures and stimulus. I think it would be quite useful to know both things.*

*You want to stop people dying, but you also want to stop the long-term consequences. At the moment we really do not know, because we have had no opportunity to evaluate countermeasures related to these new outcomes — whether countermeasures actually are equally effective on both or in fact have quite different effects on each and then how you can balance that effectiveness side by side. I would suggest that we would probably need at least two measures if we are going to do this properly.<sup>412</sup>*

To determine the most appropriate types of measures to include in a tiered approach to categorising road trauma, the Committee considered the evidence from Inquiry participants. While there were divergent views among participants about the best measures, many participants advocated the benefits of employing both threat to life and burden of injury measures. Further, there was also a clear consensus among participants about the need to retain the current serious injury definition using the proxy of hospital admissions, in order to be nationally consistent. In particular, Mr Nieuwesteeg of the TAC highlighted the importance of retaining the resource-use measure:

*ICISS, as good as it is, is still available only when you have the hospital admission. In cases where they do not go to hospital it is not possible, so it is still useful to have resource measures. We are not ready to say, 'This and this and this are your best'. We just nominate at this point that ICISS is useful and in the meantime we should be using the TAC-validated police measures of serious injury.<sup>413</sup>*

In the context of burden of injury measures, most participants expressed the view that such a measure would be vital for tracking the extent and repercussions of road crashes. VicRoads and the TAC were both supportive of a burden of injury measure, but suggested that more research was required before such a measure, and particularly the Disability-Adjusted Life Year (DALY), could be implemented in the road safety area.<sup>414</sup>

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<sup>412</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 92.

<sup>413</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 327.

<sup>414</sup> See Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 34; VicRoads, *Submission*, no. 31, 17 May 2013, p. 50.

## 4.1 Defining serious injury

The question of an appropriate serious injury definition is one that was subject to intense scrutiny by Inquiry participants. Both submitters and witnesses provided detailed observations and conclusions about the different approaches that could be used to define serious injury. On the basis of this evidence, and its own research, the Committee agrees that no single injury definition can fulfil every policy and research need, and that ‘some perform better than others in addressing specific policy questions’.<sup>415</sup>

**Finding 10:** No single injury definition or measure can meet every policy and research need.

The Committee is also of the view that whatever measures are used in Victoria, they need to be appropriate for their intended use. As such, the Committee shares the view that a tiered approach to defining injury is necessary. In particular, it believes that developing a complete set of measures to ‘take into account all levels of injuries, from the very trivial all the way through to serious injury,’<sup>416</sup> is critically important. This approach would identify injuries on an escalating scale, with fatalities being the worst outcome and ‘no injury’ being the best outcome. This is the most appropriate way to meet Victoria’s road safety needs.

The Committee believes that a serious injury under the tiered approach would ideally be measured by reference to the threat to life category. However, while not being synonymous with seriousness, a burden of injury measure would also highlight and help track the long-term impacts of trauma. Both of these measures should be seen as having an important and equal role in informing road safety research, measuring road safety performance and aiding the development and evaluation of road safety countermeasures.

Given the strengths of the Victorian trauma and hospital data sets, the Committee understands that all the threat to life measures, as well as DALYs, can be computed using existing data. As a consequence, Victoria is in a position to undertake international comparisons using different threat to life measures (for example Maximum Abbreviated Injury Score Above 3 (MAIS 3+) or International Classification of Disease-based Injury Severity Score (ICISS)) on an ongoing or irregular basis. Decision-makers can also choose to employ more than one threat to life measure if they wish. This was highlighted as a key advantage by Mr Bruce Prosser, the Director of Information and Funding Systems at the DoH:

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<sup>415</sup> D Hendrie and T.R Miller, 'Assessing the burden of injuries: competing measures', *Journal of Injury Control and Safety Promotion*, vol. 11, no. 3, 2004, p. 198.

<sup>416</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 141.



*The data we are talking about today would support a range of measures being calculated using that data. So long as you are able to calculate the raw data at some point, it will probably lend itself to a range of evaluative measures, whether it is disability-adjusted life years or other measures. So long as you have the basic data you can obviously calculate various indicators from that. You do not have to just collect the indicators, if you know what I mean; the data is broad enough to support a range of indicators, and I presume you would want to always be looking at a problem from a range of potential perspectives because they will be measuring slightly different aspects of the problem, probably.*<sup>417</sup>

Professor Harrison of Flinders University also noted the advantages of utilising Victorian health data to calculate various injury measures:

*There are two varieties of these measures. One can be based on the Abbreviated Injury Scale (AIS) and the other is based on the International Classification of Diseases (ICD). The good news for you is that because of the types of information systems that exist in Victoria (but not everywhere else) you have an easy choice because both varieties can be used here at low cost. The source information is there for both of them. They have somewhat different strengths and limitations.*<sup>418</sup>

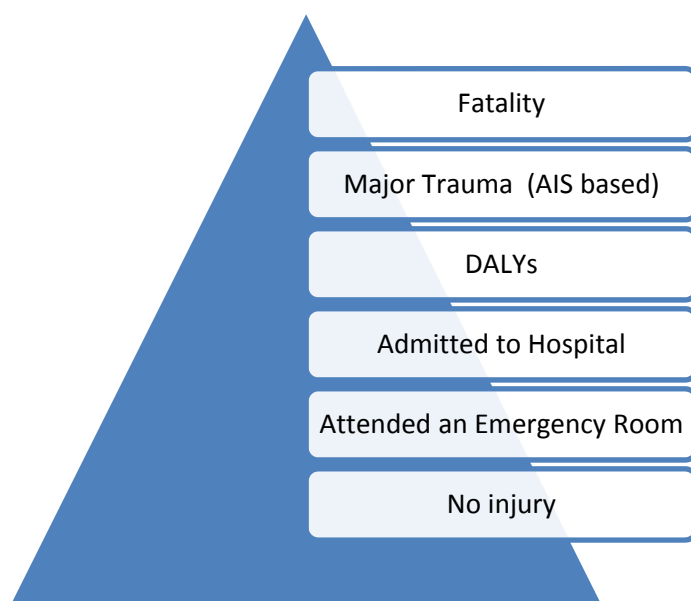
**Finding 11:** Victorian health data is comprehensive, allowing all threat to life measures and Disability-Adjusted Life Years to be compiled using existing data and existing data collection methods.

Adopting a tiered approach to definition trauma in Victoria is imperative to ensuring that road related serious injury and injury severity are better measured and monitored over time. All three injury measures (resource-use, threat to life and burden of injury) have an important role to play in Victorian road safety and, in particular, in maximising Victoria's surveillance of road trauma. The diagram below outlines in ascending order of severity the proposed approach to defining road trauma in Victoria.

<sup>417</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 59.

<sup>418</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 369.

**Diagram 2: Proposed tiered trauma definition structure**



**Recommendation 1:** That the Victorian Government adopt a tiered trauma definition structure comprising the following categories, in ascending order of seriousness:

- (a) Fatalities;
- (b) Major trauma patients;
- (c) Disability-Adjusted Life Years;
- (d) Admitted to hospital;
- (e) Attended an emergency room; and
- (f) Not injured.

The Committee expects that the majority of road trauma cases would be captured using this multi-tiered approach, with fewer and more severe trauma cases being captured at the top of the diagram. Importantly, the use of DALYs would allow Victoria to track the burden of injury post-treatment and would apply to both admitted and major trauma category patients. Also, because of Victoria's trauma system and health data collection, it is in an enviable position of being able to compile different measures for the purposes of international or national comparisons. The Committee is confident that this tiered approach will help overcome many, if not all, of the existing issues identified in Chapter Two. Each of the categories to be included in the proposed approach is discussed in further detail below.

### 4.1.1 Resource-use measure

As identified in the second chapter, the current resource-use measure is a blunt approach to identifying the seriousness of an injury. However, the Committee believes that its retention is necessary for two reasons: firstly, it provides policy and decision-makers with an overview of the resources used to treat injured road users; and secondly, it is consistent with the nationally agreed approach to measuring serious injury. These two factors make its retention necessary, an observation made by participants during the Inquiry.<sup>419</sup> The Committee believes that as long as the admission to hospital measure is not used as a surrogate or proxy to measure seriousness or severity of injury, a purpose for which it is entirely inappropriate for, it remains useful, in particular for national comparability and inter-departmental operability.<sup>420</sup>

The advantage for Victoria of retaining the current admission to hospital definition is that it, in effect, already meets the national serious injury definition, even as other jurisdictions are moving towards that definition.<sup>421</sup> A further advantage is that the admission to hospital measure captures a large cohort of road trauma victims, which in turn is used to target resources, a point raised by Victoria Police:

*The other important thing about why we still need police serious injury data at that one level is that for them very much in the road safety space it is about enforcement and targeting resources. They need to know where they have to target their resources more effectively, and they are looking at that serious injury component as one of the areas that they focus operations on: where are the areas that are having large numbers of serious injury crashes?*<sup>422</sup>

**Finding 12:** It is necessary to retain the existing ‘admission to hospital’ proxy for the purposes of national consistency, adherence with the *National Road Safety Strategy* and as a statistical measure that can be used by decision and policy-makers and for operational reasons.

While retaining the resource-use measure, the Committee proposes two changes to it. The first is to rename it ‘admitted to hospital’ rather than ‘seriously injured’. This new title most accurately reflects the type of injury data being collected and would also

<sup>419</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266; Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 174; Office of Road Safety WA, *Submission*, no. 24, 30 April 2013; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 141; Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 121; VicRoads, *Submission*, no. 31, 17 May 2013, p. 36.

<sup>420</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 36.

<sup>421</sup> Tim Risbey, Research Manager, Safety and Maritime Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 176.

<sup>422</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 272.

reduce any confusion within the broader community as to what constitutes a serious injury. The second change is to remove the data collection and reporting responsibility from Victoria Police, and instead require the DoH and Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) to report these statistics. The latter change is explained further in section 4.3.

**Recommendation 2:** That the current ‘serious injury’ definition used in Victoria be renamed ‘admitted to hospital’.

#### 4.1.2 Threat to life measure

In the tiered approach, the Committee believes that the definition of a serious injury for the purposes of Victorian road safety should be based on a threat to life measure. Given the complexity of this area, the Committee relied heavily on advice from medical data experts, including the world-leading VSTORM, as well as published research. In determining the most appropriate method for calculating a threat to life, the Committee considered the importance of comparability with other jurisdictions, and in particular the European Union (EU) (which has adopted the MAIS 3+ definition), as well as the work already undertaken in Victoria in the trauma area by the VSTORM and the Victorian State Trauma Committee (VSTC).

Additionally, the Committee was mindful of the need to set a threshold within a threat to life measure, below which a patient would not be considered to be seriously injured. This point was reiterated at public hearings, in particular by Professor Harrison of Flinders University:

*With any of the threat to life or threat to disability measures, there is a need to decide on and apply a cut point in the measure and say that it is cases above this threshold that we are going to call serious injury and report them. In the reports that you have talked about, the high threat to life is simply a cut point that we have used that was based on some research that we did some years ago with New Zealand colleagues, and we have continued to use that cut point for consistency. There could be arguments about having a more severe cut point or a lower cut point, but you need to make a cut point for those reports.<sup>423</sup>*

Professor Harrison also stated that:

*It gets harder to define serious injury if you set out to include every case that might be called serious injury. It is easier to use certain definitions that are restricted to the most severely injured or those ones plus the fairly seriously injured to produce measures that can be relatively stable over time. As you get to the less serious injuries, the issues of inclusion criteria become a bit vaguer and a little less certain. I suggest that in the context of a quantitative indicator, having an indicator that is*

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<sup>423</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 372.

*strong on detecting year to year change may be more important than one that counts every last case...*<sup>424</sup>

Associate Professor Newstead of MUARC expressed a similar view:

*What I would say is that if you use something like an ICISS or an AIS, if you want it to say what a defined serious injury is, you need to put a cut-off somewhere.*<sup>425</sup>

#### 4.1.2.1 AIS or ICISS

In the context of which threat to life measure to employ as the basis for defining serious injury, the evidence received from Inquiry participants and findings in the relevant literature reflected support for both the ICISS and the AIS. The Committee notes, however, the strong support among Inquiry participants for the use of the ICISS measure.<sup>426</sup> In his evidence, Mr David Shelton, the Executive Director of Strategy and Planning and the Road Safety Coordinator at VicRoads, provided a succinct overview of how Victoria should define serious injury, outlining the key measures to support this approach:

*...we adopt ICISS as the measure of injury severity; and secondly, that further research be done to develop a measure that incorporates a threat-to-life and a non-fatal measure. In particular, the further work on a threat-to-life and a non-fatal measure needs to examine the feasibility of using a measure such as DALY to measure the ongoing disability that the people incur from road trauma. We would propose in the first instance that we continue to report the current measure but add to it a measure of severity such as the ICISS measure.*<sup>427</sup>

*...the ICISS method provides probably the most objective measure that we have, it is regularly available and we can use it. For example, in putting this submission together we got the VAED dataset of all the ICISS scores of what is serious for every road user group or the majority of types of crashes for road user groups. We have that data. It is available. One of the constraints might be that the survival ratios, the SRRs, are probably a little bit outdated.*<sup>428</sup>

<sup>424</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 367.

<sup>425</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 90.

<sup>426</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 26; Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 41; VicRoads, *Submission*, no. 31, 17 May 2013, p. 52.; See Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 119.

<sup>427</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267.

<sup>428</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267.

The TAC also provided qualified support for the ICISS, although it referred to it as an 'interim option'.<sup>429</sup> Mr Nieuwesteeg expanded on this point in his appearance before the Committee:

*Our suggestions are that we put some effort into implementing threat to life in the short term, because we believe it is quite achievable and very relevant and helpful, but again it does not capture everyone, so we would suggest that we look to incorporate some measures of impairment down the track. The big challenge with impairment is that it can take years for someone's impairment injuries to settle down so that you can actually take a measure. You can take a measure at the three-month mark that may be different to if you take it at the two-month mark. The TAC has a measure that it uses which is reasonably objective, but timing is the issue.<sup>430</sup>*

Given the broad support for ICISS, the Committee sought the views of expert medical witnesses from the DoH and VSTORM on its appropriateness. The DoH deferred to the expertise of the VSTC and its related entities, including VSTORM. Specifically, Dr Lum from the DoH, explained:

*The state trauma committee and the VSTORM trauma registry have a long heritage of measuring outcomes of all types of serious trauma, and their whole purpose is to look at serious trauma. In the context of road safety, our recommendation really is to ask for advice from that particular committee, which has extensive expertise in the area of defining serious injury. In my view, road injury should have a similar basis for defining what a serious road injury is for the generic trauma-type classification of seriousness. So the recommendation is to ask the state trauma committee to provide advice on that.<sup>431</sup>*

Both the Royal Australasian College of Surgeons (RACS) and Professor Gabbe, Head of the Victorian State Trauma Registry (VSTR) highlighted the advantages of the AIS based Injury Severity Score (ISS) as compared to the ICISS. In its submission, the RACS noted the advantage of AIS and ISS in terms of comparing Victorian road trauma with other jurisdictions, as well as being able to compare traumatic injuries caused by road trauma against those suffered due to other causes. Further, the submission concluded that 'the use of AIS and ISS measures would also allow for the incorporation of current data sets' for the purposes of road trauma analysis.<sup>432</sup> In correspondence with the Committee, Professor Gabbe provided an overview of the technical and administrative advantages of the AIS, and in turn the ISS, as compared to the ICISS:

*The ICISS represents a good "threat to life" measure but has no capacity to assist in monitoring or evaluating outcomes other than mortality. As one approach to monitoring serious injury, it is a good tool to have in the tool belt. The ISS>12*

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<sup>429</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 41.

<sup>430</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 317.

<sup>431</sup> Dr Martin Lum, Medical Director, Hospital and Health Service Performance, Department of Health, *Transcript of evidence*, 22 July 2013, p. 60.

<sup>432</sup> Royal Australasian College of Surgeons, *Submission*, no. 18, 22 April 2013.

*threshold has similar benefits to the ICISS cut-off for high risk of mortality and therefore either could be used to monitor mortality. However, it is the fundamental building blocks of these “threat to life” thresholds or scales that differ. The ICD-10 diagnosis codes which underpin the ICISS are poor for defining injury severity in any other terms. The diagnosis codes are not rich enough in their detail to differentiate simple injuries from more complex injuries that may have a much higher risk of long term or permanent disability. This is a major failing of the ICD-10 system. In contrast, the AIS, which underpins the ISS, was purpose built to provide a detailed and comprehensive system for classifying injury. The depth of information captured in the AIS diagnosis codes provides a much richer source of data for monitoring injury types and severities, and for supporting research. The AIS is more expensive to collect but it should be noted that this has been a fundamental component of the Victorian State Trauma Registry for over a decade and is collected for all ISS>12 patients in the state. All of these patients are also followed-up routinely to 2-years post-injury to capture detailed information about function and quality of life.*

*Overall, the ICISS is limited to measuring probability of survival but serves no other purpose. If monitoring serious injury as defined in terms of morbidity such as lost quality of life or function, or an incapacity to work, then the ICISS will not be useful at all. The ISS>12 threshold is comparable to the ICISS as a “filter” for identifying those at higher risk of mortality, all cases meeting this threshold are already captured (and have been for over a decade), and the use of this threshold by the Victorian State Trauma System has ensured that the data relating to morbidity has been collected, and continues to be collected, for all cases meeting this threshold. Long term quality of life, pain, work disability, and function are already collected for ISS>12 cases in Victoria, enabling detailed monitoring of patient case-mix, mortality and morbidity. This data has also been used successfully to describe DALYs in the road trauma population over more than a decade.<sup>433</sup>*

The Committee believes that Professor Gabbe’s commentary on assessing the merits of the ICISS compared to the AIS based ISS is highly instructive. The ICISS is at a disadvantage due to its limited utility in monitoring serious injury over time. Comparing ICISS data against existing trauma data would be not be possible, and the capacity to measure outcomes of trauma, for example by compiling DALYs, would similarly be lost. For these reasons, the Committee believes the AIS based ISS is the better option.

#### **4.1.2.2 Major Trauma**

The Committee is of the view that using the existing Victorian major trauma definition as the standard definition of what constitutes a serious injury, based on the AIS, is the most appropriate option. The Committee reached its conclusion based on a number of factors:

- Given all the evidence received, Victoria already has a trauma definition based on the AIS that reflects a high level of injury severity. That definition, and the work of the VSTORM through the VSTR is both nationally and internationally recognised as

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<sup>433</sup> Correspondence from Professor Gabbe, 13 February 2014, pg. 2

world-leading in terms of tracking trauma through the Victorian State Trauma System (VSTS);

- Because of the investment in the VSTS, the VSTR and the VSTORM, the infrastructure (including data analysts, and coding guidance material) already exists through which road trauma cases can be identified, assessed and reported;
- The AIS is recognised as an excellent basis for assessing threat to life, both by Victorian medical experts and by the Centres for Disease Control and Prevention (CDC);<sup>434</sup>
- A person admitted to a trauma hospital for treatment on the basis of suffering a major trauma is clearly seriously injured. This should also be easily recognisable by the community more broadly;
- While the Committee is aware of the potential capacity to translate Victorian Admitted Episodes Dataset (VAED) data into AIS scores, and the possibility of an *International Statistical Classification for Diseases and Related Health Problems, Revision 10, Australian Modification* (ICD-10-AM) map to be developed to allow such translations to occur, it does not believe that translating different datasets, by using such maps, is an appropriate or accurate way to monitor road trauma. The Committee notes that the VSTORM has the capacity to undertake, and already does undertake AIS assessments of admitted patients using its own data analysts and coding guidance material; and
- Because Victorian health data can be used to compute all threat to life measures, choosing the major trauma definition would not inhibit researchers or government in compiling different statistics using an alternative threat to life measure.

The Committee raised the proposition of using the major trauma definition with Professor Harrison of Flinders University who agreed that it would be useful:

*There is a tradition in trauma registries of being concerned particularly about probability of survival, and trauma surgeons have tended to focus on high threat to life cases that meet the definition, such as AIS 3 and above. Roughly speaking, that is the inclusion criteria of the Victorian State Trauma Registry. They also include a few other groups — people who have been ventilated for 24 hours or more, I think, and one or two other groups.*

*For many purposes that would be a good measure. In terms of probability of death measures, that would be quite a good measure to use. The catch, however, is that in terms of people who sustain persisting disability as a result of road injuries there are*

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<sup>434</sup> See the recommendation of the expert working group convened by the National Centre for Health Statistics (NCHS) in Expert Group on Injury Severity Measurement, 'Discussion document on injury severity measurement', viewed January 2014, <<http://www.cdc.gov/nchs/data/injury/DicussionDocu.pdf>>, p. 14



*probably quite a lot not included by that criterion. Below that threshold there will be quite a lot. I am being a little bit coy about saying how much and how many and so on because there is some work that is being done right at the moment that will give us a much better quantitative sense of how many there are and what sorts of cases there are, but there are certainly some, and it could be quite a lot.*<sup>435</sup>

Overall, the Committee believes the existing major trauma definition is the most appropriate way to define serious injury in Victorian road safety. This will deliver clear benefits to the way Victoria tracks and monitors road trauma, and enhance efficiencies by utilising an existing, well-developed and world leading data collection system and injury definition. It also removes the need to create yet another type of definition specific to road safety.

The Committee also notes that upon this definition being adopted, a number of consequential changes will need to be made to various Victorian Government documents and processes. In particular, the *Victorian Road Safety Strategy 2013-2022* (including the mooted severely injured category)<sup>436</sup> and accompanying action plans, in addition to any public education material, will require updating to reflect the new serious injury definition. New reporting arrangements will also need to be established to ensure that road trauma patients are identified within the existing VSTR and VSTORM analysis and monitoring process. Further, it will be necessary to align any coding manuals used by the VSTORM to identify road ‘major trauma’ victims with the *Road Safety Act 1986* definition of a ‘road’ and ‘road related’ area, to ensure that only those patients who meet that definition are included in the official statistics.

**Recommendation 3:** That the classification guidelines used by the Victorian State Trauma Outcomes Registry and Monitoring Group to code road crashes be amended so that they align with the definition of a ‘road’ and ‘road related area’ as set out in the *Road Safety Act 1986*.

#### 4.1.3 Burden of injury measure

The Committee is of the view that the burden of injury measure is arguably the most neglected area in road safety statistics. While studies track threat to life (for example the Australian Institute of Health and Welfare’s (AIHW) semi-regular publication *Serious injury due to land transport accidents, Australia*) among road trauma victims, very little is known about long-term outcomes. Road safety agencies and other participants, particularly those dealing with transport and occupational health and safety compensation, recognise the importance of identifying the burden of injuries arising from road trauma. This was viewed as an acute issue given that some injuries may not be deemed as a threat to life

<sup>435</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 373.

<sup>436</sup> See State Government of Victoria, *Victoria’s Road Safety Strategy 2013-2022*, Melbourne, 2013, p. 4.

according to the major trauma or ICISS definitions, but may have a catastrophic impact on a person's life long after the acute phase of their injuries has passed. This point was made by Professor Harrison of Flinders University:

*If, in time, you move towards measures that are really focused on disability, then I think you may well find that that threshold is set a bit high and that it misses out on some cases that really matter in terms of disability but really do not threaten life very much — so, joint injuries or disrupted knees. People can have disrupted knees without really being at a very high threat to life, but they can have persisting serious disability. That is really my concern, and that is really the main reason why I am tending to advocate 'Both' as my answer to which of the two to choose. The all-hospitalised cases with a cut point are likely to be less affected by the problem I am just describing than the trauma registry set that has the quite high AIS threshold for inclusion. As I said in my presentation, both have very strong special benefits. But in answer to your specific question, that would be my main concern — that it would turn out that if you hooked your wagon solely to the Victorian trauma registry inclusion criteria, there would be a non-trivial number of serious injury or persisting-disability cases that would be below the cut point and therefore out of scope.<sup>437</sup>*

The Committee recognises that adopting a burden of injury measure would also have important benefits for countermeasure development and evaluation,<sup>438</sup> and could serve as a valuable tool in economic analyses to assess the reduction attributes of different mooted interventions.<sup>439</sup>

Based on the evidence received, the DALY is clearly the preferred method of measuring the burden of injury from road trauma. The Committee accepts the hesitation on the part of the TAC, VicRoads and MUARC about whether DALYs are currently applicable to road safety, mainly due to the lack of local disability weights. However, it also notes that DALYs are currently being used in the VSTR and the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR). In addition, the existing DALY weights drawn from the *Global Burden of Disease 2010* study appear to have been subjected to an appropriate level of scrutiny and rigour. Further, the Committee believes that the project aimed at producing alternative disability weights (referred to in section 3.3.3.2), which includes the VSTORM, would help build on this work by developing more robust and localised weightings. Importantly, such weights once produced would lead to more robust DALYs for use in road safety.<sup>440</sup>

The Committee understands that adopting DALYs and using existing disability weightings would enable those benefits to be realised and provide new information on the burden of

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<sup>437</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 374.

<sup>438</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

<sup>439</sup> D Hendrie and T.R Miller, 'Assessing the burden of injuries: competing measures', *Journal of Injury Control and Safety Promotion*, vol. 11, no. 3, 2004, p. 198.

<sup>440</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

injuries, which is currently lacking. The Committee acknowledges that it can take time to identify the long-term impact of injury, because of the time period between the injury occurring and its impact on functional outcomes (a period that may take several years). However, it believes that introducing the use of DALYs with existing disability weights now would help contribute to a greater understanding of the burden of road trauma on the community and is likely to outweigh any disadvantage of not having locally derived weightings.

Once disability weights are produced locally, perhaps as part of the VSTORM-led project, these could be used in road trauma cases. The Committee believes a trial of DALYs in a cohort of road trauma victims, including admitted patients, and those who qualify as major trauma patients, would provide a good reference to assess the specific applicability of DALYs in a road trauma setting. Such a trial could be undertaken by the VSTORM with the involvement of VicRoads and the TAC. If the trial is successful, DALYs would then become the preferred definition to assess the burden of injury from road trauma.

**Recommendation 4:** That the Victorian State Trauma Outcomes Registry and Monitoring Group and the Victorian State Trauma Committee be given responsibility for the monitoring of changes to Disability-Adjusted Life Years and Years of Life Lost values and their updating as needed.

**Recommendation 5:** That the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) undertake a 12 month trial using Disability-Adjusted Life Years (DALYs) to measure the burden of injury in road trauma patients who have met the ‘major trauma’ definition as used in the Victorian State Trauma Registry. The trial should involve patients from all road user categories (pedestrian, bicyclist, motorcyclist, passenger and freight vehicles), with trial outcomes submitted to the Minister for Roads once completed. An assessment by VSTORM of DALYs for use in road safety should also be conducted, with input from road safety agencies.

#### 4.1.4 Alternative approach

In making its findings and recommendations, the Committee was mindful of the fact that these represent a significant change from the current approach in road safety. Given the importance of trauma data, the Committee believes it is necessary to provide a secondary recommendation if the Victorian Government does not accept the recommendation to adopt the tiered trauma definitions structure. That recommendation is set out below.

**Recommendation 6:** That the Victorian Government establish a *Road Safety Trauma Definitions Committee* chaired by the responsible Minister, with secretariat support provided by the Victorian State Trauma Outcomes Registry and Monitoring Group steering committee. The Committee should comprise representatives from road safety agencies, the Department of Health, the commissioners for privacy and health records, and other relevant stakeholders. Its role will be to identify, assess, and make recommendations on the most suitable serious injury definition based on a threat to life measure and a burden of injury measure. This Committee should assess the ability of each of the recommended measures to be mapped or compared against other threat to life measures; its utility in countermeasure development; and its capacity to monitor trends, over time. This Committee is to provide its findings and recommendations to the Ministerial Council for Road Safety within 12 months of this report being tabled.

## 4.2 National consistency

The need for national consistency in defining crash related serious injury was a common theme in the evidence received throughout the Inquiry. In particular, a number of Inquiry participants reiterated to the Committee the importance of employing a measure that allowed comparability of data across jurisdictions. Professor Rebecca Ivers, Director of the Injury Division at the George Institute for Global Health reflected on this matter in her appearance before the Committee:

*It is important that any measures that are used are consistent with national approaches, with other states and with international approaches as well so that we do not develop a new measure that is only used in Victoria. That would really limit the ability to generalise your programs elsewhere and to take other programs and compare the outcomes to see how effective they are. Those measures absolutely have their place. I would not recommend one over the other, because it is something that would have to be done across the different agencies in Victoria and be carefully negotiated to make sure that it is consistent.<sup>441</sup>*

Similarly, Ms Chika Sakashita, a Project Manager, also at the George Institute for Global Health referred to the importance of ensuring comparability across jurisdictions, as well as for the purposes of measuring the success of the National Road Safety Strategy (NRSS):

*Comparability is really important for several reasons. First, it allows us to see how Victoria is going compared to other states and other countries. It also enables people in Victoria to monitor their progress against the national target. Victoria is a signatory to the national road safety strategy, which has the target of a 30 per cent reduction in fatalities and serious injuries. It is impossible to know whether Victoria is actually*

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<sup>441</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 147.

*meeting that target unless all states are using the same definitions. Victoria is counting serious injury as hospital admission, irrespective of the length of stay in the hospital, whereas South Australia, for example, is counting serious injury as hospital admission involving overnight stay. If you are not counting the same thing, you cannot really assess that Australia is achieving that national target.<sup>442</sup>*

Given the status of Victoria as a leading Australian road safety jurisdiction, the Committee recommends that the approach to injury definitions outlined above might serve as a model for a nationally consistent approach to defining and collecting road trauma statistics. Harmonising injury definitions through the Standing Council on Transport and Infrastructure is worth exploring given the importance of tracking injury outcomes nationally and the emphasis on more consistent injury definitions evident in the NRSS and Austroads projects.

**Recommendation 7:** That Victoria, through the Standing Council on Transport and Infrastructure, raise the harmonisation of injury definitions, using the Victorian approach as a possible national model.

### 4.3 Reporting responsibilities

Various improvements are required to overcome both the issues identified in Chapter Two relating to police reported injury data, and to enable the reporting of the new injury definitions recommended in the preceding sections. These improvements are intended to meet the objective of ensuring that data is accurate and purpose specific, and reported in a timely manner. In the Committee's view, road safety data can only be improved if the current approach to road safety reporting is replaced. That outcome can be achieved if the current reporting line, which currently resides with Victoria Police, is replaced by health entities, specifically the DoH and the VSTORM. This notion was also acknowledged by Victoria Police, with its submission noting that 'at a state level, cooperation exists in a fragmented manner with adhoc reporting'.<sup>443</sup> The submission went on to recommend that this be replaced with a collaborative and innovative multi-agency approach involving the development of a multi-agency committee to undertake a range of tasks aimed at improving both the collection and use of road trauma data, as well as dealing with reporting requirements and associated issues such as privacy.<sup>444</sup> Changing the line of reporting would also address issues raised in Chapter Two such as limited police

<sup>442</sup> Chika Sakashita, Project Manager, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 143.

<sup>443</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 24.

<sup>444</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 24.

resources, the 'pressure to reduce costs', and discontinuities in Traffic Incident System (TIS) data collection methods.<sup>445</sup>

Overall, the evidence presented to the Committee supported the conclusion that the health related datasets containing serious injury data were best placed to provide accurate and timely information about road trauma and trauma trends. The Road Safety Action Group Inner Melbourne (RSAGIM) stated in its submission that 'only medical professionals have the appropriate qualifications and experience to credibly diagnose the level of injury severity from road crashes'.<sup>446</sup> A leading advocate of this approach was the Western Australia (WA) Government's Office of Road Safety, which referred to its own recommendations to the WA Road Safety Council (RSC) for improving road safety data:

*...the Office of Road Safety (ORS) recommended to the RSC that the injury severity information recorded in the Trauma Registries was the most appropriate source of timely information for a reliable measure of the number of people killed and seriously injured as a result of road crashes. The reasoning being that there is a very high degree of confidence in the accuracy and validity of these measures, that all road traffic casualties treated at Trauma Centres would be counted, and that these measures of injury severity are consistent with international practice.*<sup>447</sup>

Another option presented to the Committee was that the TAC claims database be used as repository of road trauma data. Associate Professor Newstead of MUARC advised the Committee that the TAC database was an excellent source of road trauma data:

*Now we have a very fortuitous situation in Victoria that the TAC is the monopoly insurer for road injury in this state, and so every claim that is made for a road injury is put through the TAC. They have a very good database which actually records all their claims information. Within that database you can actually identify those who have made claims for hospital admission very reliably, because the hospitals seek compensation for the hospital admission of the road crash victim from the TAC. They send the hospital admission information to the TAC, and the TAC recompenses the health department for the cost of that admission. So they know very well when someone is admitted to hospital.*<sup>448</sup>

Associate Professor Newstead also quantified the potential of the TAC database to fulfil a road trauma reporting function through drawing on MUARC research:

*We actually compared the TAC's hospital admissions data to the police hospital admissions data and also looked at the total claims number, which is an indication of the number of casualty crashes we should be seeing in this state. The top line on that chart, the green line, is the total number of claims, which should be roughly*

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<sup>445</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, pp. 87, 100.

<sup>446</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 9.

<sup>447</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>448</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 87.

*representative of the number of casualty crashes we are seeing in Victoria. As you can see, that does not have a major discontinuity in it. Immediately you can see there was a problem with the police data system. The other thing you can see in the bottom two lines, which are a comparison of the TAC hospitalisation claims to the official hospital serious injury records and the police data, is that with the introduction of tests they did diverge. So there was a problem with the accuracy of that reporting. Now the agencies have been doing a lot of work with their data quality group to try to cross-validate a serious injury measure between the police system and the TAC claims, and with the involvement of VicRoads as well. You can see that it has actually converged back again.<sup>449</sup>*

Essentially, the MUARC research focused on whether the issues with the current reporting structure could be overcome through linking the TAC, VicRoads and Victoria Police databases (improving data through linkages is explored more fully in the next chapter). The TAC submission also discussed the findings outlined by Associate Professor Newstead, noting in particular ‘the feasibility of establishing a linked road injury dataset including police-reported crash data, TAC claims data, hospital admissions data and in-depth crash investigation data (Australian National Crash In depth Study (ANCIS))’.<sup>450</sup>

The Committee believes, however, that based on its findings in the *Inquiry into Motorcycle Safety* report, the TAC may not have a complete dataset as there are some crashes that may not meet the monetary threshold for compensation or may be incorrectly defined as having occurred ‘off road’ and are therefore excluded from crash statistics. In contrast, the Victorian Emergency Minimum Dataset (VEMD) and the VAED have been shown to have a more complete record of these cases because patients are counted once they enter the hospital system.

In its submission, VicRoads acknowledged the value in using TAC data to validate police collected road trauma admissions but indicated that it preferred to receive admissions data from the DoH and the VSTORM. It recommended:

*Recommendation 5: While Police reported serious injury data when validated by Transport Accident Commission data provides timely information for road safety use, the official measure of injury severity should be based on the ICISS. This data should be provided by Department of Health or the Victorian Injury Surveillance Unit.<sup>451</sup>*

The RSAGIM advocated for an entirely different approach. With slight variation, the RSAGIM submission borrowed this Committee’s recommendation from its previous Inquiry for the creation of an independent office of road safety data. It stated:

<sup>449</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, pp. 87-88.

<sup>450</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 53.

<sup>451</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 52.

*That an independent office of road safety data be created, which will be responsible for collecting, collating, interpreting and publishing all data relevant to road safety, and, for the purpose of this Inquiry, specifically motorcycle safety.*<sup>452</sup>

Support for the establishment of an independent road safety data office was also a focus of the MUARC submission:

*To ensure the road safety data system is seen as an essential resource to support effective road safety policy and practice, establishment of a dedicated road safety data office is recommended. The office needs to have appropriate resourcing and authority to ensure the establishment, development and management of the road safety data system. Careful consideration needs to be given on where this office should sit to best meet its charter. It needs to have close collaborations with each agency contributing vital data to the system and needs to have the power to mandate requirements for data collection within these agencies.*<sup>453</sup>

The Committee continues to support this recommendation and what it sought to accomplish. However, given the more confined nature of this inquiry's terms of reference, the Committee believes that a reordering of the current reporting structure would achieve an efficient reporting system in the short-term, while the creation of a specific office of road safety data should be the long-term aim for the Victorian Government.

#### 4.3.1 New responsibilities for reporting and sharing of road trauma data

The Committee acknowledges that because the most accurate sources of road trauma injury data are health databases, the entities that manage those databases should also be responsible for reporting such data. Moving away from police collecting and distributing data towards health agencies reporting is the most appropriate way to overcome the entrenched issues identified by the Committee. Under the proposed tiered approach to defining injury, the VEMD, VAED and VSTR databases are crucial to the reporting of road trauma data in Victoria. Given that the DoH is responsible for collating the VEMD dataset (covering the category 'attended an emergency room') and the VAED (covering the category of 'admitted to hospital'), it should be responsible for reporting on these two trauma categories. As the VSTR is the repository for major trauma data, the VSTORM should be responsible for reporting such data. In the context of DALYs, given the centrality of the VSTORM in compiling these, it seems appropriate that it also be responsible for reporting this information.

##### 4.3.1.1 Possible limitations under the new reporting system

The Committee is aware of a limitation with placing reporting responsibility within the DoH and VSTORM areas. This limitation, which drew comment from some participants, is

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<sup>452</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 7.

<sup>453</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 27.



the role that changing admission practices can have on the accuracy of data.<sup>454</sup> Another consideration associated with this limitation was that any serious injury definition would need to overcome external pressures which would affect its capacity to accurately capture all serious injury cases. That point was made to the Committee by the DoH submission:

*As far as possible, any indicator of serious injury adopted should not be susceptible to extraneous factors such as changes in service utilisation and delivery or changes in coding practice...It is preferable that any measures chosen should not involve the use of proprietary methods (for example, licensed instruments or software). The use of propriety methods may involve significant costs and may preclude adapting instruments to local contexts with consequences for validity.*<sup>455</sup>

The DoH submission also made the following observation:

*Injury is often 'detected' through a health care setting. However, health care data need to be understood as reflecting the interaction of demand and supply. They necessarily record utilisation or activity levels. Because injury incidence is usually measured only in health care settings observed trends can be influenced by differences over time in health care seeking behaviour, the extent to which primary care givers act as gatekeepers or in hospital admission policies.*<sup>456</sup>

It is therefore possible to envisage a situation where an administrative change to VAED admissions by the DoH could have an impact not dissimilar to that caused by the changes to TIS in 2005. Additionally, such changes could also cause inconsistencies when comparing across jurisdictions.<sup>457</sup>

While the Committee acknowledges this limitation, it believes that it is outweighed by the benefits of reordering the reporting lines in the way discussed in this chapter. In particular, the Committee believes that reporting data through the DoH and VSTORM will provide the highest level of accuracy in the data and allow the Victorian Government to utilise existing data systems and infrastructure in a more efficient and effective way.

**Recommendation 8:** That the Department of Health collect and collate the following quarterly and yearly trauma statistics for those injured in a road crash:

- (a) The number of emergency room presentations; and
- (b) The number of patients admitted to hospital.

<sup>454</sup> Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 119.

<sup>455</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 23.

<sup>456</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 22.

<sup>457</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 4.

**Recommendation 9:** That the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) be responsible for collecting and collating the following quarterly and yearly trauma statistics for those injured in a road crash:

(a) The number of major trauma patients as per the VSTORM definition of a major trauma; and

(b) The number of Disability-Adjusted Life Years and Years of Life Lost.

In order to be made responsible, the Department of Health is to direct the VSTORM to undertake this new reporting role.

#### 4.3.2 Sharing data with other agencies and reporting timelines

Given the importance of road trauma data for policy and evaluation purposes, the Committee believes it is imperative that the aggregate road trauma health data collected by the DoH and VSTORM be provided to road safety agencies and the Victorian Government. This will allow these agencies to properly monitor the performance of the road network, allocate resources for road safety activities, and undertake research and policy development work that improves Victorian road safety outcomes.

In terms of reporting timelines, the Committee believes that road safety policy, research, evaluation and monitoring needs can be met with quarterly and annual reporting of presentations to an emergency room, admission to hospital and major trauma cases. The collection and publication of fatality data should remain unchanged. In the context of DALYs, while these are subject to long-term reporting timelines (possibly extending to several years or more), their specific use within research and policy development is sufficiently narrow and targeted to make a longer reporting timeline acceptable.

**Recommendation 10:** That the quarterly and yearly statistics compiled by the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) and the Department of Health (DoH) are provided to the following entities for the purposes of developing road safety policy, monitoring the burden of road crashes, undertaking research, and for public education purposes:

(a) The Ministers for health, roads, justice and the responsible Minister for the Transport Accident Commission (TAC);

(b) Road safety agencies comprising the TAC, VicRoads and Victoria Police; and

(c) In the case of the VSTORM collected data, the DoH.

The statistics collected by the VSTORM and the DoH should include analyses of gender, age and road user group.

**Recommendation 11:** That the Department of Health publish the total number of road crash patients who attend an emergency room, and those who are admitted, on a quarterly and annual basis.

### 4.3.3 Publishing road trauma statistics

The Committee is of the view that the impact of collecting, analysing and compiling trauma statistics can be enhanced if these statistics are published in a way that advances the community's understanding of road trauma, facilitates informed debate and allows trauma reductions to be monitored in a public way. For these reasons, the Committee recommends that the statistics compiled by the DoH and the VSTORM be published on the VicRoads and TAC websites, and that a brief, yearly overview of trauma statistics trends and analyses be made available, including electronically.

**Recommendation 12:** That the Victorian Government direct VicRoads and the Transport Accident Commission to publish the trauma statistics produced by the Victorian State Trauma Outcomes Registry and Monitoring Group and the Department of Health on their websites and in a yearly publication.

### 4.3.4 Resources to enable better reporting

The Committee agrees with the view that 'injury surveillance is the foundation of injury prevention'.<sup>458</sup> Further, the Committee understands that collecting and reporting data is a resource-consuming activity and it accepts that entities such as the VSTORM require adequate funding to undertake and improve their trauma monitoring activities.<sup>459</sup> Due to the recommended changes to the serious injury definition and the subsequent reporting of injury statistics by VSTORM, the Committee believes it necessary to increase the VSTORM's resources in a way that is commensurate with its new tasks.

**Recommendation 13:** That the Victorian Government amend the work program of the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) to include the monitoring and reporting of road crash trauma as described in Recommendations 3, 4, 5, 9 and 10, and provide any additional resources to VSTORM to complete these tasks.

### 4.3.5 Police reporting of fatalities and non-injury crashes

The Committee also wishes to deal with the other injury categories which would not fall within the DoH and VSTORM areas. It is important that fatalities and non-injury crashes also be reported, and this remains the responsibility of Victoria Police, the organisation most appropriately placed to report this information. As discussed in Chapter Two

<sup>458</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 11.

<sup>459</sup> Royal Australasian College of Surgeons, *Submission*, no. 18, 22 April 2013.

(section 2.4.2.2), the Committee is concerned about Victoria Police's administrative change that was made in July 2011. This change means that police officers are no longer required to create a TIS report in crashes when there are no injuries and owners of damaged property can be notified before the end of the officer's shift, or where there is no possibility of identifying an offender in a hit and run incident.<sup>460</sup> Given the implications outlined by the TAC regarding compensation claims without a supporting police report, and the importance of gathering data on non-injury crashes for monitoring purposes, the Committee believes this decision must be reversed in the interests of road safety. The Committee suggests that there might be more efficient or improved ways to collect that data, potentially by using new technologies such as online or phone applications. These should be investigated by Victoria Police as needed.

**Recommendation 14:** That Victoria Police reintroduce the collection of non-injury crash statistics.

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<sup>460</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Personal communication*, 25 November 2013.

## CHAPTER FIVE AT A GLANCE

### OVERVIEW

Chapter Five addresses Term of Reference (b), with a focus on the potential of data linkage to improve the existing use of data to provide a comprehensive picture of, in this context, road crashes, as well as to inform decision-making and policy development. The chapter outlines the data linkage process, which involves joining two or more records that relate to a common entity, whether that entity is an individual, family, event, business or address. The benefits and challenges of data linkage are canvassed, and in particular the importance and role of privacy and ethical considerations, which are essential for data linking to occur. An assessment of existing data linkages in other jurisdictions, such as New South Wales and Western Australia (WA), as well as international jurisdictions, is also provided.

The chapter concludes by assessing different proposals to link data in Victoria, including through the Transport Accident Commission, the Department of Health's Victorian Data Linkages unit and the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM). In the interim, the Committee recommends the VSTORM undertake a pilot project to determine the potential usefulness of data linkage for road safety policy. A longer term recommendation is to create a system of data linkage such as that employed in NSW and WA.

### KEY FINDINGS

Finding 13: A dedicated third party entity is needed to undertake data linking in Victoria to maximise the potential of road safety data held by various government organisations.

Finding 14: The data linkage models of Western Australia's Data Linking Unit and New South Wales' Centre for Health Record Linkage are examples of best practice in data linking in Australia.

Finding 15: Data linking is necessary for Victoria to realise further reductions in road trauma, and develop more effective and targeted countermeasures in road safety.

Finding 16: Based on the Committee's findings and recommendations in Chapters Two to Four, it is unnecessary for data linkage to be used as a means to validate police collected serious injury data.

Finding 17: Given the role of the Victorian State Trauma Registry and the Victorian Orthopaedic Trauma Outcomes Registry in collecting and collating injury outcomes data, and its considerable experience in linking data, the Victorian State Trauma Outcomes Registry and Monitoring Group presents as the strongest candidate to be the linking body for road safety.

## **RECOMMENDATIONS**

Recommendation 15: That road safety agencies, in cooperation with the Victorian State Trauma Outcomes and Registry Monitoring Group (VSTORM), undertake a pilot data linkage project. Upon the project's completion, the VSTORM should report the project's findings, including any issues with the process, the governance arrangements and any other relevant information, to the Ministerial Council for Road Safety.

Recommendation 16: That road safety agencies ensure that all road safety linkage project applications meet the ethical requirements set out by the Victorian State Trauma Committee, the privacy and patient record legislation that applies in Victoria, and the release of data requirements set by data custodians and the legislation that applies to them.

Recommendation 17: That a working group be established to investigate the implementation of an independent data linking entity, and be comprised of:

- The Transport Accident Commission (TAC), VicRoads and Victoria Police;
- The Department of Health;
- The Victorian State Trauma Outcomes Registry and Monitoring Group and the Victorian State Trauma Committee; and
- The Victorian Health Records and Privacy Commissioners.

The working group should be chaired by an independent expert, and report on issues, options and solutions for the implementation of an independent data linking entity within 18 months of the tabling of this report. The working group should investigate New South Wales' Centre for Health Record Linkage (CHeReL) and other entities, including the Western Australian Enhanced Road Safety Information System, as part of its assessment. The report produced by the working group should be provided to the Ministerial Council for Road Safety, and ministers responsible for health, justice, roads and the TAC.

## CHAPTER FIVE: IMPROVING THE EXCHANGE OF DATA AND INFORMATION THROUGH DATA LINKAGE

Improving the usefulness of road crash data in policy-making has long been an area of interest for the Victorian Government, road safety agencies and researchers. Of particular interest is seeking improvements to both data collection and data sharing, with the aim to better target research, interventions and public money to achieve greater reductions in road trauma. The evidence received by the Committee throughout the Inquiry overwhelmingly supported the use of data linkage as the primary method to improve the quality and completeness of road crash data and to enhance data exchange among government organisations.

In the preceding chapters, the Committee identified a best practice approach to define serious injury, and new reporting arrangements for road safety data. The focus of this chapter is to identify new processes and improve existing processes for the use of data held by road safety agencies, the Department of Health (DoH) and the Victorian State Trauma Registry (VSTR). As a result, a more complete picture of road trauma can be expected, leading to improved policy-development.

This chapter comprises three sections: the first provides a background to road safety data and existing data sharing efforts in Victoria; the second deals with the benefits of and barriers to linking data, including privacy considerations; and the third outlines linking data options as recommended to the Committee by various Inquiry participants.

### 5.1 Purpose of road safety data

A commonly identified theme throughout this Inquiry was that accurate and comprehensive crash data is essential for policy-makers and researchers to understand the scale or incidence of road trauma, and to make informed decisions about how to reduce it.<sup>461</sup> The use of statistical information, based on data, is vital to the development of evidence-based policy and its assessment once implemented.<sup>462</sup> In its *Guide to Road Safety part 8: Treatment of crash locations*, Austroads stated that ‘in effect, the quality of decision making in road safety is dependent on the quality of the data on which these

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<sup>461</sup> A Montella, et al., 'Critical Review of the International Crash Databases and Proposals for Improvement of the Italian National Database', *Procedia-Social and Behavioral Sciences*, vol. 53, 2012, p. 49.

<sup>462</sup> Australian Bureau of Statistics, *A guide for using statistics for Evidence Based Policy*, Canberra, 2010, p. 2.

decisions are based and by which these policies will ultimately be judged'.<sup>463</sup> The World Health Organization (WHO) expressed similar sentiments in its report *Data systems – a road safety manual for decision-makers and practitioners*:

*Reliable, accurate data can also help build political will to prioritise road safety by:*

- *Documenting the nature and magnitude of the road traffic injury problem;*
- *Demonstrating the effectiveness of interventions that prevent crashes and injuries;*
- *Providing information on reduction in socio-economic costs that can be achieved through effective prevention.*<sup>464</sup>

This report compiled by the WHO, in conjunction with the International Automobile Foundation (Fédération Internationale de l'Automobile) and the World Bank, identified the importance of road safety monitoring systems and, in turn, the types of data such systems should collect. The manual detailed a number of minimum requirements for a good crash data system, which included:

- *[The ability to] capture nearly all crashes that result in death and a significant proportion of those that result in serious injuries;*
- *provide adequate detail on the vehicle, the road user and the road/environment to assist with identification of causes and selection of countermeasures;*
- *include accurate crash location information; [and]*
- *provide reliable output in [a] timely manner to facilitate evidence-based decisions.*<sup>465</sup>

The manual also indicated that ideally a comprehensive data system would encompass data collection and analysis mechanisms comprising:

- *final outcomes – including at least deaths and serious injuries to road users, and the characteristics of the crashes that result in them;*
- *exposure measures – e.g. demographic data, number of licensed drivers, traffic volume data, infrastructure factors, to help interpret crash data and measure indicators;*
- *intermediate outcomes – e.g. mean traffic speeds, seat-belt and helmet wearing rates, drink-driving and vehicle and infrastructure safety ratings;*

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<sup>463</sup> Austroads, *Guide to Road Safety Part 8: Treatment of Crash Locations*, Sydney, 2009, p. 29.

<sup>464</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 39; World Health Organization, *Data systems: a road safety manual for decision-makers and practitioners*, World Health Organization, Geneva, 2010, p. 5.

<sup>465</sup> World Health Organization, *Data systems: a road safety manual for decision-makers and practitioners*, World Health Organization, Geneva, 2010, p. 7.



- *socio-economic costs associated with road traffic injuries; [and]*
- *outputs – including various enforcement efforts.*<sup>466</sup>

The report also indicated that in the absence of good data, decision-making can be undermined:

*Many people have opinions about what should be done to make roads safer, often based on personal experience or anecdotal information that may misrepresent the true priority issues. By contrast, reliable and detailed data help practitioners accurately identify problems, risk factors and priority areas, and to formulate strategy, set targets and monitor performance...This cycle of gathering data, taking action and then evaluating is fundamental for any road safety strategy, including the Safe System approach to road safety...Without ongoing, data-led diagnosis and management of the leading road injury problems, there will be no significant, sustainable reductions in exposure to crash risk or the severity of crashes.*<sup>467</sup>

Based on the evidence received by the Committee, there are many categories of crash related data held by different organisations that can be linked. The Committee has identified the following datasets as linkable in Victoria:

- Victoria Police Transport Incident System (TIS) data;
- VicRoads Road Crash Information System (RCIS), licensing and registration data;
- Transport Accident Commission (TAC) compensation data;
- DoH data dealing with presentations to an emergency room and admission to hospital (Victorian Emergency Minimum Dataset (VEMD) and Victorian Admitted Episodes Dataset (VAED)); and
- VSTR and the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) data (including additional data compiled by the Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM) such as Disability-Adjusted Life Years (DALYs)).<sup>468</sup>

Other datasets that could be linked are those held by insurers, local government,<sup>469</sup> and occupational health and safety (OH&S) agencies and enforcement data held by the Department of Justice (DoJ). OH&S data was also identified as information that should be linked to road safety CRASH and health data. Safe Work Australia advised the Committee this would be highly beneficial in order to draw attention to the burden of workplace

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<sup>466</sup> World Health Organization, *Data systems: a road safety manual for decision-makers and practitioners*, World Health Organization, Geneva, 2010, pp. 9-10.

<sup>467</sup> World Health Organization, *Data systems: a road safety manual for decision-makers and practitioners*, World Health Organization, Geneva, 2010, p. 5.

<sup>468</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 317; Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, pp. 51-52. See also Dr David Andreassen, *Submission*, no. 9, 22 March 2013, p. 4.

<sup>469</sup> James Cleaver, Policy Adviser, Transport and Infrastructure Committee, Municipal Association of Victoria, *Transcript of evidence*, 22 July 2013, p. 32.

injuries and deaths caused by road crashes, which is said to comprise of up to a third of all worker fatalities.<sup>470</sup> The Committee notes, however, that the addition of private and public insurers (the TAC and WorkCover Victoria) would require delicate consideration of commercial in confidence, ethical, legislative and privacy considerations, and may, rightly not be possible in certain circumstances.

The Committee is aware that road crash information is used by a wide variety of organisations and individuals for different purposes. A list of these organisations and individuals compiled by Austroads highlights the importance and widespread use of road safety data:

- *Road safety engineers, for developing remedial or pro-active road and traffic measures;*
- *Police, for charging a person with a criminal offence in relation to a specific crash [and for enforcement purposes (i.e. establishing locations for breath testing stations)];*
- *Hospitals and health centres to monitor their health service requirements;*
- *Lawyers acting for clients in civil litigation [such as compensation cases];*
- *Insurers, seeking facts before settling [cases];*
- *Those with responsibility for road safety education and publicity, to ensure that their efforts are well-targeted;*
- *Safety administrators, exercising a duty to report statistical information on road crashes;*
- *Researchers, who need access to an accurate, reliable database in order to conduct rigorous research projects; [and]*
- *Vehicle and component manufacturers and suppliers of highway materials, who wish to assess the safety of their product...[for] marketing, [litigation] or product enhancement [purposes].<sup>471</sup>*

It is often the case that these organisations and individuals compile their own datasets in order to meet their specific administrative and, in some cases, legislative requirements. For example, Victoria Police collects crash information on its TIS for the purposes of administration and prosecution. Because each dataset fulfils different organisational needs, and may comprise specific data, they are likely to be of limited use to policy-makers who are seeking comprehensive data to better understand a road safety problem,

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<sup>470</sup> Dr Fleur de Crespigny, Director, Data Analysis, Policy and Services Branch, Safe Work Australia, *Transcript of evidence*, 6 August 2013, pp. 194-196; Safe Work Australia, *Submission*, no. 14, 18 April 2013, p. 8.

<sup>471</sup> Austroads, *Guide to Road Safety Part 8: Treatment of Crash Locations*, Sydney, 2009, p. 31.

or to develop an intervention.<sup>472</sup> On this basis, there are potential benefits to combining data from different sources about each road crash. A key benefit could be to improve the completeness of the data contained in each dataset, and make it more useful for those developing policy and undertaking research. The importance of doing so was widely recognised by Inquiry participants, and particularly the Victorian road safety agencies.<sup>473</sup>

## 5.2 Linking data

### 5.2.1 What is data linkage?

Data linkage refers to the joining of information from two or more records that relate to a common entity. That entity can be an individual, family, event, business, or address.<sup>474</sup> Once joined, these records are said to be linked.<sup>475</sup> Data linkage uses algorithms<sup>476</sup> to join data from a variety of sources, and then de-identifies it so it can be used for research, policy and planning purposes.<sup>477</sup> Linkage can also be carried out longitudinally, thereby allowing researchers and policy-makers to understand ‘what may be happening to individuals over a period of time in terms of their care and recovery and outcomes’.<sup>478</sup> In many respects, linkage is an epidemiological tool that while originally used by cancer researchers, is increasingly being used in other areas of public health. A recent development in data linkage has been its use in injury prevention research in the road trauma area, including in developing interventions.<sup>479</sup>

<sup>472</sup> Austroads, *Guide to Road Safety Part 8: Treatment of Crash Locations*, Sydney, 2009, p. 31.

<sup>473</sup> Actuaries Institute, *Submission*, no. 16, 19 April 2013, p. 4; ARRB Group Ltd, *Submission*, no. 23, 26 April 2013, p. 3; CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 2; Department of Health, *Submission*, no. 30, 14 May 2013, pp. 14,17-18; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 4; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 147; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 7; SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013; VicRoads, *Submission*, no. 31, 17 May 2013, pp. 11,28; Victoria Police, *Submission*, no. 32, 21 June 2013, p. 19.

<sup>474</sup> S Boufous, et al., *Data linkage of hospital and Police crash datasets in NSW*, NSW Injury Risk Management Research Centre, University of New South Wales, Sydney, 2008, p. 5; A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 8; A Williamson, 'A data-matching study of the role of fatigue in work-related crashes', *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 10, no. 3, 2007, p. 244.

<sup>475</sup> A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 8; A Williamson, 'A data-matching study of the role of fatigue in work-related crashes', *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 10, no. 3, 2007, p. 244.

<sup>476</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 54.

<sup>477</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>478</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 50.

<sup>479</sup> A Williamson, 'A data-matching study of the role of fatigue in work-related crashes', *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 10, no. 3, 2007, p. 242.

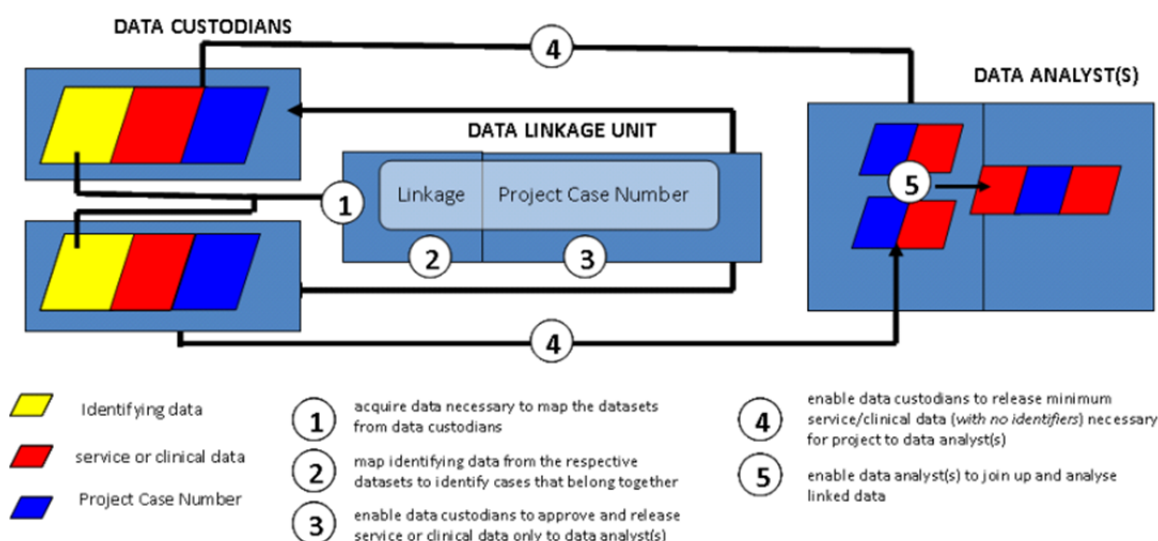
In his presentation to the Committee, Mr Bruce Prosser, Director of Information and Funding Systems at the DoH, noted that data linkage is a ‘collaborative and tightly governed process’ involving:

*...data custodians, data linkers and researchers that manages increased access to the information held by data custodians in a way that ensures that the information that is disclosed to data linkers and researchers, respectively is limited to [the things] that they need to do their jobs.<sup>480</sup>*

According to the DoH, data custodians, data linkers and researchers each have defined roles in the data linking context.<sup>481</sup> A data custodian is a person who is responsible for datasets, including the collection, use and disclosure of data. Data linkers usually work within government, or are associated with it, and create the linkage identifications that allow the data to be linked.<sup>482</sup> Lastly, researchers are the people who use the data for the purposes of analysis and research, subject to approval by data custodians and, in some cases, a Human Research Ethics Committee (HREC).<sup>483</sup>

The DoH submission included the following diagram of the conceptual representation of a data linking process.

**Diagram 3: Data linking process<sup>484</sup>**



An important aspect of data linkage is protecting the privacy of individuals whose personal information may be contained in the datasets being linked. De-identification

<sup>480</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 50; Department of Health, Presentation to Committee: 'Inquiry into Serious Injury', 22 July 2013., slide 6

<sup>481</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 50.

<sup>482</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 50.

<sup>483</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 50.

<sup>484</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 14.

refers to the process by which identifying information is altered to obscure or remove identifiers, such as birth dates, names and addresses, before the data or information is provided to others, such as researchers.<sup>485</sup> While de-identification is considered a useful technique to protect privacy and confidentiality when releasing data or information, it is not infallible.<sup>486</sup> This is particularly relevant in circumstances when the information relates to small cohorts of patients or incidents, such as quadriplegias, which may lead to the identification of individuals.<sup>487</sup> However, these risks can be minimised, for example, by ensuring as many identifying features are removed from the data as possible, requiring the agency receiving the data to sign confidentiality or usage restriction agreements, and controlling how the data is stored and handled.<sup>488</sup>

Another way to protect privacy in the linking process is to have a trusted, independent third party conduct the actual linkages of the datasets. While not all agencies responsible for linking use this process, it is considered best practice. An Australian example of this best practice is the New South Wales (NSW) Centre for Health Record Linkage, referred to as the CHeReL. The CHeReL uses the following process:

1. *Custodians of the data collections to be linked provide the CHeReL with an encrypted source record number and demographic details for each record in their dataset [Clinical data is not provided to the CHeReL];*
2. *The CHeReL links these records using probabilistic matching of the demographic details, and assigns a CHeReL person number for records that belong to the same person...The CHeReL person number never leaves the CHeReL. The CHeReL person ID and the associated source record numbers form the CHeReL Master Linkage Key (MLK). The MLK provides a 'pointer' to records for a person in different datasets;*
3. *When the data custodians and ethics committee approve a project, the CHeReL assigns a project-specific person number (PPN) for each person in the linked dataset...The PPNs assigned are different for each project;*
4. *The data custodian decrypts the source record number, and merges the project person number with the clinical variables that have been approved for use in the project. The source record number is removed and the researcher is provided with the PPN and the clinical information; [and]*

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<sup>485</sup> Menzies Foundation, *Public support for data-based research to improve health*, A discussion paper based on the proceedings of a Menzies Foundation Workshop, East Melbourne, 2013, p. 18; Office of the Australian Information Commissioner, 'Privacy Business Resource 3 - De-identification of data and information - consultation draft April 2013', viewed May 2014, <<http://www.oaic.gov.au/>>.

<sup>486</sup> Office of the Australian Information Commissioner, 'Privacy Business Resource 3 - De-identification of data and information - consultation draft April 2013', viewed May 2014, <<http://www.oaic.gov.au/>>.

<sup>487</sup> Alan Woodroffe, Senior Manager Policy, Service and Review, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 324.

<sup>488</sup> Office of the Australian Information Commissioner, 'Privacy Business Resource 3 - De-identification of data and information - consultation draft April 2013', viewed May 2014, <<http://www.oaic.gov.au/>>.

5. *The researcher is then able to combine the records for the same person from the different datasets using the PPN.*<sup>489</sup>

This process ensures that the identity and therefore the privacy of the person whose data is being linked, is always protected. CHeReL, as the third party agency undertaking the linking, has the necessary information to link the data but does not have any clinical or other information relating to individuals. Similarly, the data custodians can only access their own data, while the researchers, for whom the linking is being undertaken, receive the linked records without any identifying variables, including those that link back to the CHeReL MLK.<sup>490</sup> The CHeReL model is discussed further in section 5.2.3.4.

**Finding 13:** A dedicated third party entity is needed to undertake data linking in Victoria to maximise the potential of road safety data held by various government organisations.

Within data linkage, there are two different techniques used to join data, which are referred to as deterministic and probabilistic linking.<sup>491</sup> The deterministic method involves linking datasets through a unique identifier or key. Individual records in each linked dataset use the same identifier thus allowing data to be linked.<sup>492</sup> Once the identifier is established, any identifying information in individual records, such as date of birth, surname etc, is removed, leaving only the identifier as the link between the different records.<sup>493</sup>

Probabilistic record linkage is said to mimic the steps a human would use to assess whether two records from two different datasets belong to the same person.<sup>494</sup> These steps include allowing for incomplete or erroneous data; evaluating how common a particular name is in a dataset; assessing how likely it is that a particular pair would match at random; and how likely it is that full or partial agreement on values in a data field reflects consistency within the whole record.<sup>495</sup> The probability of records belonging to

<sup>489</sup> Centre for Health Record Linkage (CHeReL), 'How record linkage works', viewed January 2014, <<http://www.cherel.org.au/how-record-linkage-works>>.

<sup>490</sup> Centre for Health Record Linkage (CHeReL), 'How record linkage works', viewed January 2014, <<http://www.cherel.org.au/how-record-linkage-works>>.

<sup>491</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 53; A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 9.

<sup>492</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 53; VicRoads, *Submission*, no. 31, 17 May 2013, p. 36.

<sup>493</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 56.

<sup>494</sup> A Williamson, 'A data-matching study of the role of fatigue in work-related crashes', *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 10, no. 3, 2007, p. 244.

<sup>495</sup> S Boufous, et al., *Data linkage of hospital and Police crash datasets in NSW*, NSW Injury Risk Management Research Centre, University of New South Wales, Sydney, 2008, p. 5; A Williamson, 'A data-matching study of the role of fatigue in work-related crashes', *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 10, no. 3, 2007, p. 245.

the same individual is determined using a weighting.<sup>496</sup> This technique involves using variables to link data, relying on information such as birthdates, surnames, initials, gender, postcode, and the day and location of the crash.<sup>497</sup>

The Committee is aware that the deterministic method is the most accurate method of the two. However, the absence of a unique identifier across different datasets means that probabilistic linking is often used. The Committee identified a number of issues with the probabilistic method, with the first relating to the difficulty in linking datasets when they contain inaccurate data.<sup>498</sup> Secondly, the Committee was advised that accurate results from de-identified data linkage are difficult to achieve in Victoria. This claim was based on Monash University Accident Research Centre (MUARC) research that attempted to link de-identified hospital admission data, TAC claims data and police-reported crash data, which only produced a linkage match rate of 36%.<sup>499</sup> According to MUARC, 'an important finding of the project was that the de-identified linkage of hospital admissions data was not feasible'.<sup>500</sup> It concluded that successful linkage would require identifying information.<sup>501</sup> Similarly, VicRoads noted in its submission issues related to using the probabilistic method to link its data with health data:

*Any data linkage project with the Department of Health and VicRoads would require the probabilistic method and, as such, cases within both datasets could possibly remain unmatched.*<sup>502</sup>

A solution to overcome this limitation was identified in Victoria Police's submission, which proposed the 'introduction of a unique identifier for each person involved in road trauma'.<sup>503</sup> Essentially, this would enable deterministic linking to be used. While such an approach could have some benefits, Victoria Police accepted that:

*An obvious risk in the creation and implementation of this new unique identifier is the community perceptions that this may infringe upon an individual's civil liberties. This*

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<sup>496</sup> International Traffic Safety Data and Analysis Group (IRTAD), *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, OECD/International Transport Forum, Paris, 2011, p. 53.

<sup>497</sup> See for example M J Giles, 'Data for the Study of Road Crashes in Australia', *Australian Economic Review*, vol. 34, no. 2, 2001, p. 224; VicRoads, *Submission*, no. 31, 17 May 2013, p. 36; A Williamson, 'A data-matching study of the role of fatigue in work-related crashes', *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 10, no. 3, 2007, p. 245.

<sup>498</sup> R A Lyons, et al., 'Using multiple datasets to understand trends in serious road traffic casualties', *Accident Analysis & Prevention*, vol. 40, no. 4, 2008, p. 1409; A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 9.

<sup>499</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 41.

<sup>500</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 21.

<sup>501</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 21.

<sup>502</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 37.

<sup>503</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 4.

would be required to be addressed, particularly privacy concerns; i.e. Australia Card.<sup>504</sup>

The second issue relates to the possibility that probabilistic linking can induce false positives and false negatives, thus diluting its overall usefulness.<sup>505</sup> The Committee understands that a false negative occurs when two records that should be linked are not because of missing identifiers in the record(s). In contrast, a false positive occurs when the linking weights (threshold) used in the linking software to determine whether two records should be linked (the higher the weighting, the greater the likelihood that the records belong to the same person) are too low so that linking occurs but the records do not belong to the same person.<sup>506</sup>

Despite these limitations with probabilistic linking, the Committee understands that it is a widely used method, and is a more feasible option than the deterministic method.

### 5.2.2 Why link datasets?

The advantages of data linking are well-recognised in Australia and internationally. Overall, the Committee believes that by bringing different data together, data linking gives policy-makers a more comprehensive understanding of the nature and causal factors underlying crashes.<sup>507</sup> Without this, it will become increasingly more difficult to realise ongoing reductions in road trauma. A 2005 Austroads report, *The prospects for integrated road safety management in Australia: A national overview*, identified that the current information contained in mass crash databases was inadequate for research into injury reductions, and suggested that linkages were needed to make existing data more useable.<sup>508</sup>

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<sup>504</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 19.

**Note:** A prominent and early example of these types of privacy concerns was the Hawke Government's attempt to introduce the Australia Card in 1986. That reform was defeated by 1987, following community concerns about the role of government and privacy protection. The report of the Joint Select Committee on an Australia Card of the Australian Parliament, noted that one 'concern was that the introduction of a multi-purpose identifier changes fundamentally the relationship between the individual and government'. Reference 1.G Greenleaf, 'Lessons from the Australia Card -- deux ex machina?', viewed October 2013, <<http://austlii.edu.au/itlaw/articles/GGOzcard1-Lessons.html>>, p. 6.; 2. Menzies Foundation, *Public support for data-based research to improve health*, A discussion paper based on the proceedings of a Menzies Foundation Workshop, East Melbourne, 2013, p. 17.; 3. (ALRC, *For your information: Australian Privacy law and Practice*, Vol 2, p. 1050 citing the Parliament of Australia—Joint Select Committee on an Australia Card, *Parliament of Australia—Joint Select Committee on an Australia Card*, Report of the Joint Select Committee on an Australia Card (1986), [3.7]).

<sup>505</sup> R A Lyons, et al., 'Using multiple datasets to understand trends in serious road traffic casualties', *Accident Analysis & Prevention*, vol. 40, no. 4, 2008, p. 1409.

<sup>506</sup> Centre for Health Record Linkage (CHeReL), 'Quality Assurance', viewed January 2014, <<http://www.cherel.org.au/quality-assurance>>.

<sup>507</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 2; S Lujic, et al., 'How comparable are road traffic crash cases in hospital admissions data and police records? An examination of data linkage rates', *Australian And New Zealand Journal Of Public Health* vol. 32, no. 1, 2008, p. 28.

<sup>508</sup> P Cairney, *The prospects for integrated road safety management in Australia : A national overview*, Austroads, Sydney, 2005, p. 39; VicRoads, *Submission*, no. 31, 17 May 2013, p. 39.



The most significant benefit of data linkage is that it can assist to overcome the information limitations of individual datasets. While there are a variety of data sources for road crashes, each operates within a specific organisational context. The most commonly cited example by Inquiry participants was the value in linking crash data collected by Victoria Police with the DoH hospital datasets, the VEMD and the VAED.<sup>509</sup> Professor Rebecca Ivers, Director of the Injury Division at the George Institute for Global Health, advised the Committee that doing so:

*...allows you to look at both the context of the crash, so the data you get from the police report — that is, what happened, where the person was travelling, the time of day, the context of the crash and the type of crash; that information is only available in the police report — and then the hospitalisation data, so the severity, the length of stay and whatever injury severity scoring you might want to use. You can combine that data, because it gives you a much richer dataset to work with. If we are looking at preventing crashes, we would like to know all of those things together. What we are having to do at the moment is look at things in isolation. We have the police data saying, 'These are the kind of crashes', but we do not really know what the outcome of those crashes were in terms of severity. Having linked data allows you to pick out the worst crashes or the crashes that generate the most severe injuries and put in place interventions that are targeted at those particular crashes.*<sup>510</sup>

Further, in the research literature, MUARC researchers D'Elia and Newstead noted that adding higher resolution injury outcome data to police data would 'provide researchers with the opportunity to conduct a broad range of research examining the association between injury outcomes and other factors'.<sup>511</sup> They also noted that without data linkage, other factors not captured in hospital data, such as crash circumstances, or vehicle details, which may be derived from police crash reports, would simply not be available.<sup>512</sup> Conversely, as noted by VicRoads and MUARC, information about injury type and severity is similarly not available in police reports.<sup>513</sup> On this basis, the Committee shares the view that linking allows data limitations to be overcome, and essentially enhances the use of data sources<sup>514</sup> and improves data quality by including more variables.<sup>515</sup>

<sup>509</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 21; VicRoads, *Submission*, no. 31, 17 May 2013, p. 36.

<sup>510</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 147.

<sup>511</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 3.

<sup>512</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 3; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 21; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 9.

<sup>513</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 21; VicRoads, *Submission*, no. 31, 17 May 2013, p. 36.

<sup>514</sup> D G Lopez, et al., 'Complementing police road-crash records with trauma registry data—an initial evaluation', *Accident Analysis & Prevention*, vol. 32, no. 6, 2000, p. 771.

<sup>515</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 2.

Research commissioned by the Royal Automobile Club of Victoria (RACV) also highlighted the advantages of drawing together all crash information through data linkage. The report, *The suitability of current crash databases for analysis of motorcycle crashes*, noted that using more than one data source in a surveillance system increased the sensitivity (the ability to correctly identify all true cases of injury within a population), specificity (the measure of how non-cases are misclassified), and the representativeness of the information (including a good sample that is representative of the whole population being surveyed).<sup>516</sup> The report noted that linking road crash databases provides the best available data on many aspects of crashes.<sup>517</sup>

Similarly, the Committee heard from Inquiry participants that data linkage allows researchers to establish a complete picture of the true impact of road crashes, beginning with the incidence of crashes, the injuries suffered by crash victims, and the long-term injury outcomes. The ability to better understand crash trauma was also noted by Mr Prosser at the DoH:

*...information is very powerful in this space, and the ability to link the datasets from across the different agencies in ways that enable us to understand...the full history of an injury event leading to treatment, leading to recovery and leading to outcomes is a critical part of any approach to serious injury amelioration.*<sup>518</sup>

Further, Professor Russell Gruen, Director of the National Trauma Research Institute at Alfred Health, explained how data linkage can improve the care of those injured in road crashes:

*I think from someone who is interested in proving the quality of care provided it is a very exciting possibility, the reason being that we can deal with what we know about the patient and how to improve care through what we do. To be able to link back to the circumstances in which the injury occurred and map the severity of injury and the processes of care that took place and how that happened through mechanism X and so on is very powerful in terms of being able to use the trauma system both to prevent injury as well as to treat it.*<sup>519</sup>

The Committee also received evidence that linking promotes efficiency among relevant agencies, with the DoH stating in its submission that 'linking data from a variety of sources could enable decision makers to obtain analyses that would otherwise be

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<sup>516</sup> K Greig, N Haworth and A Nielson, *The suitability of current crash databases for analysis of motorcycle crashes*, RACV, Melbourne, 2008, p. 28.

<sup>517</sup> K Greig, N Haworth and A Nielson, *The suitability of current crash databases for analysis of motorcycle crashes*, RACV, Melbourne, 2008, p. 28.

<sup>518</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 53.

<sup>519</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, pp. 43-44.

impossible or prohibitively expensive.<sup>520</sup> Mr Prosser from the DoH elaborated on this point in his presentation to the Committee:

*There would obviously be a huge cost involved if every agency tried to collect the range of information you would need to answer the broadest range of potential questions you might want to ask about a particular government function. Every agency historically concentrates on the data it needs to perform its core functions and to deliver the policy objectives of government at the time. What data linkage offers is the ability to combine those core information requirements of different government functions without having to reproduce the detail of another function of government. For example, there is no point in the hospital system trying to acquire data that is related specifically to traffic accidents. Our data captures whether an injury coming into an emergency department is caused by a traffic accident. We do not have the time to inquire about the detail of that accident. That is something that another dataset and another government function really needs to collect. The ability to link those data fields avoids the need for us to collect more information to try to answer more complicated or extensive questions. Data linkage is ultimately an efficient way to do that. It is not easy, though, in the sense that...datasets get established over time, they have their own rationale, their own characteristics of data and their own legislative backing.<sup>521</sup>*

The efficiency benefits of linking were also identified in a 2013 Menzies Foundation discussion paper. The Foundation concluded that ‘electronic data linkage, with safeguards to protect privacy, now makes it possible to answer important health questions which would be impossible if very large numbers of records had to be scanned manually.’<sup>522</sup>

The Committee also notes that data linkage has specific benefits for researchers. According to MUARC, research using linked data has the potential to significantly enhance the evidence base for road and non-road injury prevention policy-making, preventive measures and the evaluation of intervention programs. In a feasibility study about de-identified data linkage in Victoria, MUARC researchers D’Elia and Newstead concluded that that ‘effective linking of datasets would potentially lead to more robust and better qualified results from research that would previously have only analysed datasets individually’.<sup>523</sup> Researchers from the University of Queensland also determined that linking could enhance university research and policy-making through improving data quality by including more cases or variables, and increasing accuracy through detection and the correction of data record errors. Data linking was also shown to improve researchers’ capacity to address research questions by reducing the time spent gathering ad hoc data, which can be time-consuming and expensive. They also reported that linking

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<sup>520</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 14.

<sup>521</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, pp. 53-54.

<sup>522</sup> Menzies Foundation, *Public support for data-based research to improve health*, A discussion paper based on the proceedings of a Menzies Foundation Workshop, East Melbourne, 2013, p. 8.

<sup>523</sup> A D’Elia and S V Newstead, *De-identified Linkage of Victorian Injury Data Records: A Feasibility Study*, Monash University Accident Research Centre, Clayton, 2010, p. xi.

greatly increases the value of datasets by allowing data to be used for a wider range of purposes.<sup>524</sup>

### 5.2.3 Data linkage in practice

Data linkage, including in the road safety area, is reasonably well-established. Internationally, road safety focused data linkage is carried out in the United States of America (USA) and in Sweden,<sup>525</sup> while Australian jurisdictions have also embraced data linkage, particularly in Western Australia (WA).

The usefulness of systems such as the USA's Crash Outcome Data Evaluation System (CODES) and the Swedish Traffic Accident Data Acquisition (STRADA) system have been noted as models for best practice linkage. The European Transport Safety Council (ETSC) in its report, *Social and economic consequences of road traffic injury in Europe*, recommended that:

*Countries should encourage electronic linkages between sources of injury data, like STRADA in Sweden or the CODES system of the United States.*<sup>526</sup>

These linking systems, as well as those used in WA and NSW are outlined below. The section ends with an overview of current linking practices in Victoria.

#### 5.2.3.1 The Crash Outcome Data Evaluation System

In the USA, the CODES uses probabilistic data linkage to assess 'the occurrence, costs and outcomes of transportation-related injuries and to evaluate the cost-effectiveness of various preventative measures.'<sup>527</sup> The CODES was established in response to a 1991 congressional mandate to examine and report on the medical and financial outcome benefits regarding safety belts and motorcycle helmets.<sup>528</sup> Since 2005, the National Highway Traffic Safety Administration has funded almost two-thirds of USA state road agencies to develop linkage capabilities.<sup>529</sup>

The CODES uses a number of variables to link data, including personal and demographic information (i.e. age, postcode and vehicle registration among others).<sup>530</sup> The CODES data

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<sup>524</sup> A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 9.

<sup>525</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 37.

<sup>526</sup> R Elvik, et al., *Social and Economic Consequences of Road Traffic Injury in Europe*, European Transport Safety Council (ETSC), Brussels, 2007, p. 6.

<sup>527</sup> S Boufous and C Finch, *Record Linkage: a tool for injury prevention research*, NSW Injury Risk Management Research Centre, Sydney, 2006, p. 267.

<sup>528</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 40. Citing National Highway Traffic Safety Administration, 'Data Linkage Codes: The Crash Outcome Data Evaluation System Brochure', viewed November 2013, <<http://www-nrd.nhtsa.dot.gov/Pubs/808544.pdf>>.

<sup>529</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 40.

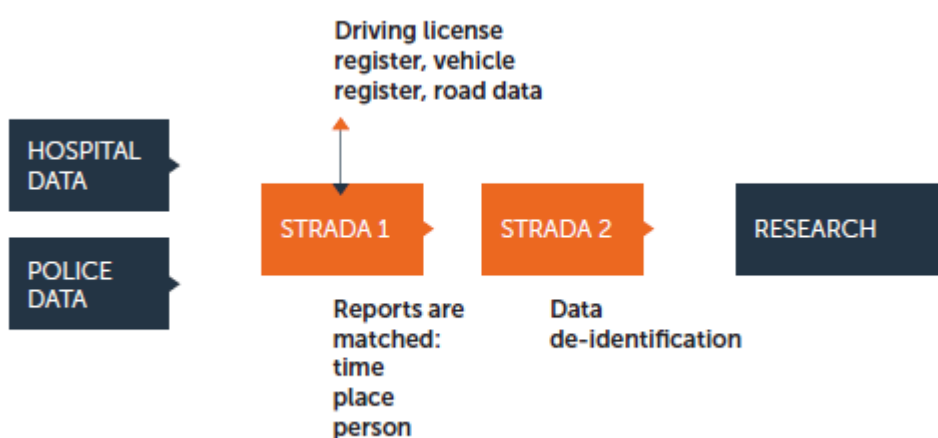
<sup>530</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 41.

is widely used in USA road safety, including for the identification of priority projects, supporting decision-making and monitoring the effectiveness of different countermeasures, including emergency medical services.<sup>531</sup> The data sources used in the CODES include medical records (such as triage, admission and rehabilitation information), insurance claims, and other crash information.<sup>532</sup>

### 5.2.3.2 The Swedish Traffic Accident Data Acquisition

The STRADA is Sweden's linking system for road safety data. Established in 1996, it is government-owned and run by the Swedish Transport Agency (the Trafikverket). It links hospital and police information related to road trauma, adds its own licensing and registration information and makes these data files available to researchers in a de-identified format.<sup>533</sup> The data produced by the STRADA is important and highly valuable, with official statistics on road traffic injuries being drawn from it.<sup>534</sup> Researchers also use the linked data to determine the effectiveness of different countermeasures. A disadvantage with the STRADA system is that not all Swedish hospitals provide their data to STRADA (19 out of 21 counties require their hospitals to provide data), while police reporting has been mandatory since 2003.<sup>535</sup> The process by which data is reported, linked and then provided to researchers is reflected in the diagram below.

**Diagram 4: The Swedish Traffic Accident Data Acquisition Data Linkage Process**<sup>536</sup>



According to VicRoads, there are several advantages with the STRADA. As it comprises more detailed information, there is greater knowledge of road traffic injuries and crashes.

<sup>531</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 41.

<sup>532</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 41.

<sup>533</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 318; VicRoads, *Submission*, no. 31, 17 May 2013, p. 39.

<sup>534</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 39.

<sup>535</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 324; VicRoads, *Submission*, no. 31, 17 May 2013, p. 39.

<sup>536</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 40.

The inclusion of hospital data also decreases the number of unrecorded cases, predominantly those involving unprotected road users: pedestrians, bicyclists and moped drivers. A further advantage is that the inclusion of hospital data allows those who receive the STRADA linked data to better assess the severity and types of injuries caused by road crashes.<sup>537</sup>

### 5.2.3.3 Western Australia's Data Linking Unit

WA is considered to be at the forefront of linking efforts in Australia due to its history of data linking for road safety purposes.<sup>538</sup> Its linking capacities are also identified as best practice.<sup>539</sup> Linking efforts in WA began as early as 1987,<sup>540</sup> although the current WA Data Linking Unit (WA DLU) was established in 1995<sup>541</sup> and is part of the Data Linking Branch (DLB) located in the WA Department of Health (WA DoH). It is responsible for linking health data. The data sources that the WA DLU can link are substantial, and appear to be the most comprehensive of any jurisdiction in Australia. These include licensing information, discharge from hospital summary reports, police records, and insurance information from the Insurance Commission of Western Australia.<sup>542</sup> In her presentation to the Committee, Adjunct Professor Diana Rosman, Program Manager of DLB at the WA DoH, outlined how the DLU's linking system operates:

*So the system has the capacity and the model we use has the ability to provide information that is specifically tailored to the research question. So it is not a linked database at all; it is a database of links. The piece we manage is the index, if you like, to all the information that remains with the data source...It is not a repository, which is another word that is used, or an integrated database or a linked resource. It is not those things. It is not just for road safety, it is for many things...<sup>543</sup>*

The output of the WA DLU has been prolific, with it supplying information to more than 800 research projects since 1995.<sup>544</sup> The WA DLU's linking process is underpinned by a 'separation principle' that involves separating personal or demographic information from the content data prior to linkage. In addition, the people who see the data and the linking

<sup>537</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 40.

<sup>538</sup> Claire Thompson, Acting Principal Policy Officer, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 260.

<sup>539</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 55.

<sup>540</sup> D L Rosman, 'The Western Australian Road Injury Database (1987–1996): ten years of linked police, hospital and death records of road crashes and injuries', *Accident Analysis & Prevention*, vol. 33, no. 1, 2001, p. 81.

<sup>541</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 238. See Department of Health, 'Data Linkage Branch: Public Health Division: Access Policy', viewed February 2014, <<http://www.datalinkage-wa.org.au/sites/default/files/DLB%20Access%20Policy%20Dec2010%28%29.pdf>>, p. 4.

<sup>542</sup> Claire Thompson, Acting Principal Policy Officer, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 260; Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 238.

<sup>543</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 239.

<sup>544</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 239.

variables are in the team that undertakes the linkage, which is separated from the team that analyses the variables only.<sup>545</sup> This ensures that privacy and ethical considerations are met. Data custodians control the data and approve each research extract of linked data as required.<sup>546</sup> The linkage itself is carried out by specialist coders using a linkage engine which is software that links different data by looking for the similarities within different data.<sup>547</sup> The unit itself is comprised of around 23 people including technical and coding specialists.<sup>548</sup> Appendix C sets out the WA DLU access requirements for linked data, including the ethics and data handling considerations that need to be met.

In the area of road safety, a core work task of the WA DLU is linking ‘road crash reports to hospital morbidity and mortality data using personal identifiers’.<sup>549</sup> Adjunct Professor Rosman informed the Committee about an ongoing road safety data linkage project:

*One of the projects that we have been undertaking since 2007 is funded by the Road Trauma Trust Account in Western Australia to use and join linked data about road crashes primarily to provide information back to the Road Safety Council and researchers on outcome measures other than fatalities, so serious injury and different ways of measuring that. Again we have been doing that formally in the Department of Health since 2007, but it is an area that I have worked on in the past at the University of Western Australia.*<sup>550</sup>

Other Inquiry participants noted the importance and quality of work undertaken by the WA DLU. According to Mr Peter Carver, Project Director of Health Strategy at the DoH:

*Western Australia data linkage is considered best practice in Australia. They have been doing it for longer than Victoria. We have been over to look at them and work through with them as to how they do their work, and we are adopting elements of their model and their intent to hold things in an integrated database for certain key areas of public policy...I would be a strong supporter of adopting their model and following the things that they do.*<sup>551</sup>

Mr Peter Schofield, Manager of Road Safety Strategy and Partnerships at VicRoads also commented on the benefits of the WA DLU but noted that it is not without its limitations:

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<sup>545</sup> Department of Health, 'Data Linkage Branch: Public Health Division: Access Policy', viewed February 2014, <<http://www.datalinkage-wa.org.au/sites/default/files/DLB%20Access%20Policy%20Dec2010%282%29.pdf>>, p. 4

<sup>546</sup> Department of Health, 'Data Linkage Branch: Public Health Division: Access Policy', viewed February 2014, <<http://www.datalinkage-wa.org.au/sites/default/files/DLB%20Access%20Policy%20Dec2010%282%29.pdf>>, p. 4

<sup>547</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 239.

<sup>548</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 239.

<sup>549</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 36.

<sup>550</sup> Adjunct Professor Diana Rosman, Program Manager, Data Linkage Branch, Department of Health Western Australia, *Transcript of evidence*, 10 September 2013, p. 238.

<sup>551</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 55.

*I think one of the observations that we have had from the WA system is that whilst in principle it was great, while they had got the linkage and while resolving the legal issues surrounding privacy and health records is important and there are important lessons for anybody to study, that system in a way has probably not developed as far as they would have liked because of the resourcing issue. Whilst it is a great model and they have overcome some severe obstacles which would be useful lessons for anybody to pick up, I am not sure it is delivering what they expected it to at this particular point in time.*<sup>552</sup>

Nevertheless, the WA approach remains a prominent and longstanding example of data linkage, particularly in the road safety area.

#### **5.2.3.4 NSW – Centre for Health Record Linkage**

Data linkage of road trauma records in NSW is undertaken by the CHeReL, which was established in 2006 to 'provide high quality record linkage services for research to benefit the people of NSW and the ACT'.<sup>553</sup> It is managed by the NSW Ministry of Health. The aims and objectives of the CHeReL are to:

- *facilitate research that may contribute to the promotion, protection and maintenance of the health of the public;*
- *facilitate the planning, evaluation and delivery of health services;*
- *support activities related to the above aims across the full spectrum of health;*
- *contribute to knowledge regarding research methods relating to health data collection, linkage of health-related data and compilation and use of health related statistics generally; and*
- *allow the outcomes of activities related to the above aims to be available for the benefit of the public and to contribute to knowledge on an open and equitable basis.*<sup>554</sup>

CHeReL uses probabilistic linkage techniques, and incorporates NSW Police data, NSW CrashLink data, Australian Bureau of Statistics (ABS) mortality information, and hospital presentation and admissions data.<sup>555</sup> The CHeReL established a MLK, based on a number of datasets containing more than 26 million records.<sup>556</sup> It has produced in excess of 140

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<sup>552</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 274.

<sup>553</sup> Centre for Health Record Linkage (CHeReL), *The First Three Years: 2006–07 to 2008–09*, Cancer Institute NSW, Eveleigh, 2009, p. 1.

<sup>554</sup> Centre for Health Record Linkage (CHeReL), 'Mission Statement', viewed January 2014, <<http://www.cherel.org.au/mission-statement>>.

<sup>555</sup> Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 120.

<sup>556</sup> Centre for Health Record Linkage (CHeReL), *The First Three Years: 2006–07 to 2008–09*, Cancer Institute NSW, Eveleigh, 2009, p. 3.



record linkage projects.<sup>557</sup> As with other data linkage entities, the CHeReL has established protocols for privacy and ethics and has consulted with the Office of the NSW Privacy Commissioner and the Office of the Privacy Commissioner (Commonwealth).<sup>558</sup>

Organisations can become members of the CHeReL, and pay an annual fee which allows them to access discounted linkage services subject to meeting the requirements for accessing such data, and to participate in the Data Linkage Advisory Committee.<sup>559</sup> This Committee is part of the CHeReL's governance structure and provides advice to the NSW Ministry of Health on the CHeReL's strategic plan, the development of record linkage infrastructure and services, and the use of linked data to enhance policy relevant research and inform policy and practice.<sup>560</sup>

The CHeReL offers four types of linkages: linking between and within records held in the MLK; linking other datasets with the MLK; linking datasets that are not included in the MLK (for example linking educational outcomes to child protection data); and de-duplicating datasets where there are multiple records for the one person within the one dataset.<sup>561</sup>

As mentioned earlier, the process used by the CHeReL is considered best practice because it ensures privacy is protected while enabling researchers to use linked records data.

**Finding 14:** The data linkage models of Western Australia's Data Linking Unit and New South Wales' Centre for Health Record Linkage are examples of best practice in data linking in Australia.

### 5.2.3.5 Linkage practices in Victoria

In Victoria, the Victorian State Trauma Outcome Registry and Monitoring Group and the DoH Victorian Data Linkages (VDL) have experience with data linking, predominantly in the area of health.

#### *Victorian State Trauma Outcomes Registry and Monitoring Group*

The VSTORM provides a linkage service whereby patient level data held in the VSTR and the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR) can be linked to de-

<sup>557</sup> Centre for Health Record Linkage (CHeReL), 'Completed Linkage Projects 2007-2010', viewed January 2014, <[http://www.cherel.org.au/media/18445/completed\\_projects\\_2007-2010.pdf](http://www.cherel.org.au/media/18445/completed_projects_2007-2010.pdf)>; Centre for Health Record Linkage (CHeReL), 'Completed Projects', viewed January 2014, <<http://www.cherel.org.au/completed-projects>>.

<sup>558</sup> Centre for Health Record Linkage (CHeReL), *The First Three Years: 2006-07 to 2008-09*, Cancer Institute NSW, Eveleigh, 2009, p. 4.

<sup>559</sup> Centre for Health Record Linkage (CHeReL), 'Funding', viewed January 2014, <<http://www.cherel.org.au/funding>>.

<sup>560</sup> Centre for Health Record Linkage (CHeReL), 'Structure and Governance', viewed January 2014, <<http://www.cherel.org.au/structure-and-governance>>.

<sup>561</sup> Centre for Health Record Linkage (CHeReL), 'Our Services', viewed January 2014, <<http://www.cherel.org.au/our-services>>.

identified records and variables upon the request of data custodians. The data linkage is not undertaken by the VSTORM, but by the Clinical Informatics and Data Management Unit (CIDMU), a specialised unit at Monash University. The probabilistic method is used for linkage (patient name and address, date of birth, injury data, admission, hospital Unit Record (UR) number, ambulance record number and TAC claim number). Upon CIDMU completing the linkage, the VSTORM provides the requesting data custodian with aggregate data, in the form of tables and graphs.<sup>562</sup> In order to meet its own ethics and broader legislative requirements, the VSTORM does not provide data where there is the potential to identify individuals, such as when there are very few cases involving a particular injury. Further, Professor Belinda Gabbe, Head of the VSTR, advised the Committee that the VSTORM cannot release patient level data as part of any linkage.

Professor Gabbe also advised that the VSTORM has a number of established linkages, including with the Victorian Ambulance Clinical Information System (VACIS), TAC claims data and the Victorian Registry of Deaths, among others.

*One of the questions we were asked to discuss here is the capacity of the state trauma registry to link with other datasets, and the Victorian State Trauma Registry collects a number of items that could be used to link — and we do use them to do some of the linkages we already have in place, so we actually collect identifiable data...We get the ambulance record number from the case number, and we also collect the TAC claims number for the major trauma service cases as well, so we have quite a collection, or a selection, of data items that could actually be used to link with other datasets.<sup>563</sup>*

*With respect to the other things that we can do, we can also look at cost data for serious road injury, because we have a linkage with the TAC claims data. Every six months or so we get all the TAC claims data from the TAC via the compensation research database, which is held by the Institute for Safety, Compensation and Recovery Research...so we can look at what the costs of these patients have been in dollar terms, but we can also do it through disability-adjusted life years as well.<sup>564</sup>*

In addition, the VSTORM is currently discussing new linkages with the VAED, VEMD and rehabilitation databases.<sup>565</sup> The Committee understands that at present the VSTORM is not linking road safety data with its own clinical data. While it has investigated the potential to do so, specifically with Victoria Police and VicRoads, these investigations remain preliminary in nature.

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<sup>562</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group, *Personal communication*, 13 February 2013.

<sup>563</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 207.

<sup>564</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 207.

<sup>565</sup> Victorian State Trauma Outcome Registry and Monitoring Group (VSTORM), Presentation to Committee: 'Victorian State Trauma Outcome Registry and Monitoring Group (VSTORM)', 10 September 2013.

*Victorian Data Linkages Unit*

The DoH explained in its submission that its VDL comprises sophisticated data linkage methods and strategies, which allows it to conduct specific data linkage projects for external researchers, linking key hospital datasets with other health and non-health data to ‘assist with and improve evidence based policy and clinical practice development’.<sup>566</sup> According to the DoH, the VDL uses ‘privacy preserving methods to link together records pertaining to the same individual across different datasets for uses including: progressive reporting; program and clinical evaluation; service planning; and policy development’.<sup>567</sup> The VDL is said to: ‘undertake project specific data linkages of the key hospital datasets to other health and non-health data sets to external researchers to assist with and improve evidence based policy and clinical practice development’.<sup>568</sup> The VDL has provided data linkage services to over 50 research programs at state and national levels.<sup>569</sup>

In terms of the process for applying to access the data, the VDL uses a data linkage protocol that involves:

- Separating identifying information (linkage variables) from content information (research or analysis variables);
- Releasing linkable data required to answer defined research questions to researchers (broadly defined to include data analysts in government departments) by data custodians; and
- Acceptance by researchers to adhere to various privacy and security requirements.<sup>570</sup>

The Committee notes, however, that unlike the NSW CHeReL model, the VDL is an example of a data custodian, in this case the DoH which compiles the VEMD and VAED datasets, also undertaking the linkage of that data. This structure, particularly when linking data owned by other custodians, poses substantial risks to privacy, because the data and data linkage keys are held in the one organisation.

Various Inquiry participants advised the Committee of efforts to link road trauma and health data through the VDL. Mr Carver at the DoH advised the Committee that the Department had:

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<sup>566</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 15.

<sup>567</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 15.

<sup>568</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 15.

<sup>569</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 15.

<sup>570</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

*...in-principle agreement from TAC, WorkSafe and the custodians of the Victorian State Trauma Registry — to... acquire their data into the data linkage unit to start to do some trial linkages to answer some specific questions.*<sup>571</sup>

The VicRoads submission also noted these efforts:

*VicRoads and the Department of Health have held preliminary discussions on a data linkage project to better understand the relationship between crash type, injury severity and the region of the body affected. This will allow more effective countermeasures to be developed that address severe serious injuries.*<sup>572</sup>

### *Road safety linking projects*

The Committee is also aware of efforts by road safety agencies and researchers to conduct data linkage projects. At the public hearings, Associate Professor Newstead, Associate Director of Injury Analysis and Data at MUARC, advised the Committee that MUARC had linked TAC, VicRoads and Victoria Police data to successfully undertake research into the efficacy of airbags.<sup>573</sup> According to MUARC, the linked data used in the airbag research highlighted the potential of such linkage to improve road safety research.<sup>574</sup> However, MUARC also cautioned in its submission that the project identified the need to find solutions to redress inaccuracies in the police collected data to ensure that accurate data was available for linking.<sup>575</sup> An additional finding was that there might also be limitations in the types of police data that could be linked, due to police restrictions on the collection of certain types of data.<sup>576</sup>

MUARC also identified a linked system covering the TAC, Victoria Police and VicRoads datasets, referred to as the linked TAC-RCIS-TIS system, as a potential model for Victorian road safety.<sup>577</sup> The project investigated the feasibility of linking these datasets held by road safety agencies. A key finding was that a combined dataset would be 'more capable of measuring detailed injury outcome consistently over time'.<sup>578</sup> However, there were limitations, with MUARC being unable to enjoin health data because of difficulties with hospital admissions coding which made probabilistic matching of the data held in the TAC-RCIS-TIS datasets difficult.<sup>579</sup> Despite this, MUARC researchers did not view this as an

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<sup>571</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 52.

<sup>572</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 37.

<sup>573</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 92.

<sup>574</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 92.

<sup>575</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 27.

<sup>576</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 12.

<sup>577</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 27.

<sup>578</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 21.

<sup>579</sup> A D'Elia and S V Newstead, *De-identified Linkage of Victorian Injury Data Records: A Feasibility Study*, Monash University Accident Research Centre, Clayton, 2010, p. xii; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 91.

overwhelming disadvantage. This is because the TAC compensation dataset already contains health records,<sup>580</sup> although MUARC noted that health data was necessary as some crashes might not be captured by the TAC dataset if they are not compensable.<sup>581</sup> The MUARC submission concluded that a linked TAC-RCIS-TIS data system would be beneficial but only as ‘the first step in an integrated road safety data system including more specific measures of serious injury that can enhance the ability of Victoria to develop future road safety policy based on leading edge data and research’.<sup>582</sup> As discussed in Chapter Four, MUARC proposed that an office of road safety data would be best placed to achieve efficient and effective use of road safety data.

#### 5.2.4 Barriers to data linkage

There are a number of potential barriers to linking, with arguably the most significant pertaining to privacy. This issue is dealt with separately in the following section. A related issue is that accessing linked data requires researchers and government agencies to meet certain requirements, such as obtaining approval from multiple data custodians and human research ethics committees. Researchers Watson, McKenzie and Watson suggested that these requirements might be counterproductive because interested parties could be dissuaded from undertaking frequent linkage requests.<sup>583</sup> They also claimed that legislation, policy and guidelines can be open to interpretation, which can complicate the process of negotiating access to data between different agencies.<sup>584</sup>

The Committee received similar evidence from Inquiry participants. Mr Carver at the DoH explained to the Committee that gaining agreement and cooperation between agencies to link their respective databases can act as a barrier, as can legislation that governs how data is to be used.<sup>585</sup> Further, Mr Michael Nieuwesteeg, the Research Manager of Road Safety and Marketing at the TAC, indicated that data, business and collection rules, and differences among organisations that collect data can also affect how data is linked.<sup>586</sup> These differences may also affect linkage rates, an issue identified in the MUARC research that linked the State Traffic Accident Record (STAR) and TAC datasets. It was found that

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<sup>580</sup> A D'Elia and S V Newstead, *De-identified Linkage of Victorian Injury Data Records: A Feasibility Study*, Monash University Accident Research Centre, Clayton, 2010, p. xii; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 21-22; Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 92.

<sup>581</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 22.

<sup>582</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 23.

<sup>583</sup> A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 9.

<sup>584</sup> A Watson, K McKenzie and B C Watson, 'Priorities for developing and evaluating data quality characteristics of road crash data in Australia', Paper presented at the *Proceedings of Australasian Road Safety Research, Policing and Education Conference 2011*, Perth, 2011, p. 7.

<sup>585</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 53.

<sup>586</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 324.

the overall matching of cases never exceeded 76% and was as low as 68% during the target years 2000-2004.<sup>587</sup> Research in NSW also found linkage rates to be imperfect, with a linkage project dealing with road crashes from 2000-2001 producing a linkage rate of 69%.<sup>588</sup> This indicates that linking in and of itself does not mean that all road crash data can be automatically and seamlessly linked to other data sources.

The RACV research report, *The suitability of current crash databases for analysis of motorcycle crashes*, identified the following five major limitations to linking:

- Inadequate or incomparable identifying items to discriminate between the person on a data record (that is, verification is only possible where multiple datasets have complimentary information), because the information is only found in one data source;
- Human errors when recording information which make linking difficult;
- A lack of detail or imprecision in the data collected, because data may be collected for administrative purposes which are not useful for other purposes such as research or policy development;
- Incomplete data held by either hospitals or police; and
- Inconsistencies between different systems and coding approaches.<sup>589</sup>

The Committee notes that even within organisations, there may be issues of interoperability, a point raised in Victoria Police's submission in relation to the limited interoperability of its databases.<sup>590</sup>

Despite these barriers, the Committee does not believe the usefulness of data linkage is diminished as a whole. Instead, the recommendations made in Chapter Four are expected to address the issues of data accuracy and completeness outlined above.

There are also other procedural considerations that can affect linking. The DoH submission provided the following overview of these considerations:

*Bringing together the content data held within disparate datasets through data linkage is not straightforward. To establish whether datasets can, in fact, be linked is a technical and time-consuming undertaking. First, the development of data*

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<sup>587</sup> A D'Elia and S V Newstead, *De-identified Linkage of Victorian Injury Data Records: A Feasibility Study*, Monash University Accident Research Centre, Clayton, 2010, p. 14.

<sup>588</sup> S Lujic, et al., 'How comparable are road traffic crash cases in hospital admissions data and police records? An examination of data linkage rates', *Australian And New Zealand Journal Of Public Health* vol. 32, no. 1, 2008, pp. 31-32.

<sup>589</sup> K Greig, N Haworth and A Nielson, *The suitability of current crash databases for analysis of motorcycle crashes*, RACV, Melbourne, 2008, p. 29.

<sup>590</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 18.

*dictionaries is critical. However, even where they are published, agencies may often lack a common understanding of what exactly the content variables included in individual datasets measure. Any particular agency is necessarily more familiar with its own data collections than with those of other agencies. While agency administrative data can be a valuable source of injury-related data, they are not necessarily designed to provide this information, and agencies may not have systems in place to ensure the reliability and validity of the data. Secondly, there may be legislative and other restrictions associated with the disclosure of data that an agency is authorised to collect and these may differ across the datasets it holds. Establishing a business case for data linkages, even pilot ones, can be a resource intensive exercise. Thirdly, there is a question of whether there is a sufficient number of high quality identifying variables common between any two datasets to allow a high quality linkage to be undertaken. Often, the proof of whether or not this is the case can be demonstrated only through pilot linkages.*<sup>591</sup>

Added to these barriers is that data linkage, while more efficient in terms of resources utilised to produce a more complete picture, may also incur additional costs. The Committee was advised by Professor James Harrison, Director of the Research Centre for Injury Studies, and Program Manager of the National Surveillance Unit at Flinders University and Mr Carver at the DoH that linkage has a cost component, which may limit the capacity of agencies to undertake comprehensive linking if they have limited resources.<sup>592</sup> The Committee also received evidence about linking being a time-consuming task. For example, Mr David Shelton, Executive Director of Strategy Planning and the Road Safety Coordinator at VicRoads recognised that continuous linking in a timely manner akin to the daily road toll updates would not be possible when dealing with the in-depth data produced through linking.<sup>593</sup>

### 5.3 Privacy and ethics

Throughout the Inquiry the Committee became aware of the privacy considerations relevant to data linkage, with privacy considered a critical factor among Inquiry participants.<sup>594</sup> The key privacy issue in linking data is the possibility of a person being identified, which the Committee notes is a concern also felt in the broader community.

<sup>591</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 17.

<sup>592</sup> Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 370; Professor James Harrison, Research Centre for Injury Studies Director, Program Manager, National Injury Surveillance Unit, Flinders University, Presentation to Committee: 'Serious Road Injury: define, measure, report', 28 October 2013, p. 370; Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 56.

<sup>593</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 273.

<sup>594</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 55; Professor James Harrison, Director, Research Centre for Injury Studies, Program Manager, National Injury Surveillance Unit, Flinders University, *Transcript of evidence*, 28 October 2013, p. 370; Professor James Harrison, Research Centre for Injury Studies Director, Program Manager, National Injury Surveillance Unit, Flinders University, Presentation to Committee: 'Serious Road Injury: define, measure, report', 28 October 2013.

The recent discussion paper by the Menzies Foundation highlighted the importance of privacy in a general context:

*Communities and individuals value privacy and strike a balance between personal needs and goals, and what others need or want to know about them. Privacy underpins human dignity and gives people a measure of control in everyday interactions, and over the use of their personal information in the wider world.*<sup>595</sup>

Public expectations around privacy were also noted by Mr Prosser at the DoH in his presentation to the Committee, indicating that this was one of the key reasons behind the Department's slow progress around linking:

*There has always been a background privacy concern around large datasets and how they are protected and managed. I think we are probably moving to a position where there is more confidence in our ability to link datasets and preserve privacy. We have not moved too far ahead of public concern about how government departments manage big datasets and transfer and share information between them. Part of the reason we are making slow but steady progress is that we want to make sure we do not get too far ahead of what the public expects us to do in terms of protecting the privacy of the records we hold.*<sup>596</sup>

It was clear in the evidence presented to the Committee that both the DoH and the VSTORM consider privacy of paramount importance and employ various methods to minimise privacy breaches in their linking efforts. The extent to which the VSTR protects patient data was explained by Professor Gabbe:

*Privacy is obviously highly important. We collect patient-level data. We have very strict protocols in place for the follow-up of patients. Patients can opt to stay on the registry but decline the telephone interviews, and that happens; that is part of what we do. The database is kept in a red zone; it is ISO accredited. We keep the state trauma registry with the equivalent privacy and security that you have for your banking details. Occasionally we get a patient whose data has been received and they want to know why and they have not been happy about it. We have only had one complaint in more than 10 years from a patient, and the review was by the ethics committee. We put in some additional steps and that has all been fine.*<sup>597</sup>

### 5.3.1 Legislative and ethical requirements

Aside from community expectations, the protection of individual privacy is guided by legislation, including the *Information Privacy Act 2000* (IPA) and the *Health Records Act 2001* (HRA). It is these two Acts that predominantly govern the collection, use, access and release of health and other data that are likely to be linked for road safety purposes in

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<sup>595</sup> Menzies Foundation, *Public support for data-based research to improve health*, A discussion paper based on the proceedings of a Menzies Foundation Workshop, East Melbourne, 2013, p. 16.

<sup>596</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 55.

<sup>597</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 210.



Victoria. The Committee notes that other laws relevant to Victoria Police, VicRoads and the TAC may also affect the way these agencies share data for linking purposes.<sup>598</sup>

### 5.3.1.1 Information Privacy Act 2000

According to Mr David Watts, the Acting Privacy Commissioner, the Victorian IPA is a 'default regime that governs the collection, use, disclosure and handling of personal information in Victoria in the public sector'.<sup>599</sup> The handling of personal information is guided by the IPA's accompanying Information Privacy Principles (IPPs). For the purposes of the Act, 'personal information' is defined as:

*Information or an opinion (including information or an opinion forming part of a database), that is recorded in any form and whether true or not, about an individual whose identity is apparent, or can reasonably be ascertained, from the information or opinion, but does not include information of a kind to which the Health Records Act 2001 applies.*<sup>600</sup>

Mr Watt advised the Committee that while privacy is an important public interest, it is not an absolute right.<sup>601</sup> Rather, it needs to be balanced against other public interests, a point recognised in one of the objectives of the IPA which 'is to balance the public interest in the free flow of information with the public interest in protecting the privacy of personal information in the public sector'.<sup>602</sup> This is also reflected in IPP 2.1 which permits the disclosure of personal information in certain circumstances, including for the purposes of research, 'or the compilation or analysis of statistics in the public interest other than for publication in a form that identifies any particular individual'.<sup>603</sup>

Another important consideration that Mr Watt raised with the Committee is the effect of empowering legislation on the capacity of government agencies to collect, use and distribute data. Examples of empowering legislation in the road safety context are the *Commissioner for Law Enforcement Data Security Act 2005*, the *Coroners Act 2008*, and the *Road Safety Act 1986*. These laws, combined with the IPA and the HRA, 'govern or

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<sup>598</sup> **Note:** For example, empowering legislation that these organisations operate under s.13 of the *Charter of Human Rights and Responsibilities Act 2006* (Vic) which provides Victorians with a right to privacy and reputation. There may also be other legislation that applies more generally to those linking data, and not just the road safety agencies, such as the Commonwealth *Privacy Act 1988*, in certain circumstances.

<sup>599</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, Presentation to Committee: 'Briefing from the Office of the Victorian Privacy Commissioner', 28 October 2013, p. 1.

<sup>600</sup> S.3 Information Privacy Act 2000 (Vic)

<sup>601</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, Presentation to Committee: 'Briefing from the Office of the Victorian Privacy Commissioner', 28 October 2013, p. 2.

<sup>602</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, *Transcript of evidence*, 28 October 2013, p. 359.

<sup>603</sup> S. 2.1(c) IPP: David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, Presentation to Committee: 'Briefing from the Office of the Victorian Privacy Commissioner', 28 October 2013, p. 3.

restrict the way information is used' and therefore influence the willingness and capacity of different government agencies to link data.<sup>604</sup> As noted by Mr Watts:

*So in a very real sense, when you talk about information sharing, each government department comes to the table with a whole set of different rules; it is not as if the landscape is exactly the same for each.*<sup>605</sup>

### **5.3.1.2 Health Records Act 2001**

The HRA regulates the collection and handling of health information in Victoria by public and private organisations, which would cover road trauma victims.<sup>606</sup> Under the HRA, a number of Health Privacy Principles regulate the collection, use and disclosure of health information for the purposes of research or the compilation or analysis of statistics, in the public interest.<sup>607</sup> The Health Service Commissioner is responsible for a number of actions under the Act.

In correspondence to the Committee, Dr Pradeep Philip, Secretary of the DoH, explained that the DoH has engaged with the Privacy Commissioner and the Health Services Commissioner since the inception of the VDL. He also advised that the VDL is permitted to undertake data linkage under the HRA, provided it is within the purpose of the objectives of the Act and it adheres to the Health Services Commissioner's statutory guidelines on research.<sup>608</sup>

### **5.3.1.3 Ethical aspects to linking**

In addition to the legislative protections around the collection and handling of information, there is a secondary overlay of protection based on ethical considerations. The Committee heard from the DoH and the VSTORM representatives that those seeking to access linked data, including linked road trauma data, are required to meet certain ethical requirements established by the agencies themselves, along with those set by data custodians and data linkers. Further, the Committee understands that both the DoH and VSTORM are bound by ethics approval processes administered by the National Health and Medical Research Council (NHMRC). In addition, the VSTORM was required to secure ethics approval for its protocols for collecting patient level data from 138 hospitals, in addition to the Monash University Human Research Ethics Committee.<sup>609</sup>

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<sup>604</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, *Transcript of evidence*, 28 October 2013, p. 361.

<sup>605</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, *Transcript of evidence*, 28 October 2013, p. 361.

<sup>606</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>607</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>608</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>609</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 210.

Professor Gabbe of the VSTR explained the ethics processes associated with the VSTR data access arrangements:

*We have data access policies. People can apply to access data from the registry, and all of those requests have to be ethically approved. If it is for research purposes, they have to go through an ethics committee and receive approval for their project. It then comes to us as the data custodians...we need to make a decision about whether it is in the interests of the registry and what the registry has been put in place to do — to approve those requests. We have had situations where people have had their project approved by ethics but knocked back by us because we felt that the project and the analysis were not appropriate.*<sup>610</sup>

The Committee also received evidence from the DoH and the VSTORM reflecting the interplay between ethics and privacy in their data linking project processes. Mr Carver at the DoH advised the Committee that:

*Research, or policy projects where they are researched, must be approved by an NHMRC-standard Human Research Ethics Committee. We ensure that we do not provide researchers with any more than they need, and we need to make sure that the custodians are comfortable — that how we do this, how we deliver it, ensures that their requirements around privacy are protected. We do that simply by establishing memorandums of understanding and making sure that we have ethics approval. We do the back end linkage work and we make sure that all the various project approvals are in place, and then we extract the data for each project and we leave the people to go and do their work. The protections include: they must destroy the data after it is done, and they are not allowed to distribute it or publish it without approval. Those are the protections.*<sup>611</sup>

### 5.3.2 Privacy as a barrier to data linkage

A general theme in the evidence regarding data linkage was the limitation posed by privacy protections in the disclosure of particular datasets to road safety agencies and researchers. Mr Shelton of VicRoads informed the Committee:

*There are a whole lot of controls in place, appropriately, around people's privacy. There will be a set of controls in the health arena and a set of controls in the policing arena. Sometimes they will inhibit people from sharing information.*<sup>612</sup>

Similarly, Mr Nieuwesteeg of the TAC advised the Committee:

*I think partially the barrier is a perception. There are legitimate privacy barriers, but also I think there is a risk aversion within the government and government agencies.*<sup>613</sup>

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<sup>610</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 211.

<sup>611</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 52.

<sup>612</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 275.

In his presentation to the Committee, Mr Watts of Privacy Victoria acknowledged the current governance issues around information sharing within the Victorian Government:

*...when you talk about information sharing, each government department comes to the table with a whole set of different rules; it is not as if the landscape is exactly the same for each. There is insufficient discussion, I would have thought, and thrashing through of those issues within government and within departments. That is the first point I would make: there is insufficient meeting of minds and thinking through the information-sharing issues that need to be dealt with.*

*The second point I would make is that that is caused by flaws in governance, in my view. Various regulators – the Ombudsman, the Auditor-General and I, in respect of Victoria Police – have pointed out flaws in the way we go about governing our use of information within the public sector.<sup>614</sup>*

The evidence from Inquiry participants indicated that interpretation of privacy and other laws by government and road safety agencies has limited efforts to undertake data linking, rather than the laws themselves. Associate Professor Newstead of MUARC, in particular, claimed that ‘each agency has even a different interpretation of what the privacy legislation means, and they use it in different ways at different times’.<sup>615</sup> In response to the criticism around privacy inhibiting the appropriate sharing of personal information, Mr Watts of Privacy Victoria advised the Committee that the criticism lacked substance. He indicated that it often related more to public sector agencies lacking the skills to work with privacy to support their business processes. He also proposed that if the IPA was found to lack sufficient flexibility, there were avenues to redress this issue within the Act:

*It is meant to have some flexibility built into it. It provides the ability to develop codes that apply to particular schemes of information sharing within a particular subject matter area.<sup>616</sup>*

It was also clear to the Committee that there was a genuine interest among road safety agencies, health agencies and researchers to work through these privacy concerns and protections, and agree on a process that would facilitate data matching for road safety research and policy purposes. Professor Gabbe of the VSTR informed the Committee of existing linking efforts between relevant agencies:

*We have had no issues dealing with the TAC; the TAC have been fantastic to deal with. The ambulance services have been great to deal with, and Adult Retrieval*

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<sup>613</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 322.

<sup>614</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, *Transcript of evidence*, 28 October 2013, p. 361.

<sup>615</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 98.

<sup>616</sup> David Watts, Acting Privacy Commissioner, Victorian Commissioner for Law Enforcement Data Security, Privacy Victoria, *Transcript of evidence*, 28 October 2013, p. 364.

*Victoria have been great to deal with. When we have spoken to VicPol they have been very supportive; they can see that we are sitting on data that would be very useful for their purposes. We are happy about that; as registry custodians the last thing you want is to be sitting on a data resource that is not used and is not useful. We would like to see the potential of the datasets to be maximised. With VicRoads there have been some preliminary discussions...*<sup>617</sup>

Despite these ongoing privacy concerns, data linkage is being carried out successfully and ethically both in Victoria and in other jurisdictions, and in accordance with the applicable laws. The Committee acknowledges the experiences of the VSTORM and VDL in data linkage, and in particular the VSTORM's capacity to deal with privacy concerns through its existing ethics overlay, ethics approval and data linkage processes. The Committee is also of the view that privacy considerations can be navigated if adequate safeguards are in place, including the de-identification of data and employing appropriate mechanisms to ensure that those receiving the data meet certain standards. As discussed in section 5.2.1, in NSW, concerns associated with the linkage of road crash data have been overcome by having the CheReL complete the linkage independently of the data custodians.<sup>618</sup>

## 5.4 Proposals for linking

The Committee observed general support among Inquiry participants for data linkage for road safety purposes. Together with other improvements in trauma definitions, and statistical reporting, data linkage would enable Victoria to maximise its efforts to reduce trauma. The DoH informed the Committee that support for such linkages extended beyond traditional road safety stakeholders, and included the Health Services Commissioner because of the benefits that linkage could, with adequate protections, provide to Victorians.<sup>619</sup>

Support for road trauma data linkage was also provided by Professor Ivers of the George Institute who recommended that:

*...data linkage is probably going to be the most useful tool that we have for better improving our injury outcome data. What we would be recommending is that you would use existing linkage services that you have. Rather than establishing an entirely new system that is built around police data linking to other systems, [use] the Victorian data linkage unit, which already has significant expertise in actually doing linkage. There are a number of national linkage units that are all feeding in together, so there is a growing movement for health data and linking to other datasets. It would be far preferable to actually use that existing expertise and build it up from the other side and start trying to link police through to all the other things. You would*

<sup>617</sup> Professor Belinda Gabbe, Head, Victorian State Trauma Registry, Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM), *Transcript of evidence*, 10 September 2013, p. 211.

<sup>618</sup> Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 120.

<sup>619</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 58. See also Department of Health, *Submission*, no. 30, 14 May 2013, p. 17.

*start from the health data and the existing expertise that is there, particularly around the trauma outcome data.*<sup>620</sup>

Further, Assistant Commissioner Robert Hill of the Road Policing Command at Victoria Police, in his presentation to the Committee, highlighted the importance of data linkage for Victoria Police:

*In terms of the first priority, building our road safety capabilities...our strategic direction...is to strengthen our road policing intelligence, tasking and coordination processes and assessment and evaluation tools. Accordingly we commit to: one, developing improved standards for the collection, analysis and reporting of road safety intelligence to enhance our understanding and response to road trauma; two, the integration of Victoria Police databases that capture road policing statistics to enhance accessibility and a standard of data; three, developing measures to improve intelligence data sharing between agencies to enhance engagement and the development of a holistic solution as to road safety issues and also to improve tasking and coordination processes to ensure that road policing resources are deployed for maximum impact, including the implementation of electronic, live intelligence tasking...*<sup>621</sup>

The Committee notes, however, that this support was tempered by the challenges associated with data linkage. Mr Shelton at VicRoads cautioned that these barriers were not insignificant. He advised that for linking to be realised, it would require determining whether the datasets hold the data needed to draw policy insights, whether probabilistic matching could occur in a meaningful way, and whether appropriate governance arrangements were in place to ensure legislative protections are met.<sup>622</sup>

In addition to these barriers, the Centre for Accident Research and Road Safety – Queensland (CARRS-Q) submission cautioned that it was ‘necessary to establish whether the benefits that could be derived from linked data would be sufficient to offset the likely costs’.<sup>623</sup> Similarly, VicRoads noted in its submission that ‘further research was needed to establish whether linked data provided a significant advantage over non-linked data in quality and quantity’.<sup>624</sup> This sentiment was also expressed in MUARC’s submission, which noted that linking datasets held by road safety agencies with hospital data ‘might not be worth the investment required to overcome the technical and other issues associated with that linkage’.<sup>625</sup> For these reasons, VicRoads was supportive of conducting pilot

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<sup>620</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 142.

<sup>621</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 301.

<sup>622</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266.

<sup>623</sup> CARRS-Q, *Submission*, no. 15, 19 April 2013, p. 2.

<sup>624</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 37.

<sup>625</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 22.

linkage projects to determine the efficacy of linkage in the road safety context.<sup>626</sup> In his presentation to the Committee, Mr Schofield of VicRoads stated that:

*...one of the things we said we should try to do with the data linkage project is to firstly pilot it to see if it can be done. Importantly for countermeasure development and understanding the injury severity to parts of the body, one of the things that we see as imperative, apart from an overall matching of process, is to understand from the different crash types that occur between different road user groups what the injury outcomes are that are likely to affect a person involved in a crash.*<sup>627</sup>

Despite these concerns, the Committee strongly believes the benefits of data linkage are substantial, with the evidence received clearly reflecting the advantages from a theoretical and practical perspective. Data linkage is by no means cutting edge – it has been used for many years in road safety in several Australian jurisdictions, including in Victoria, and in a more systematic manner in health policy and research. The Committee shares the view that data linkage is the best way to provide policy-makers with a more definitive and comprehensive picture of road trauma in Victoria. On this basis, data linkage maximizes the use of existing datasets (the infrastructure) and data (the information). Without data linkage, the Committee believes the capacity for the Victorian Government and road safety agencies to further reduce road trauma will be limited, as will be their capacity to develop and assess new and existing countermeasures that are appropriate both in terms of fiscal expenditure and community expectations.

**Finding 15:** Data linking is necessary for Victoria to realise further reductions in road trauma, and develop more effective and targeted countermeasures in road safety.

#### 5.4.1 Data linkage to validate data

Many participants focused on data linkage as a means to validate the data available in different datasets, specifically in the context of redressing accuracy issues associated with police compiled injury statistics. The effect of such an approach would be more comprehensive and accurate datasets.<sup>628</sup> This purpose was also identified by the

<sup>626</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 271.

<sup>627</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 271.

<sup>628</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 129; Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 272; Superintendent Phillip Green, Operational Systems Support Division, Intelligence and Covert Support Command, Intelligence and Covert Support Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 303; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 146; Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 300; VicRoads, *Submission*, no. 31, 17 May 2013, p. 37.

Committee in research literature.<sup>629</sup> As discussed in Chapter Two, Victoria Police is limited in its capacity to confirm the hospital admission status of crash victims due to Victorian hospitals inability to provide such information to investigating officers. In correspondence with the Committee, Dr Philip of the DoH, distinguished between Victoria Police using data linking as a means to improve its own serious injury statistics and data linking for research purposes.<sup>630</sup> The Committee shares this view, and does not believe linking data in order to validate police collected serious injury data will be necessary if the Victorian Government accepts the recommendations proposed in Chapter Four. In particular, improving accuracy in police datasets will be achieved if the DoH and the VSTORM are required to report and share the aggregate data they already collect with road safety agencies, as per recommendation 10. Ultimately, this will meet the legislative protections and address the issues associated with accuracy and timeliness identified in Chapter Two.

**Finding 16:** Based on the Committee’s findings and recommendations in Chapters Two to Four, it is unnecessary for data linkage to be used as a means to validate police collected serious injury data.

#### 5.4.2 Proposals from Inquiry participants

Options for harnessing data linkage in Victorian road safety were proposed to the Committee by a number of participants, and these are outlined below. Before assessing each of these proposals, the Committee discusses the option of data integration, which was also raised as a potential option for the collection and handling of road safety data.

##### 5.4.2.1 An integrated database

Data integration was an issue that drew limited responses during the Inquiry, although given its potential value to road safety policy the Committee decided to include it in this discussion. The Committee interpreted data integration to mean that all relevant data is housed, analysed and compiled in one repository, by one data custodian, which other government agencies and researchers can then access it upon request or by right.

The Committee understands that New Zealand (NZ) utilises a single repository data system managed by the Accident Compensation Corporation, which is the equivalent of the TAC, and insures victims of road crashes among others.<sup>631</sup> According to Dr Liz de Rome, Senior Research Officer of Neuroscience Research Australia, an advantage of the

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<sup>629</sup> A D'Elia and S Newstead, 'Alternative measures of serious injury for National Road Safety Strategy target setting', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Perth, Western Australia, 2011, p. 3.

<sup>630</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>631</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 112. See also Accident Compensation Corporation (ACC), 'Am I Covered?', viewed February 2014, <<http://www.acc.co.nz/making-a-claim/am-i-covered/index.htm>>.



NZ approach is that because all relevant data is contained in the one location, it is easier for researchers and others to interrogate the data.<sup>632</sup>

The advantages of a single repository were raised by a number of participants. Mr Prosser at the DoH while cautious in his support for integrated datasets noted that:

*...we are not yet clear on what the right model is to support data linkage, but we would certainly want to have a good look at any option which looked at concentrating whole datasets in one place and holding them in a big bank of information, as opposed to people maintaining their own data warehouse with their own datasets but having the ability to link particular data for particular policy and research purposes.*<sup>633</sup>

In his presentation to the Committee, Assistant Commissioner Hill at Victoria Police referred to his observations of European data practices, particularly those in the Netherlands and Sweden:

*They have a single entry report - the one report that different agencies can have access to and value add and draw information from. If we had something similar in this state, that accuracy would be of great benefit to Victoria Police and the community of Victoria and would provide us with that intelligence from a policing perspective to be able to deploy our resources in a more effective manner. That single identifier, that report that is provided, gave a true picture for the enforcement agency as to the extent of an individual's injuries and then using that intelligence to map against the activities you are policing in the future. I can certainly see some enormous benefits from working with the Department of Health and bringing it into the road safety partnership. Similarly there are enormous benefits from bringing other areas into the tent as well, local councils being one example.*<sup>634</sup>

The Committee was also advised by the WA Government's Office of Road Safety of its plans to establish a road safety database, referred to as the Enhanced Road Safety Information System (ERSIS), that would enable data from multiple data sources to be used through the one database.<sup>635</sup> This project is based on the Curtin-Monash Accident Research Centre (C-MARC) paper, *An enhanced Road Safety Information system for WA*, which outlined the 'groundwork for the establishment of a road safety database access system'.<sup>636</sup> According to C-MARC, the creation of such a system would deliver a range of benefits, including cutting edge research, better monitoring, the capacity to answer ad hoc queries from road safety agencies and researchers, and the ability to be used for

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<sup>632</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 112.

<sup>633</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 56.

<sup>634</sup> Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 305.

<sup>635</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>636</sup> A D'Elia and S Newstead, *An Enhanced Road Safety Information System for Western Australia*, Curtin-Monash Accident Research Centre (C-MARC), Bentley, 2011, p. 2.

planning and research beyond road safety, for example in the transport planning area.<sup>637</sup> The Committee understands that a business case for the project has been completed,<sup>638</sup> and institutional arrangements, such as Memoranda of Understanding (MOU), are being planned.<sup>639</sup> Because this project remains at a formative stage, it is difficult to make any conclusions about whether a data repository is the best option to manage road safety data in Victoria.

#### 5.4.2.2 The Transport Accident Commission as the data linker

In its presentation to the Committee, the TAC proposed that it be established as the responsible agency for linking road safety data in Victoria. Mr Nieuwesteeg at the TAC stated:

*We put up our hand as a potential host...and the reasons we cite for the TAC being appropriately placed to take on this role is that we have a statutory mandate to improve road safety and collect road safety data; we have a reliable source of funding; we host both road safety and public health expertise; we have a unique interest among government agencies in all pre-crash, crash and post-crash phases and across all dimensions of the safe system; we have agreements for data sharing already, and these are effective and road safety oriented; we have a track record of utilising this linked data and providing insights from it; we have undertaken research into our needs with Deloitte considering how we can further improve things; and we have a long history of dealing with privacy issues through managing personal information about TAC claimants.<sup>640</sup>*

As part of his presentation, Mr Nieuwesteeg also addressed what would be required of the TAC to implement such a linked system:

*We think the TAC would represent the cheapest and simplest solution among those you might be considering for someone hosting a linked dataset, but we make the point that we need some things for this to happen. We need high-level support, and we really need strong leadership to surmount the challenges within each organisation, in particular those challenges relating to the mobilisation of resources and the navigation of data security protocols. We will need the establishment of formal agreements and appropriate legislative support so we can guarantee the data collection. We need to use a risk-management approach to privacy, which the TAC is experienced at using.*

*This says that there are inherent risks when you are working with private data, but there are also greater gains to be made. If you are totally risk averse, you will fail to make those gains, and the TAC has managed those risks for many years without*

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<sup>637</sup> A D'Elia and S Newstead, *An Enhanced Road Safety Information System for Western Australia*, Curtin-Monash Accident Research Centre (C-MARC), Bentley, 2011, p. 12.

<sup>638</sup> Claire Thompson, Acting Principal Policy Officer, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 261.

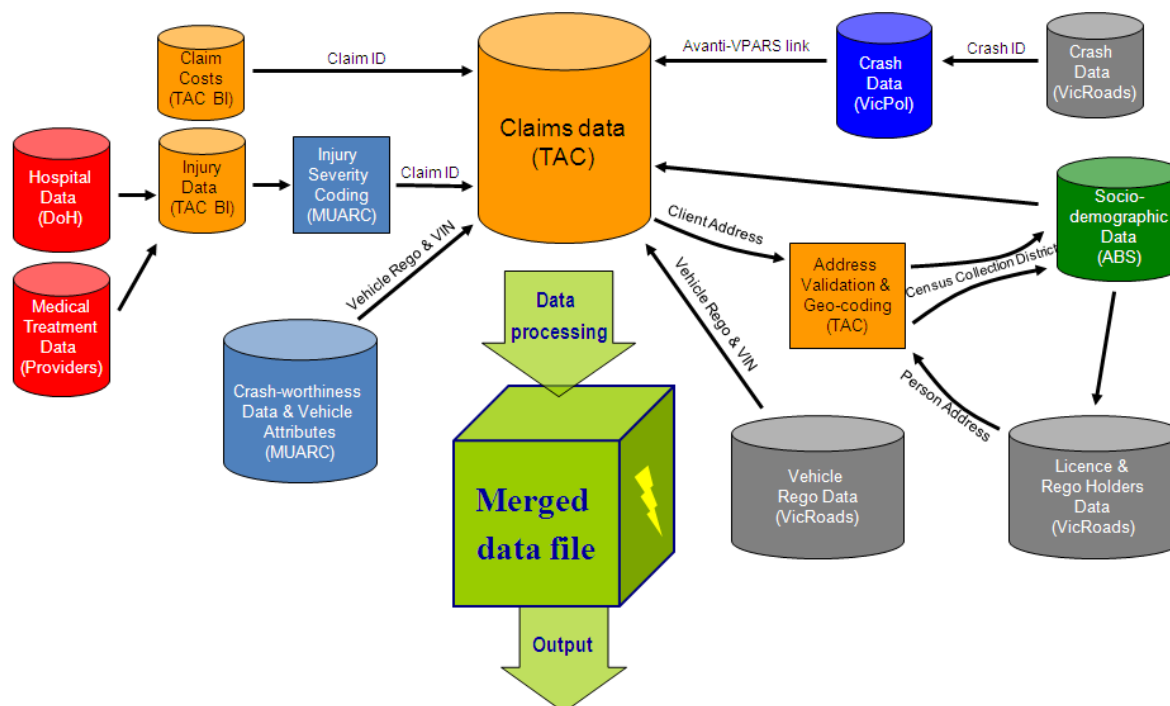
<sup>639</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>640</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 319.

major incident. We think this can be done without being gigantic, we think with a small team of two to four people, depending on scope, and obviously the purchase of some hardware and software, and obviously we need some long-term commitment. It would be worthwhile investing in that small team.<sup>641</sup>

In its presentation to the Committee, the TAC also provided a suggested model for improving road safety data. The schematic diagram below illustrates the way data might move through the TAC, and the kinds of data that would be linked.

**Diagram 5: The Transport Accident Commission linking model<sup>642</sup>**



The comprehensiveness of the procedural steps involved in linking the data, the breadth of data sources and the work needed to undertake this level of linking is made clear in this model. In terms of the possible advantages of this TAC model, Mr Hafez Alavi, a Senior Data Analyst at the TAC, suggested there would be similarities with the approaches used by the STRADA in Sweden and the CODES in the USA.<sup>643</sup> Therefore, one might expect similar benefits to those enjoyed in Sweden and the USA to apply in Victoria.

In response to this proposal, the Committee acknowledges the potential advantages of the TAC taking responsibility for data linking. In particular, the Committee notes that the TAC has a reliable source of funding and strong road safety and public health expertise. However, the Committee is concerned about the limitations of this proposal. On the basis

<sup>641</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 319.

<sup>642</sup> Transport Accident Commission (TAC), Presentation to Committee: 'Serious Injury Inquiry', 11 September 2013.

<sup>643</sup> Hafez Alavi, Senior Data Analyst, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 326.

of privacy and ethics considerations, the Committee believes it is inappropriate to have other agencies' data linked by the TAC as it is also a data custodian. Such a model does not provide the necessary separation of roles to ensure protection of privacy. An associated issue is that data custodians may not be comfortable providing the TAC with their data and may be prohibited from doing so by their empowering legislation, ethics approval and other legislation such as the HRA. For example, the Committee understands that the VSTR and the VOTOR patient specific data would be unavailable for linking if the TAC was the designated linking body. Further, the Committee believes there is a conflict of interest in the TAC undertaking linkages with particular datasets given its primary role as an insurer.

Another concern for the Committee with this model is that while the TAC has access to health data in its capacity as the compensation insurer for road trauma, the data is likely to be incomplete due to the TAC not insuring all road crashes (i.e. single cyclist crashes) and may exclude those that occur off-road or which fall below the TAC threshold for compensation.

The Committee is also aware of other limitations that could affect the TAC's capacity to fulfil the linking role. The TAC does not have the same technical experience of linking datasets as the VSTORM and the VDL, and it also lacks the infrastructure and resources to undertake data linkage in the near future. If the TAC was to become the core linking body, the Committee believes that a long lead-in time would be necessary to establish the appropriate resources and infrastructure, as well as to negotiate agreements with various data custodians. Further, on the basis of the privacy and ethical considerations discussed in section 5.3.1, the Committee notes the TAC's limited experience in dealing with overlapping privacy and ethical frameworks is a significant issue. For these reasons, and the fact that health related datasets need to be linked in order to realise the full potential of road safety data linkages, the Committee does not believe that the TAC is the most appropriate agency to undertake data linkage for road safety purposes.

#### **5.4.2.3 Victorian Data Linkages as the data linker**

The DoH VDL was also identified as the potential data linking agency for Victorian road safety data. Mr Prosser and Mr Carver both of the DoH highlighted the potential role of the Department in linking given its expertise and infrastructure.<sup>644</sup> Mr Carver stated:

*We have the system; we have the platforms to do the work. I would see the only things that will cause delay as being working through with each individual data custodian and agency appropriate agreements to do the data linkage and making sure that we have enough resources to do that work. But the technological solutions are all available, from the software to do the linking to the software to securely*

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<sup>644</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 49.

*transfer data between agencies — and the technical infrastructure is already in place to store the data and all those things.*<sup>645</sup>

In addition to these and its broader capacity to undertake linkage, the DoH advised the Committee of its in-principle agreement with the TAC, WorkSafe and the VSTR to acquire their identifying data.<sup>646</sup> In correspondence with the Committee, Dr Philip of the DoH explained that the acquisition of this data would allow for trial linkages to answer specific questions on service provision, treatment, patient experience and outcomes for trauma victims.<sup>647</sup> Dr Philip also advised that any operational, technical and legislative issues would be expected to be resolved during these pilot projects.

Despite this progress, privacy and access to data remain areas of ongoing concern for road safety agencies and researchers that wish to create opportunities to link their datasets with health data. The Committee asked the TAC to comment on the option of the DoH VDL linking road safety data. In response, Mr Nieuwesteeg of the TAC suggested there could be disadvantages with this option:

*If we all give data to the Department of Health, it is all held by them. I then need to say to the Department of Health, 'Can you give me the crash information that came from police, and by the way I would like to get the seatbelt data from Ambulance Victoria and I would like to get the hospital information. I might also like to get some vehicle characteristics from the VicRoads registration'. I might need all that information. I am going to have to specify that for every question I have, which makes it very difficult to do trial and error kinds of research where you let the data do the talking. It also adds a lot of time.*<sup>648</sup>

The Committee acknowledges the potential of the VDL to be the responsible agency for linking road safety data. Such a proposal would maximise access to health data for road safety agencies seeking to better understand the impact of road crashes. However, as with the TAC's proposal, the Committee believes the potential privacy risks are simply overwhelming given that the DoH is both a data custodian and data linker. This may also pose an issue for external agencies providing data for linking to the VDL. On this basis, the VDL's process does not meet best practice in data linkage, as compared to the NSW' CHeReL.

The VDL's capacity to provide useful linked data and in turn research is well-recognised, although it is important to note that these linkages have involved data that falls strictly within the health area and datasets within the control of the DoH. For road safety purposes, this would involve linking data held by road safety agencies and potentially other organisations such as WorkCover, the VSTR, the VOTOR, and the DoJ. Given that

<sup>645</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 62.

<sup>646</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 52.

<sup>647</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>648</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 324.

arrangements for linkage are not established with these external agencies, and ethical and legislative obligations are yet to be assessed, the Committee does not believe that the VDL is in a position to undertake road safety linkages at present.

#### **5.4.2.4 The Victorian State Trauma Outcomes Registry and Monitoring Group as the data linker**

The VSTORM is widely recognised for its work in linkage, having undertaken a substantial number of linked data projects for the purposes of research in the health sector.

The Committee believes that the VSTORM is currently best placed to undertake data linking for road safety purposes in Victoria. A key supporting argument is that the VSTORM has established Victorian leading privacy and ethics approvals protocols, which allow systematic and regular linking to occur. The Committee understands that the VSTORM regularly involves the Privacy and Health Services Commissioners in its operations, thus providing a high level of governance and transparency to its linking projects. This approach may explain its strong record in patient participant rates in injury outcomes registries and its strong complaints record. The VSTORM already has the infrastructure, staff and capacity to undertake data linkage, to a greater extent than the TAC and the VDL.

At present, any road safety agency or research body such as MUARC can request the VSTORM to undertake data linkage upon the approval of the relevant data custodians. A request by a road safety agency to link its data to the VSTORM can be undertaken as the latter has the capacity to authorise its own data to be linked. In instances where a linkage project involves the use of multiple agencies' datasets, the agency applying for such a linkage would require authorisation from other data custodians and would have to meet the ethical and legislative requirements.

Given its considerable experience in linking data and the importance of the VSTR and the VOTOR in terms of injury outcomes data, the VSTORM is the strongest candidate to be the linking body for road safety. As noted, it has a number of established linkages with various agencies and has had preliminary discussions with Victoria Police about potential linking in the future. The VSTORM's linking process also requires that data linkage be undertaken by a third party, which the Committee believes is important for the protection of privacy.

**Finding 17:** Given the role of the Victorian State Trauma Registry and the Victorian Orthopaedic Trauma Outcomes Registry in collecting and collating injury outcomes data, and its considerable experience in linking data, the Victorian State Trauma Outcomes Registry and Monitoring Group presents as the strongest candidate to be the linking body for road safety.

#### 5.4.2.5 Data linkages pilot project

As noted earlier, some Inquiry participants suggested conducting a pilot project to assess the usefulness of data linkage for road safety purposes. The Committee accepts that this is a prudent approach and supports conducting a pilot linkage project. Given that such a project would involve multiple data custodians, the Committee expects it will be necessary to consult with the DoH, the VSTORM, and road safety agencies. The Committee also suggests consulting with the Victorian Health Records and Privacy Commissioners to ensure concerns around privacy and confidentiality are correctly identified and addressed.

It is the Committee's expectation that such a project would identify the practices and processes required to meet the ethical and legislative requirements, including those that apply to data custodians and data linkers. In time, the successful conclusion of such a project could then serve as a template for future data linkage projects, with the VSTORM as the designated responsible linking agency.

**Recommendation 15:** That road safety agencies, in cooperation with the Victorian State Trauma Outcomes and Registry Monitoring Group (VSTORM), undertake a pilot data linkage project. Upon the project's completion, the VSTORM should report the project's findings, including any issues with the process, the governance arrangements and any other relevant information, to the Ministerial Council for Road Safety.

**Recommendation 16:** That road safety agencies ensure that all road safety linkage project applications meet the ethical requirements set out by the Victorian State Trauma Committee, the privacy and patient record legislation that applies in Victoria, and the release of data requirements set by data custodians and the legislation that applies to them.

### 5.5 Best Practice Linkage

While the VSTORM is currently in a position to undertake data linkage projects for road safety purposes, there is clearly a need to investigate a best practice model that could be implemented in Victoria in the long-term. In the Committee's view, the CHeReL in NSW presents a best practice model for data linkage in Victoria. This is based on its capacity to manage research needs with legislative and ethical requirements, and its record of producing linkages that answer complex policy questions. Further, the Committee believes the processes used by the CHeReL effectively manage conflicts of interest, and privacy and ethical concerns of data custodians, as well as providing researchers with clear guidance on what is required to access linked data. The Committee is also of the

view that the WA ERSIS project may provide a model that could be applicable to Victoria. Both models use a third party linking entity in their linking processes, which the Committee believes is essential to managing ethical and privacy risks.

On this basis, the Committee proposes that a working group be formed to investigate options for the establishment of an independent data linking entity. Such an entity is necessary to meet community expectations around the privacy and confidentiality of health records and other data to be linked. It will also ensure that in the long-term, data linkage becomes a systematic tool used by the Victorian Government, road safety agencies and researchers to maximise the potential of road safety data to reduce road trauma.

**Recommendation 17:** That a working group be established to investigate the implementation of an independent data linking entity, and be comprised of:

- The Transport Accident Commission (TAC), VicRoads and Victoria Police;
- The Department of Health;
- The Victorian State Trauma Outcomes Registry and Monitoring Group and the Victorian State Trauma Committee; and
- The Victorian Health Records and Privacy Commissioners.

The working group should be chaired by an independent expert, and report on issues, options and solutions for the implementation of an independent data linking entity within 18 months of the tabling of this report. The working group should investigate New South Wales' Centre for Health Record Linkage (CHeReL) and other entities, including the Western Australian Enhanced Road Safety Information System, as part of its assessment. The report produced by the working group should be provided to the Ministerial Council for Road Safety, and ministers responsible for health, justice, roads and the TAC.



## PART 2

Chapter 6: The Costs of Serious Injury

Chapter 7: Which Costing Methodology for Victoria?



## CHAPTER SIX AT A GLANCE

### OVERVIEW

Chapter Six is the first of two chapters that address Term of Reference (ToR) (a), with this chapter providing the background context. The calculation of costs for policy development purposes and informed decision-making, particularly when deciding to invest public money or to impose new regulations on the community, is an important function. Based on the substantial contribution of Inquiry participants to this ToR, the Committee undertook a comprehensive review of the economic methodologies for calculating crash costs. The two economic approaches to calculating costs, the Human Capital and the Willingness-To-Pay (WTP) approaches, and the methodologies used to derive them are outlined.

A focus of this chapter is the WTP approach, particularly WTP derived using Stated Preference (SP) methods, with the Committee identifying considerable methodological and implementation issues. The chapter also explores other methods for deriving crash costs, such as judicial assessments of pain and suffering and economic loss in transport accident compensation cases, Quality-Adjusted Life Years, Cost of Illness studies and those used in the occupational health and safety policy area.

### KEY FINDINGS

Finding 18: Willingness-To-Pay studies using stated preference methods, including those conducted using contingent valuation, are affected by hypothetical and other biases which make Value of a Statistical Life values derived from such methods unreliable.

Finding 19: A key issue associated with stated preference studies, including those conducted using contingent valuation, is the inability of participants to understand and price risk accordingly.

Finding 20: Given the issues of bias and the capacity of respondents to evaluate risk, the use of the Willingness-To-Pay approach based on stated preference methods is inappropriate for calculating the costs of crashes in Victoria.

Finding 21: Willingness-To-Pay values derived using the revealed preference method is preferable to those derived using stated preference, although it is more limited in what it can price in terms of actual behaviours based on assessments of crash risk.

Finding 22: Quality-Adjusted Life Years and Disability-Adjusted Life Years could provide an alternative costing methodology for the purposes of road safety evaluations and regulatory assessments.

Finding 23: A number of alternative models exist for calculating costs, which may provide valuable insights when developing road safety policy in the future. Road safety agencies should keep abreast of developments in these methodologies and explore options for their utilisation in policy development and evaluation.

### **RECOMMENDATIONS**

There are no recommendations in this chapter.

## CHAPTER SIX: THE COSTS OF SERIOUS INJURY

The key focus of road safety policy is to improve the operation of the road network in order to reduce the risks of crashes and the impact of trauma once they occur. That focus is, in part, driven by the cost of crashes to the community, which are typically presented in non-monetary ways: the inability of a person to walk again and the pain and suffering endured by families and friends. The community often understands cost in broad physical and psychological terms, but there are also economic costs that require attention.<sup>649</sup> Crashes represent a strong economic cost, to both individuals and the broader community, in terms of lost productivity, lost wellbeing, hospitalisation and rehabilitation, and transfer costs such as welfare benefits.<sup>650</sup>

Accurately quantifying the economic cost of crashes is an important part of road safety policy. Crash costs have a vital role in guiding government decision-making and policy development through the economic assessment of proposed road safety interventions. Further, in the same way that trauma statistics represent the burden of road crashes through the number of hospitalisations or deaths, crash costs also contribute to an understanding of the magnitude of the road safety burden.

It is commonly understood that calculating the costs of road crashes is a complex task.<sup>651</sup> This complexity stems from identifying the types of costs that should be captured, how they should be calculated, and the type of economic evaluation they are used for.<sup>652</sup> The focus of this chapter is on the methodologies used to derive the costs of crashes, both in Victoria and elsewhere. In investigating Term of Reference (a), the Committee relied on evidence provided by distinguished academics, government agencies, road safety experts and economists from other areas of regulation. The Committee also undertook a substantial literature review given the highly technical nature of this area.

Based on the evidence received, the current debate around calculating the cost of road crashes centres on whether the existing costs methodology, the Human Capital (HC)

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<sup>649</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 10.

<sup>650</sup> A García-Altés and J Puig-Junoy, 'What is the social cost of injured people in traffic collisions? An assessment for Catalonia', *The Journal of Trauma and Acute Care Surgery*, vol. 70, no. 3, 2011, p. 744.

<sup>651</sup> A Morris, et al., 'An approach to the derivation of the cost of UK vehicle crash injuries', Paper presented at the *Annual Proceedings/Association for the Advancement of Automotive Medicine*, Association for the Advancement of Automotive Medicine, Chicago, 2006, p. 285.

<sup>652</sup> A Morris, et al., 'An approach to the derivation of the cost of UK vehicle crash injuries', Paper presented at the *Annual Proceedings/Association for the Advancement of Automotive Medicine*, Association for the Advancement of Automotive Medicine, Chicago, 2006, p. 285.

approach, should be replaced with the Willingness-To-Pay (WTP) approach. This matter has attracted extensive scrutiny by state and national road safety bodies, and is heavily debated among various stakeholders, including researchers and academics. Further, it is a question that other policy areas have dealt with, the most pertinent being health, and one that has broader implications beyond road safety.

This chapter is separated into three sections. The first section outlines the background to calculating crash costs, including the application of cost methodologies in government regulatory analyses and the evaluation of new interventions; the second introduces, assesses and makes findings on the strengths and weaknesses of each methodology; and the last section discusses other models used to derive costs which might be used in Victorian road safety. Proposals for changing the Victorian approach to calculating crash costs and the issues associated with doing so are dealt with in Chapter Seven.

## 6.1 Calculating crash costs in the policy environment

Defining human activities in terms of their costs is useful because it neatly summarises complex policy issues into a monetary figure. It is an important tool to inform decision-making and to guide governments and agencies seeking to influence the agenda or debate about a policy issue, particularly in terms of determining appropriate responses to that issue. Throughout the Inquiry, the Committee came to understand that determining such costs requires the use of technical economic methodologies. This section aims to explain the principles on which these economic methodologies are based.

An important principle underpinning these methodologies is that the monetisation of fatality and injury costs are a construct intended primarily for policy purposes. They do not seek to place a value on an identified human life or a certain probability of death.<sup>653</sup> Rather, they represent statistical lives and statistical injuries, which are then used to calculate costs. This is an extremely important distinction as no individual life can be valued and monetised.<sup>654</sup> The Committee acknowledges the complex and controversial nature of this issue, which according to Monash University Accident Research Centre (MUARC) researchers is 'based on the neglect of the difference between a particular, individual life and an anonymous, statistical life'.<sup>655</sup> The researchers explain further that:

*Western society places a very high value on the individual, as demonstrated, for example, by the very great efforts which are sometimes devoted to rescuing*

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<sup>653</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 349.

<sup>654</sup> R Elvik, 'How much do road accidents cost the national economy?', *Accident Analysis & Prevention*, vol. 32, no. 6, 2000, p. 850; W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, p. 4.

<sup>655</sup> W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, p. 4.

*individuals in distress. Such efforts are dedicated by moral considerations and are not subject to benefit-cost analyses.*

*Investment in safety measures is a very different question because the beneficiaries are the anonymous, potential victims of future random events. Their moral status is quite different from that of particular individuals in distress. The view taken in cost of illness or injury studies is that life generally, and improvements in human health have finite values and that estimates of these values can be made.<sup>656</sup>*

### 6.1.1 Why calculate costs?

Calculating the costs of crash related fatalities and injuries is an important task for government to promote and implement road safety interventions, particularly road infrastructure programs.<sup>657</sup> These costs can be used in benefit-cost analysis (BCA) to establish whether the benefits of an investment in a road safety measure outweigh the costs, and on this basis justify the adoption of a particular measure.<sup>658</sup> In fact, these costs are an essential feature of BCA and Cost-effectiveness analysis (CEA) of not only road safety investments but other health and safety projects worldwide, including occupational health, environmental protection and public health initiatives.<sup>659</sup> It also allows such interventions to be compared to other policy areas in order to determine policy priorities and to allocate government resources accordingly.<sup>660</sup>

In Victoria, the derivation of crash costs, combined with policy assessment tools such as Regulatory Impact Statements (RISs), provide a basis for decision-making relating to both the feasibility of interventions and evaluation of their effectiveness once implemented.<sup>661</sup> These costs are an important component of RISs, which under sub-section 10(3) of the *Subordinate Legislation Act 1994* must be completed when new regulations are proposed. As discussed in Chapter Eight, RISs include BCAs in order to justify the regulatory burden

<sup>656</sup> W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, p. 4. Citing the Bureau of Transport and Communication Economics/Environmental Protection Authority 1993.

<sup>657</sup> B De Brabander and L Vereeck, 'Valuing the Prevention of Road Accidents in Belgium', *Transport Reviews: A Transnational Transdisciplinary Journal*, vol. 27, no. 6, 2007, p. 715; C Doucouliagos, T D Stanley and M Giles, 'Are estimates of the value of a statistical life exaggerated?', *Journal of Health Economics*, vol. 31, no. 1, 2012, p. 197; N A Kruger and M Svensson, 'The impact of real options on willingness to pay for mortality risk reductions', *Journal of Health Economics*, vol. 28, no. 3, 2009, p. 563; R Smith, S Jan and A Shiell, *What are Australians willing to pay for road safety? CHERE Discussion Paper No 21*, Centre for Health Economics Research and Evaluation (CHERE), Sydney, 1993, p. 3.

<sup>658</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Cost-benefit analysis of road safety measures*, SWOV, Leidschendam, 2011, p. 1.

<sup>659</sup> C Doucouliagos, T D Stanley and M Giles, 'Are estimates of the value of a statistical life exaggerated?', *Journal of Health Economics*, vol. 31, no. 1, 2012, p. 197.

<sup>660</sup> E J MacKenzie and M Segui-Gomez, 'Understanding and using the new estimates on the economic impact of motor vehicle crashes', *Annals of Emergency Medicine*, vol. 40, no. 4, 2002, p. 430; SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Cost-benefit analysis of road safety measures*, SWOV, Leidschendam, 2011, p. 1.

<sup>661</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Road crash costs*, SWOV, Leidschendam, 2011, pp. 1-2.

imposed by proposed regulations.<sup>662</sup> It achieves this by outlining the monetary value of lives saved versus the costs imposed by the regulations in question.<sup>663</sup> Outlined below is an example of a BCA included in a VicRoads' RIS for the *Road Safety (Drivers) Regulation 2009*:

*Based on Austroads endorsed unit costs per person for 2007 of \$1,635,488 for a fatality, \$393,342 for a serious injury and \$15,631 for other injury, the annual benefits in terms of reduced injuries from road crashes can be calculated by multiplying the total community cost per person for each of the three levels of injury by the estimated reduction in the number of people killed and injured in road crashes expected from the proposed Regulations.*

*The introduction of the proposed Regulations would be expected to lead to a crash reduction in total of 11.95 fewer deaths, 216.70 serious injuries and 600.25 other injuries. This would mean a community saving of \$19.54 million in fatalities, \$85.23 million in serious injuries and \$9.28 million in other injuries, yielding a total of \$114.16 million benefit in road trauma savings in Victoria each year or \$949.42 million over ten years using a discount rate of 3.5 per cent.*<sup>664</sup>

As mentioned earlier, the role of crash costs extends to evaluating interventions. In its submission, the Transport Accident Commission (TAC) noted that these costs are a vital component of its evaluations of large infrastructure programs, such as the Safer Road Infrastructure Program (SRIP). The Committee notes that based on the size of funds allocated to infrastructure programs with a road safety component or objective (e.g. \$100 million per annum over the next decade according to the TAC), these costs methodologies assume greater importance and it is essential that they are as accurate as possible.<sup>665</sup>

In Australia, crash costs form one of the four road user effects (RUE) established by Austroads for the economic evaluation of road transport projects in Australia. These have been adopted by the Standing Council on Transport and Infrastructure (SCOTI) as appropriate parameters for this purpose.<sup>666</sup> The four RUE values include vehicle operating costs, travel time (value of), externality costs (i.e. environmental impacts, congestion and pavement damage), and the social cost of crashes.<sup>667</sup> These are discussed further in Chapter Eight. The social cost of crashes refers to both the economic value of personal and material damages and the pain and suffering caused by vehicle crashes.<sup>668</sup> They are

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<sup>662</sup> VicRoads, *Road Safety (Drivers) Regulations 2009: Regulatory Impact Statement - Final Version*, Kew, 2009, p. 41.

<sup>663</sup> VicRoads, *Road Safety (Drivers) Regulations 2009: Regulatory Impact Statement - Final Version*, Kew, 2009, p. 41.

<sup>664</sup> VicRoads, *Road Safety (Drivers) Regulations 2009: Regulatory Impact Statement - Final Version*, Kew, 2009, p. 102.

<sup>665</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 43.

<sup>666</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 8.

<sup>667</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 4.

<sup>668</sup> J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 803.



based on the Hybrid-HC derived values produced by the Bureau of Infrastructure, Transport and Regional Economics (BITRE).<sup>669</sup>

A secondary purpose of crash costs is to draw attention to the size of the road trauma burden (by providing a macroeconomic context within which to understand the size of the problem).<sup>670</sup> These estimates, usually calculated in the billions of dollars or in Gross Domestic Product (GDP) impacts, are used as a public communication tool to draw the community's attention to the significant impact that road crashes have on both individuals (internal costs) and broader society (external costs). For example, the BITRE's 2006 estimate of \$17.85 billion<sup>671</sup> illustrates the economic impact of road crashes, a figure that subsequently been used by the media, governments, road safety agencies and other stakeholders to highlight the road trauma burden in Australia.<sup>672</sup> The use of crash costs for this purpose is replicated in many other jurisdictions such as the United States of America (USA),<sup>673</sup> and the Netherlands.<sup>674</sup>

### 6.1.2 Types of crash costs

The process of estimating crash costs relies on a framework, to identify the different types of costs that should be included in overall estimates.<sup>675</sup> Economic models used to calculate crash costs typically aim to capture all of the human and monetary costs that directly relate to injured road users, their families, society and government. This is

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<sup>669</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 8.

<sup>670</sup> H Y Chen, et al., 'Variations in car crash-related hospitalization costs amongst young adults in New South Wales, Australia', *Injury*, vol. 43, no. 9, 2011, p. 1593.

<sup>671</sup> Bureau of Infrastructure Transport and Regional Economics, *Cost of road crashes in Australia 2006 - Report 118*, Department of Infrastructure, Transport Regional Development and Local Government, Canberra, 2009, p. v.

<sup>672</sup> Australian Automobile Association, *Reform of Fuel Tax and Other Motoring Taxes and Charges: Submission to Henry Review of Taxation*, Canberra, 2008, p. 18; National Transport Commission, *National Road Safety Partnership Program: Final Strategy*, Melbourne, 2013; Public Health Advocacy Institute of Western Australia (PHAIWA), 'Road Safety Summary Rationale Paper', viewed February 2014, <<http://www.phaiwa.org.au/component/attachments/download/142>>; Public Transport Users Association, *A Tax System for Sustainable Transport: Submission to the Review of Australia's Future Tax System*, Melbourne, 2008, p. 2.

<sup>673</sup> M P Kay, *National Highway Traffic Safety Administration Notes. Rehabilitation Costs and Long-Term Consequences of Motor Vehicle Injuries*, Department of Emergency Medicine, Center for Injury Prevention and Control, The George Washington University Medical Center, Washington, DC, 2007, p. 817; TR Miller, et al., 'Costs of crashes to government, United States, 2008', Paper presented at the *Annals of Advances in Automotive Medicine/Annual Scientific Conference*, Association for the Advancement of Automotive Medicine, Paris, 2011; R B Naumann, et al., 'Incidence and Total Lifetime Costs of Motor Vehicle-Related Fatal and Nonfatal Injury by Road User Type, United States, 2005', *Traffic Injury Prevention*, vol. 11, no. 4, 2010, pp. 353-360.

<sup>674</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Road crash costs*, SWOV, Leidschendam, 2011, p. 1.

<sup>675</sup> F M Streff, et al., 'Estimating costs of traffic crashes and crime: tools for informed decision making', *Journal of Public Health Policy*, vol. 13, no. 4, 1992, p. 451.

perceived to be an 'inexact science'<sup>676</sup> as the models attempt to derive costs for which there is no market value.<sup>677</sup>

According to a leading road safety researcher Rune Elvik, crash costs should meet certain eligibility criteria:

1. *Cost estimates should not be too old;*
2. *Cost estimates should include all road accidents including property-damage-only accidents and should adjust for incomplete accident reporting in official road accident statistics;*
3. *Cost estimates should at least include the direct and indirect costs of accidents, but preferably an economic valuation of the lost quality of life.*<sup>678</sup>

In its 1997 study, *The cost of injury to Victoria*, MUARC identified two key types of societal costs used to calculate injuries. These are:

1. Economic costs which refer to the direct costs of actual expenditure arising from the injury, such as medical costs (ambulance, hospital in-patient and emergency departments, general and specialist services); costs relating to the treatment and rehabilitation of the injury; and legal and property costs. Indirect costs associated with economic costs refer to the value of productivity losses resulting from injury or premature death;<sup>679</sup> and
2. Human costs which refer to aspects of wellbeing, including leisure, and pain and suffering. These costs are concerned with placing a value on reduced quality of life due to injury.<sup>680</sup>

A key difference between the two is that economic costs are easily measurable whereas human costs requires the concept of quality of life or pain and suffering to be translated into a monetary value, which is considered a highly challenging task. The road safety sector in Australia has typically relied on the HC approach, which strongly emphasises economic costs. However, there is increasing awareness of the need to consider human-

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<sup>676</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 6.

<sup>677</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1088.

<sup>678</sup> R Elvik, 'How much do road accidents cost the national economy?', *Accident Analysis & Prevention*, vol. 32, no. 6, 2000, p. 849.

<sup>679</sup> W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, pp. 3-4. See also J L Bastida, P S Aguilar and B D González, 'The economic costs of traffic accidents in Spain', *Journal of Trauma-Injury Infection & Critical Care*, vol. 56, no. 4, 2004, pp. 883-884; A García-Altés and K Pérez, 'The economic cost of road traffic crashes in an urban setting', *Injury prevention*, vol. 13, no. 1, 2007, p. 66; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 3.

<sup>680</sup> W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, p. 4.

related costs to accurately measure the true costs of serious injury and premature deaths resulting from road crashes.

In Australia, the BITRE is responsible for estimating the costs of road crashes in Australia. For its 2006 estimates, BITRE incorporated the following 10 components into its calculation of injury costs:

1. *Workplace and household output losses;*
2. *Medical and other related costs;*
3. *Ambulance costs;*
4. *Emergency services costs;*
5. *Long-term care costs;*
6. *Insurance administration costs;*
7. *Legal costs [comprising costs to the justice system, the costs of police attendance and investigations of road crashes, and imprisonment costs];*
8. *Workplace disruption costs;*
9. *Recruitment and re-training costs;*
10. *Non-pecuniary costs [loss of life and the pain and suffering of people injured in road crashes].*<sup>681</sup>

As part of its costing model, the BITRE also calculates fatality costs and vehicle costs. In New Zealand (NZ), the Ministry of Transport uses similar cost categories to determine the societal cost of road crashes,<sup>682</sup> as does Canada.<sup>683</sup> Based on the research literature, other cost components can include: property damage;<sup>684</sup> travel delays due to crashes;<sup>685</sup> private and public litigation costs; administrative costs to insurance companies; congestion costs;<sup>686</sup> carer costs; deadweight losses;<sup>687</sup> costs associated with equipment and

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<sup>681</sup> Bureau of Infrastructure Transport and Regional Economics, *Cost of road crashes in Australia 2006 - Report 118*, Department of Infrastructure, Transport Regional Development and Local Government, Canberra, 2009, p. 45.

<sup>682</sup> Ministry of Transport, *Social Cost of Road Crashes and Injuries: June 2012 update*, Wellington, 2012, p. i.

<sup>683</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 45; K Vodden, et al., *Analysis and estimation of the social cost of motor vehicle collisions in Ontario*, Transport Canada, Ontario, 2007, p. 107.

<sup>684</sup> J Connor and S Casswell, 'The burden of road trauma due to other people's drinking', *Accident analysis and prevention*, vol. 41, no. 5, 2009, p. 1100.

<sup>685</sup> J Connor and S Casswell, 'The burden of road trauma due to other people's drinking', *Accident analysis and prevention*, vol. 41, no. 5, 2009, p. 1102.

<sup>686</sup> B De Brabander and L Vereeck, 'Valuing the Prevention of Road Accidents in Belgium', *Transport Reviews: A Transnational Transdisciplinary Journal*, vol. 27, no. 6, 2007, p. 717. See also T Miller, et al., *HARM 2000: Crash Cost and Consequence Data for the New Millenium*, Associate for the Advancement of Automotive Medicine, Barrington, 2001.

<sup>687</sup> **Note:** A deadweight loss is the cost to the economy of transfer payments from one economic entity to another. In respect to injury, a deadweight loss is the cost of administering welfare pensions and raising additional taxation revenues because of foregone potential taxation (income and consumption) and welfare benefits. These

modifications to assist patients with daily living; and transportation costs.<sup>688</sup> In the Netherlands, costs relating to medical treatment, productivity, loss of quality of life, property damage, settlement and congestion form its costing methodology. The Dutch approach was introduced following a recommendation of the Commission of the European Communities in response to growing awareness of the need to monetise certain components that have no existing market price.<sup>689</sup>

Once costs are available for each component, they are aggregated and then multiplied by the number of injuries and deaths recorded in a jurisdiction.

### 6.1.2.1 The Value of a Statistical Life

The Value of a Statistical Life (VSL) is broadly understood to mean the marginal rate of substitution between income and fatality risk<sup>690</sup> or ‘an estimate of the financial value society places on reducing the average number of deaths by one’.<sup>691</sup> Importantly, it is not a measure of the value of a single actual life but rather it is the aggregation of the value of the WTP for infinitesimal risk reductions for different people that are aggregated to a single statistical life.<sup>692</sup> The way a VSL is calculated varies depending on the costing methodology employed. This is discussed in the next section.

The VSL is used by government agencies to guide expenditure in the areas of health and safety as it reflects the level of investment that can be justified for the saving of one life.<sup>693</sup> It is also referred to as:

*...the valuation of a change in risk such that one life will be saved, rather than the valuation of the worth of a life of a specified individual.*<sup>694</sup>

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represent a deadweight loss on the economy. See Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, Access Economics, Canberra, 2009, p. 68.

<sup>688</sup> Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, Access Economics, Canberra, 2009, pp. xiii-xiv.

**Note:** There are other costs being explored by academics in this area. One area of focus is emotional damage and grief suffered by those who have a loved one that has died. These types of costs represent ‘social pain, human cost, cost of pain, grief and suffering, non-monetary cost or intangible costs’, and are considered extremely difficult to measure. See R Pérez-Núñez, et al., ‘A qualitative approach to the intangible cost of road traffic injuries’, *International Journal of Injury Control and Safety Promotion*, vol. 19, no. 1, 2012, pp. 69-79. The impact of grief, has also been the subject of interest among Australian-based academics, for example research on bereavement costs by Dr Dennis Petrie at the University of Melbourne.

<sup>689</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Road crash costs*, SWOV, Leidschendam, 2011, p. 2.

<sup>690</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, p. xiii; Office of Best Practice Regulation, *Best Practice Regulation Guidance Note - Value of statistical life*, Department of Finance and Deregulation, Canberra, 2008.

<sup>691</sup> Office of Best Practice Regulation, *Best Practice Regulation Guidance Note - Value of statistical life*, Department of Finance and Deregulation, Canberra, 2008.

<sup>692</sup> T A Cameron, ‘Euthanizing the Value of a Statistical Life’, *Review of Environmental Economics and Policy*, vol. 4, no. 2, 2010., in C Doucouliagos, T D Stanley and M Giles, ‘Are estimates of the value of a statistical life exaggerated?’, *Journal of Health Economics*, vol. 31, no. 1, 2012, p. 197.

<sup>693</sup> K McMahon and S Dahdah, *The True Cost of Road Crashes: Valuing life and the cost of a serious injury*, International Road Assessment Programme (iRAP), Hampshire, 2008.

The Value of a Statistical Life Year (VSLY) is also used in economic analyses and refers to the marginal dollar value of a year of healthy human life.<sup>695</sup> The VSLY is considered an important measure to assess interventions that seek to avert injury and disease, most of which are not fatal.<sup>696</sup> In the context of road safety, however, there is a stronger focus on the VSL due to the incidence of fatalities and their role in driving the road trauma agenda.

Approaches employed to measure VSL values differ greatly across jurisdictions, often producing significant variations in the values. In 2007, the Australian Office of the Australian Safety and Compensation Council commissioned Access Economics to review different methodologies for valuing life, with the purpose of deriving accurate VSL values for use in BCA and CEA. Access Economics stated in its final report that the explicit development of a VSL to assist funding decisions is an important task for governments. Without a VSL, the value of injury and death is implied through decisions about funding for competing projects. However, by explicitly placing a value on life, the VSL ensures that values are well-considered and precise.<sup>697</sup>

In its final report, Access Economics identified VSL values from 244 studies (17 Australian and 227 international studies) between 1973 and 2007, covering the areas of health, occupational health and safety, transport, environment, and 'other'. A meta-analysis of the higher quality studies resulted in an average VSL of \$6.0 million in 2006 Australian dollars, with a range of \$5.0 million to \$7.1 million.<sup>698</sup>

## 6.2 Competing methodologies: Human Capital and Willingness-To-Pay

As mentioned earlier, the two prevailing methodologies for calculating the costs of crashes are the HC and WTP models. These are outlined below.

### 6.2.1 The Human Capital approach

The HC approach 'measures the cost of resources used or lost as a result of an injury or death.'<sup>699</sup> Estimates derived from the HC approach typically represent the largest

<sup>694</sup> K McMahon and S Dahdah, *The True Cost of Road Crashes: Valuing life and the cost of a serious injury*, International Road Assessment Programme (iRAP), Hampshire, 2008.

<sup>695</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, p. xviii.

<sup>696</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, p. xiii.

<sup>697</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, p. xiii; Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, Access Economics, Canberra, 2009, p. 27.

<sup>698</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, p. xiii.

<sup>699</sup> F M Streff, et al., 'Estimating costs of traffic crashes and crime: tools for informed decision making', *Journal of Public Health Policy*, vol. 13, no. 4, 1992, p. 451.

proportion of avoidable costs estimates.<sup>700</sup> It is an *ex post* approach, in that it assesses costs after a crash,<sup>701</sup> and it draws on accounting principles to estimate lost income.<sup>702</sup> It is based on the average expected earnings of individuals, which after injury are negatively affected. Consequently, the benefit of avoiding serious injury is determined by the present value of the lost income flow to the economy as a result of road crashes.<sup>703</sup> It is considered relatively straightforward and simple in its application, as it is typically based on reliable data and produces fairly consistent results.<sup>704</sup> Further, it is based on a strong theoretical foundation, thus providing decision-makers with useful information on which to make decisions.<sup>705</sup>

The HC approach to costing road crashes is widely used in Australia, including in Victoria. Austroads also employed this approach in its *2012 Guide to Project Evaluation*, which includes a June 2010 value of \$2,464,000 for a Victorian fatality and \$567,000 for a Victorian serious injury.<sup>706</sup>

The Committee is aware, however, that its use in international road safety jurisdictions is limited. A growing consensus exists both in Australia and internationally that the HC approach has disadvantages, leading to questions about its capacity to provide a true measurement of the value of life.<sup>707</sup> A commonly identified concern is that from a theoretical perspective it does not reflect the value society places on safety. For example,

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<sup>700</sup> H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 2.

<sup>701</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 7; VicRoads, *Submission*, no. 31, 17 May 2013, p. 8. PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. 8.

<sup>702</sup> J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 804; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 141; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 7.

<sup>703</sup> J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 805.

<sup>704</sup> M R J Baldock and A J McLean, *The economic cost and impact of the road toll on South Australia*, Centre for Automotive Safety Research, Adelaide, 2005, p. 1; Office of Road Safety WA, *Submission*, no. 24, 30 April 2013; J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 805.

<sup>705</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 10.

<sup>706</sup> F Tan, B Lloyd and C Evans, *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads, Sydney, 2012, p. 25.

<sup>707</sup> D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 692; K McMahon and S Dahdah, *The True Cost of Road Crashes: Valuing life and the cost of a serious injury*, International Road Assessment Programme (IRAP), Hampshire, 2008; R Tooth, *The cost of road crashes: A review of key issues*, LECG, Sydney, 2010, p. 11. J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 805.

people are more likely to value safety in order to minimise the risk of serious injury or death to themselves rather than as a means to maintain current and future productivity levels and earnings.<sup>708</sup>

As the HC approach views individuals as ‘productive entities’,<sup>709</sup> it can discriminate against those who are not in a position to contribute economically to society. According to Austroads, the HC approach yields very low values for children and the elderly because they do not contribute as much economic output compared to working adults.<sup>710</sup> Another key disadvantage is that the conventional HC approach ignores pain and suffering and quality of life or the enjoyment of life forgone as a result of a serious injury or fatality.<sup>711</sup> Consequently, it has been shown to produce lower crash costs, which in effect underestimates the true value of road safety interventions.<sup>712</sup> On this basis, it is argued that the HC approach provides incorrect values.<sup>713</sup>

Various Inquiry participants referred to the weaknesses of this approach in their evidence to the Committee, with a key weakness relating to the low values derived.<sup>714</sup> In her presentation, Professor Rebecca Ivers, Director of the Injury Division at the George Institute for Global Health, stated:

*It clearly has a lot of holes in it because it is very hard to actually take into account the income of people who are not working, community values and pain and suffering.*<sup>715</sup>

A similar conclusion was reached by Ms Margaret Prendergast, the General Manager of Policy and Regulation at the Centre for Road Safety at the Transport for NSW:

<sup>708</sup> J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 805; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 11.

<sup>709</sup> W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, p. 73.

<sup>710</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 11.

<sup>711</sup> J L Bastida, P S Aguilar and B D González, 'The economic costs of traffic accidents in Spain', *Journal of Trauma-Injury Infection & Critical Care*, vol. 56, no. 4, 2004, p. 884.

<sup>712</sup> K McMahon and S Dahdah, *The True Cost of Road Crashes: Valuing life and the cost of a serious injury*, International Road Assessment Programme (iRAP), Hampshire, 2008.

<sup>713</sup> J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 805.

<sup>714</sup> Aaron Cutter, Fellow, Actuaries Institute, *Transcript of evidence*, 5 August 2013, p. 162; Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 78; Janet Bolitho, President, Road Safety Action Group Inner Melbourne, *Transcript of evidence*, 22 July 2013, p. 5; Dr Matthew Legge, Road Safety Data Analyst, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 255; Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 22; Dr Richard Tooth, Director, Sapere Consulting, *Transcript of evidence*, 5 August 2013, p. 153; Transport Accident Commission, *Submission*, no. 35, 5 June 2013; VicRoads, *Submission*, no. 31, 17 May 2013; Victoria Police, *Submission*, no. 32, 21 June 2013.

<sup>715</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 141.

*We found that this [the HC approach] was not truly identifying what the community actually costs a death at. It fails to capture the actual value that individuals place on their lives and those of others, over and above current and future earnings. There was a concern that pure life fatality values were undervalued compared to what was developing...There were concerns that projects with really good road safety benefits were missing out on funding because other projects could derive larger benefits that did not really reflect the true cost to the community of road trauma.<sup>716</sup>*

These weaknesses were also noted by Mr Rex Deighton-Smith, Director and Principal at Jaguar Consulting:

*But if we continue the situation where very often at present we see RISs that use...[the] human capital approaches for serious injury valuation, again we can underestimate the value of any road safety measures that we might take.<sup>717</sup>*

In response to these issues, there have been attempts within the transport and road safety areas to employ a hybrid approach that considers the value of unpaid work and leisure, as well as loss of quality of life resulting from road crashes. This hybrid approach is discussed below.

## 6.2.2 The Hybrid-Human Capital approach

In 2006, BITRE developed the Hybrid-HC approach, which added pain and suffering and grief components (referred to as the human cost) into the existing HC costing methodology.<sup>718</sup> In summary, the changes included the following:

1. *Incorporate[ed] a notional value for the quality of life that would be lost by the unknown individual in the event of their premature death;*
2. *add[ed] a component to losses due to a premature death of a child to ensure negligible values are not assigned to this loss; and*
3. *adjust[ed] the loss attributed to the premature death of an elderly person, to ensure a zero value is not assigned to these losses.<sup>719</sup>*

Using the Hybrid-HC approach, the BITRE estimated that the annual cost of crashes was \$17.85 billion in 2006. It also undertook a sensitivity analysis using the WTP approach and calculated an annual cost almost \$10 billion higher at \$27.1 billion.<sup>720</sup> The values produced by BITRE, as incorporated into the Austroads report, *Economic Evaluation of*

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<sup>716</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

<sup>717</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 23.

<sup>718</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 78; F Tan, B Lloyd and C Evans, *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads, Sydney, 2012, p. 27.

<sup>719</sup> Bureau of Infrastructure Transport and Regional Economics, *Cost of road crashes in Australia 2006 - Report 118*, Department of Infrastructure, Transport Regional Development and Local Government, Canberra, 2009, p. 22.

<sup>720</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 167.



*Road Investment proposals: Improved Methods for Estimating Australian Unit Crash Costs*, are also used by VicRoads to calculate Victorian crash costs.<sup>721</sup>

Despite the use of a hybrid approach, the values produced by the BITRE are still considered by some to be conservative and significantly lower than the values likely to be produced using the alternative model of WTP.<sup>722</sup> VicRoads claimed in its submission that the limitations of the HC approach are said to remain.<sup>723</sup> Austroads noted that while the Hybrid-HC approach now included a pain, suffering and grief component, it is arbitrarily determined.<sup>724</sup> Further, it still does not reflect an individual's preference for reductions in the risk of premature death or injury. On the basis of these concerns, there have been calls to replace it with the WTP approach for use in policy analysis and evaluations.<sup>725</sup>

### 6.2.3 The Willingness-To-Pay approach

Inquiry participants who highlighted inadequacies with the HC and Hybrid-HC approaches identified the WTP model as the most appropriate alternative for calculating crash costs. The WTP approach is founded on principles of modern welfare economics<sup>726</sup> and has been used to measure costs and benefits since the 1960s.<sup>727</sup> It is based on the idea that costs can be derived by taking into account what people would be willing to pay to reduce the risk of being killed or injured in a road crash.<sup>728</sup> In contrast to the HC approach, WTP 'attempts to estimate the value of reducing fatal and injury risks rather than the costs of injury'.<sup>729</sup> It does so *ex ante*, or in advance of knowing whether a crash will occur.<sup>730</sup> The

<sup>721</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 7.

<sup>722</sup> T Risbey, M Cregan and H De Silva, 'Social Cost of Road Crashes', Paper presented at the *33rd Australasian Transport Research Forum (ATRF)*, Canberra, 2010, p. 3.

<sup>723</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 12.

<sup>724</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 7.

<sup>725</sup> D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 692; J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 802; T Risbey, M Cregan and H De Silva, 'Social Cost of Road Crashes', Paper presented at the *33rd Australasian Transport Research Forum (ATRF)*, Canberra, 2010, p. 3; R Tooth, *The cost of road crashes: A review of key issues*, LECG, Sydney, 2010, p. 11.

<sup>726</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1088; R Smith, S Jan and A Shiell, *What are Australians willing to pay for road safety? CHERE Discussion Paper No 21*, Centre for Health Economics Research and Evaluation (CHERE), Sydney, 1993, p. 3.

<sup>727</sup> Office of the Secretary of Transportation, *Memorandum To: Secretarial Officers Modal Administrators*, U.S. Department of Transportation, Washington, 2013, p. 1.

<sup>728</sup> A Morris, et al., 'An approach to the derivation of the cost of UK vehicle crash injuries', Paper presented at the *Annual Proceedings/Association for the Advancement of Automotive Medicine*, Association for the Advancement of Automotive Medicine, Chicago, 2006, p. 285.

<sup>729</sup> F M Streff, et al., 'Estimating costs of traffic crashes and crime: tools for informed decision making', *Journal of Public Health Policy*, vol. 13, no. 4, 1992, p. 452.

<sup>730</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 7. PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. 8.

WTP model is also viewed as a 'broader measure' that includes everything people value, in contrast to the HC approach which is viewed as a narrow, economic approach.<sup>731</sup>

The WTP approach determines the VSL value based on the amount individuals are willing to pay to reduce risks to their lives. The Institute for Road Safety Research (SWOV) in the Netherlands refers to WTP as 'the amount people are prepared to pay for a certain decrease in crash rate', which is then used to assign a price to risk reduction and ultimately the saving of statistical human lives.<sup>732</sup> It describes how such costs are produced using this approach:

*Suppose that people are willing to pay €60 for a crash rate reduction from 4 per 100,000 to 7 per 100,000. In that case 100,000 people are collectively prepared to pay  $100,000 \times 60 = €6$  million for an expected decrease from 7 to 4 fatalities. The VOSL [value of a statistical life] is then  $€6 \text{ million} \div 3 \text{ saved statistical lives} = €2 \text{ million per statistical life}$ .<sup>733</sup>*

Internationally, there is strong consensus among transport economists and other road safety professionals that the WTP approach is theoretically the most appropriate model to measure the value placed on life<sup>734</sup> and society's aversion to death and injury. It is also viewed as producing more robust values for the social cost of crashes,<sup>735</sup> and consistently higher results for crash costs in comparison to corresponding HC values.<sup>736</sup> Because these values represent individuals' WTP for a reduction in injury or death, they are seen to best reflect:

- *the family's monetary costs of illness, injury and death;*
- *the impacts on quality of life from injury;*
- *the sense of security derived from being safe and healthy; [and]*
- *people's aversion to gambling involuntarily with their lives and livelihoods.*<sup>737</sup>

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<sup>731</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 22.

<sup>732</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: The valuation of human losses of road deaths*, SWOV, Leidschendam, 2012, p. 1.

<sup>733</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: The valuation of human losses of road deaths*, SWOV, Leidschendam, 2012, p. 1.

<sup>734</sup> Bureau of Infrastructure Transport and Regional Economics, *Cost of road crashes in Australia 2006 - Report 118*, Department of Infrastructure, Transport Regional Development and Local Government, Canberra, 2009, p. 3; W L Watson and J Ozanne-Smith, *The cost of injury to Victoria*, Monash University Accident Research Centre Clayton, 1997, p. 7.

<sup>735</sup> F Tan, B Lloyd and C Evans, *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads, Sydney, 2012, p. 27.

<sup>736</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 141; Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 23; F Tan, B Lloyd and C Evans, *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads, Sydney, 2012, p. 28.

<sup>737</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 12.

According to Austroads, another outcome of using the WTP values for road safety project assessments is that road safety projects unable to secure funding previously, may now meet the threshold for funding because they provide greater monetary benefits through trauma reductions.<sup>738</sup> Further, the use of WTP values in the broader policy environment could result in a greater emphasis on road safety, and a greater overall focus on projects that have safety objectives compared to projects without safety objectives (i.e. road maintenance) as the safety RUEs will be of a higher value.<sup>739</sup> The WTP model is also deemed consistent with governments' objective to maximise social welfare.<sup>740</sup>

Beginning in the 1980s and 1990s, WTP has been adopted in a number of overseas jurisdictions including the USA,<sup>741</sup> the United Kingdom,<sup>742</sup> Sweden,<sup>743</sup> Canada,<sup>744</sup> NZ,<sup>745</sup> and Europe more generally.<sup>746</sup> In NZ, WTP values derived using stated preference (SP) surveys are available for minor, serious and fatal injuries and are produced by the NZ Ministry of Transport.<sup>747</sup> Using 2007 figures, the loss of life and life quality is valued at \$3.19 million (NZ). A serious injury is estimated to be 10% of the value of the VOSL and a minor injury at 0.4% of the VOSL.<sup>748</sup> The table below outlines the VSL values in five jurisdictions.

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<sup>738</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, pp. 23-24; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 12.

<sup>739</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 22.

<sup>740</sup> J Perovic and D Tsolakis, 'Valuing the social costs of crashes: is community's willingness to pay to avoid death or injury being reflected?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Adelaide, 2008, p. 812.

<sup>741</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 45.

<sup>742</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 79.

<sup>743</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 79.

<sup>744</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 45.

<sup>745</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 8.

<sup>746</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 45.

<sup>747</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 77.

<sup>748</sup> J Connor and S Casswell, 'The burden of road trauma due to other people's drinking', *Accident analysis and prevention*, vol. 41, no. 5, 2009, p. 1100.

**Table 1: International Values of a Statistical Life**

Jurisdiction	Value of a Statistical Life (VSL)	Method used to calculate the VSL
New Zealand	NZ\$3.77 million – fatality NZ\$401,000 – serious injury (2012 NZ\$ prices) <sup>749</sup>	Stated choice <sup>750</sup>
United Kingdom	£1.653 million (2010) £185,831 – serious injury <sup>751</sup>	Stated Preference
United States (Department of Transportation)	US\$9.1 million (2011)	Stated Preference
Sweden	US\$1.46 million (for an atemporal model) 2005 prices. It also excluded non-fatal crash injuries. <sup>752</sup>	Revealed Preference (Hedonic price function using information from the Swedish car market) <sup>753</sup>
Norway	Norwegian Kroners (NOK) 30.2 million – fatal NOK 22,9 million – very serious <sup>754</sup>	Stated Preference

In Australia, the Commonwealth Office of Best Practice Regulation determined in 2008 that the WTP model was the appropriate way to estimate the value of reductions in the risk of physical harm.<sup>755</sup> Despite this, road safety agencies have continued to use the HC approach to calculate crash costs. In his presentation to the Committee, Associate Professor Stuart Newstead, Associate Director of Injury Analysis and Data at MUARC noted the contrast between the approaches employed internationally and in Australia, stating that Australia was ‘very unusual in remaining one of the few jurisdictions that used human capital costs to value its road crashes’.<sup>756</sup> The Committee notes, however, the recent shift from the HC approach to WTP in NSW, the first jurisdiction in Australia to do so.

<sup>749</sup> Ministry of Transport, *Social Cost of Road Crashes and Injuries: June 2012 update*, Wellington, 2012, p. ii.

<sup>750</sup> J Connor and S Casswell, 'The burden of road trauma due to other people's drinking', *Accident analysis and prevention*, vol. 41, no. 5, 2009, pp. 1101-1102.

<sup>751</sup> Department for Transport and Transport Analysis Guidance (TAG), *The Accidents Sub-Objective: TAG Unit 3.4.1*, London, 2011, p. 3.

<sup>752</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 61.

<sup>753</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 55.

<sup>754</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 63.

<sup>755</sup> T Risbey, M Cregan and H De Silva, 'Social Cost of Road Crashes', Paper presented at the *33rd Australasian Transport Research Forum (ATRF)*, Canberra, 2010, p. 3.

<sup>756</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 94.

There are two ways to derive WTP values, including SP or choice surveys (sometimes based on standard gamble scenarios<sup>757</sup> and also referred to as contingent valuation), and revealed preference (RP) (also referred to as implicit or hedonic methods).<sup>758</sup> Each of these techniques have slightly different approaches, which are summarised below:

- Contingent valuation – survey respondents are asked their WTP for a particular good;
- Hedonic pricing – this approach assumes that a good or service is composed of a group of characteristics that together can be combined in ways that increase or decrease the benefit. The difference in price between different groupings is therefore the estimates of the WTP for certain characteristics OR estimates [of] the wage differential that employers must pay workers to accept riskier jobs, taking other factors into account;
- Revealed pricing – attempts to identify risk appetite through estimating the value of life based on differences in wages for occupations of different risks; and
- Standard gamble – respondents are given a scenario which includes their hypothetical involvement and provides them with different options of treatment based on a variety of risks.<sup>759</sup>

These two methods, SP and RP, are ‘typically used to impute monetary values or shadow prices that individuals place on their own health and well-being’,<sup>760</sup> things for which there are no market prices. These are described in further detail below.

### 6.2.3.1 Willingness-To-Pay using the stated preference method

The SP approach involves the use of surveys in which respondents are asked about their WTP for a private or a public good leading to a mortality risk reduction.<sup>761</sup> SP surveys are

<sup>757</sup> **Note:** Standard gamble experiments involve risk-risk trade-offs, which seek to determine the respondents subjective valuation of preventing one kind of physical harm relative to another. See PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. 10.

<sup>758</sup> Accent and RAND Europe, *Review of stated preference and willingness to pay methods*, Competition Commission, London, 2010, pp. 1-2; H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 2; R Smith, S Jan and A Shiell, *What are Australians willing to pay for road safety? CHERE Discussion Paper No 21*, Centre for Health Economics Research and Evaluation (CHERE), Sydney, 1993, p. 3.

<sup>759</sup> Office of the Secretary of Transportation, *Memorandum To: Secretarial Officers Modal Administrators*, U.S. Department of Transportation, Washington, 2013, p. 3; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 11.

<sup>760</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1089.

<sup>761</sup> N A Kruger and M Svensson, 'The impact of real options on willingness to pay for mortality risk reductions', *Journal of Health Economics*, vol. 28, no. 3, 2009, p. 563.

typically used when RP data is unavailable.<sup>762</sup> A commonly used SP survey method is contingent valuation (CV), which asks respondents of a representative sample to state their WTP for a risk reduction through either hypothetical or referenced questions, or their Willingness-To-Accept (WTA) compensation for a loss.<sup>763</sup> In these surveys, WTP values are derived by assessing respondent choices in situations where they rank or trade off various states of wellbeing (losses or gain) either against each other or for a monetary amount.<sup>764</sup> These valuations are then aggregated across the population to determine the VSL.

In Australia, surveys employed to derive WTP values typically rely on the CV method. An example of a CV survey approach in a road safety context is: 'participants are provided with a series of scenarios requiring people to choose between two routes with different levels of safety, travel time and other characteristics'.<sup>765</sup>

The three SP survey methods used to estimate the VSL are:

- *Ex-post: if you were experiencing condition x, how much would you be willing to pay for obtaining the benefits from intervention z?*
- *Ex-ante: if the chance of experiencing condition x were y%, how much would you be willing to pay for obtaining intervention z?*
- *Ex-ante (insurance based): what would you be willing to pay for an insurance against incurring costs for intervention z in case if condition x?*<sup>766</sup>

The SP method is viewed as having advantages over the RP method because it tailors survey questions and directly communicates the risk reduction benefits to respondents.<sup>767</sup> On this basis, it is considered a more sophisticated method because it provides survey participants with pairs of hypothetical but realistic scenarios, where they have to trade off travel attributes such as time, cost and number of casualty crashes in deciding which alternative to choose.<sup>768</sup>

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<sup>762</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1089.

<sup>763</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 349.

<sup>764</sup> Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, Access Economics, Canberra, 2009, p. 74.

<sup>765</sup> H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 3.

<sup>766</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, pp. 34-35.

<sup>767</sup> N A Kruger and M Svensson, 'The impact of real options on willingness to pay for mortality risk reductions', *Journal of Health Economics*, vol. 28, no. 3, 2009, p. 563.

<sup>768</sup> H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 3.

### 6.2.3.2 Willingness-To-Pay using the revealed preference method

As indicated earlier, the alternative method to measuring people's WTP is through RP, whereby individuals' behaviours are observed to determine the amount of money they are willing to pay to reduce the risk of premature death or injury, while performing risky activities.<sup>769</sup> On this basis, the RP method analyses market trade-offs between risk and money, and is based on subjective preferences. Essentially, by observing market prices, it is possible to identify the value placed by individuals on a given thing,<sup>770</sup> for example in road safety the price paid by consumers for additional safety features in vehicles to reduce their risk of death or injury.<sup>771</sup> According to the TAC, there has been a long tradition of using RP for WTP studies in the USA and Canada.<sup>772</sup>

Outside of the road safety context, the RP method generally focuses on wage differences between risky jobs.<sup>773</sup> In these studies, employees' WTP is observed (through reduced wages) for an improvement in workplace safety. The values derived this way are commonly used to estimate the VSL.<sup>774</sup> Some claim that the RP method is more advantageous than the SP method, because it is based on actual behaviours, rather than hypothetical survey questions. VicRoads made this point in its submission, indicating that in WTP studies it is better to use available RP data before commissioning SP studies.<sup>775</sup> In his presentation to the Committee, Dr Dennis Petrie, a Senior Research Fellow in the Melbourne School of Population and Global Health at the University of Melbourne also acknowledged the superiority of the RP method, suggesting it was the gold standard for evaluating people's WTP.<sup>776</sup>

## 6.3 Issues with the methods for deriving Willingness-To-Pay values

At the beginning of the Inquiry, there appeared to be overwhelming support for the use of the WTP model to calculate crash costs. However, throughout its investigations, the Committee came to understand some of the methodological concerns with WTP studies, and their potential adverse impact on the accuracy of final VSL values. In response, the Committee examined the role and feasibility of the WTP model to gain a better

<sup>769</sup> D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 692.

<sup>770</sup> Accent and RAND Europe, *Review of stated preference and willingness to pay methods*, Competition Commission, London, 2010, p. 4.

<sup>771</sup> Office of Best Practice Regulation, *Best Practice Regulation Guidance Note - Value of statistical life*, Department of Finance and Deregulation, Canberra, 2008.

<sup>772</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 45.

<sup>773</sup> N A Kruger and M Svensson, 'The impact of real options on willingness to pay for mortality risk reductions', *Journal of Health Economics*, vol. 28, no. 3, 2009, p. 563.

<sup>774</sup> Office of Best Practice Regulation, *Best Practice Regulation Guidance Note - Value of statistical life*, Department of Finance and Deregulation, Canberra, 2008.

<sup>775</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 11.

<sup>776</sup> Dr Dennis Petrie, Senior Research Fellow, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 230.

understanding of the key issues and how they might apply to road safety. Based on this evidence, the Committee acknowledges that criticisms of WTP are longstanding and that WTP values should be treated with scepticism.<sup>777</sup> One description noted by the Committee is that WTP is ‘of a ghostly nature that escapes precise empirical measurement’.<sup>778</sup>

There are a number of methodological issues associated with the way WTP studies derive VSL values, including bias, study design, and the capacity of respondents to make informed decisions about risk. Generally these issues arise from the use of SP survey methods, particularly CV, to derive WTP values, although there are also some limitations with the RP approach.

### 6.3.1 Bias

The most commonly cited issue with WTP values, particularly those derived using CV studies, is that they are ‘plagued by hypothetical bias’.<sup>779</sup> This is because SP surveys elicit hypothetical answers to questions based on hypothetical scenarios.<sup>780</sup> In his presentation to the Committee, Professor Anthony Harris, the Director of the Centre for Health Economics at Monash University, indicated the need to take caution when using hypothetical scenarios in SP studies:

*... [WTP] has the potential for bias in terms of numerous things, with hypothetical bias being the obvious one, because it is a hypothetical scenario; it is not a real one. By and large anyone can use actual studies — wage studies of course and travel cost studies — but most of the literature is based on hypothetical questions that people are asked. You are always open to bias, not just in terms of the way people respond but the way in which you frame the questions. In any of these surveys you are limited by what you can possibly ask people, the scenario you draw up. Any scenario is a snapshot of what you are trying to ask, so in that sense there is some bias built in.*<sup>781</sup>

On this basis, Professor Harris expressed scepticism at the usefulness of the CV method.<sup>782</sup> Similarly, researchers Hausman and Diamond argue that as this results in ‘a single purchase of an unfamiliar commodity it represents a guess as to what the

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<sup>777</sup> RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 31.

<sup>778</sup> L Hultkrantz, G Lindberg and C Andersson, ‘The value of improved road safety’, *Journal of Risk and Uncertainty*, vol. 32, no. 2, 2006.

<sup>779</sup> N A Kruger and M Svensson, ‘The impact of real options on willingness to pay for mortality risk reductions’, *Journal of Health Economics*, vol. 28, no. 3, 2009, p. 563.

<sup>780</sup> RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 25.

<sup>781</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 343.

<sup>782</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 343.



commodity might be worth, rather than an evaluation based on experience'.<sup>783</sup> Dr Gary Dolman, the Head of the BITRE, noted that while there are tools to try to correct this type of bias, values derived in this way cannot be perfect:

*...one of the weaknesses, potentially, of willingness-to-pay is that you are asking people hypothetical questions and they will give answers which might be somewhat different to the answer they would give if they were to actually come up with the dollars themselves...There are methods to try to correct for those biases that are inherent in the methodology, but I guess there is no way of being absolutely sure that the willingness-to-pay method, wherever the data is collected, is absolutely a pure measure. It is an estimate of something that is quite abstract.*<sup>784</sup>

A secondary aspect of hypothetical bias, referred to as non-commitment bias, is based on the notion that purchases in the market are based on spending real money, whereas responses to a SP survey are not.<sup>785</sup> While this may not entirely invalidate values derived using CV surveys, it certainly makes these values problematic and questionable. Dr Petrie from the University of Melbourne also provided the Committee with an example of this in the context of respondents estimating values relating to toll roads:

*It is very difficult to do, so often you get people who kind of overestimate how much they are really willing to pay in practice. They will state that they are willing to pay a lot when actually, when it comes down to it, it is probably a bit less. In Queensland they were trying to evaluate the benefit of tolls, and they asked people to state their preference in terms of how much they would use the toll road. They overestimated 10 times more than people actually used it. This is why the private company that built it went bust, mainly because this estimate was just so far out. Again, what people state is not always what they actually do, so there are a lot of problems with getting stated preferences, mainly because it is a tough question to ask; people are not very good at answering it, basically.*<sup>786</sup>

According to Professor Luke Connelly, Professor of Health Economics at the Australian Centre for Economic Research on Health, and the Centre of National Research on Disability and Rehabilitation Medicine at the School of Economics, University of Queensland, while WTP is theoretically preferable, the issues with the SP approach are difficult to overcome:

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<sup>783</sup> RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 25. Citing J A Hausman, *On Contingent Valuation Measurement of Nonuse Values*, Emerald Group Publishing Limited, New York, 1993, p. 13.

<sup>784</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 169.

<sup>785</sup> RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 26.

<sup>786</sup> Dr Dennis Petrie, Senior Research Fellow, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 229.

*It is not the concept of willingness-to-pay that is the source of the problem here; that is the right latent concept to be thinking about, I believe. The problem really is the method that is used to measure that phenomenon, and one of the chinks in the armour, I think, of the research that is currently being done on this question of how much you are willing to pay for a life year or a quality-adjusted life year is that although it does not use these traditional contingent [valuation] approaches, it tends to use a choice method called discrete-choice experiments, or stated-choice experiments. These are still stated preference measures; they are not revealed preference measures. Once again the question of hypothetical bias and all of these other potential sources of bias, I think, still exists in relation to the use of these newer methods, which certainly are more advanced in the way that they deal with people and try to minimise bias, but I think that once again the difference between what people say they will do and what they actually do in practice is likely to be fairly radical.<sup>787</sup>*

Professor Connelly also observed that despite attempts to overcome hypothetical bias through the CV method, leading economic academics are not yet convinced of the reliability of this method and it remains a 'subject of great controversy'.<sup>788</sup> He cited the critiques of Hausman and Diamond:

*More recently, just last year Jerry Hausman, in a very strident piece of criticism of contingent valuation approaches entitled 'Contingent Valuation — from Dubious to Hopeless', said this:*

*'Approximately 20 years ago, Peter Diamond and I wrote an article for this journal analysing contingent valuation methods (Diamond and Hausman 1994). At that time Peter's view was that contingent valuation was hopeless, while I was dubious but somewhat more optimistic. But 20 years later, after millions of dollars of largely government-funded research, I have concluded that Peter's earlier position was correct and that contingent valuation is hopeless'.<sup>789</sup>*

Professor Connelly also provided the Committee with an example of an Australian case study by Hausman, which reflects how CV studies are regarded in quasi-judicial settings but which is also relevant to the current context. The case study involved the Copyright Tribunal of Australia which was assessing the level of compensation that cable TV providers should pay to copyright owners for the retransmission of content on free-to-air broadcasts.<sup>790</sup> The study was conducted by two well-known and respected economists. A range of issues with the survey results, including the inability of respondents to reach

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<sup>787</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 353.

<sup>788</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 349.

<sup>789</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 349.

<sup>790</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 350.

logical valuations, led to the tribunal disregarding the CV evidence completely.<sup>791</sup> In its decision, the tribunal stated:

*...[a] person exercising quasi-judicial functions must...not spin a coin or consult an astrologer, but he may take into account any material which, as a matter of reason, has some probative value...If it is capable of having any probative value, the weight attached to it is a matter for the person to whom Parliament has entrusted the responsibility of deciding the issue...*

*[On that basis, it concluded that] Courts and tribunals must proceed on the basis of probative evidence, not speculation...We have such a level of doubt about the survey that we attach no weight to it.*<sup>792</sup>

The Committee is aware of biases, other than hypothetical bias, that can exist in SP studies. These include strategic,<sup>793</sup> first response, associated range, relational and importance,<sup>794</sup> compliance,<sup>795</sup> and publication selection biases.<sup>796</sup>

**Finding 18:** Willingness-To-Pay studies using stated preference methods, including those conducted using contingent valuation, are affected by hypothetical and other biases which make Value of a Statistical Life values derived from such methods unreliable.

<sup>791</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 351.

<sup>792</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 351.

<sup>793</sup> **Note:** Strategic bias occurs when a survey respondent provides a WTP value that differs from their true value in 'an attempt to influence the provision of a good, and is considered to be a significant problem in estimating true WTP values'. See RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 28.

<sup>794</sup> **Note:** It has also been suggested that survey respondents have difficulty determining their maximum WTP for a commodity/good, and instead try to establish this using another means. How they then determine their value range can be affected by starting or first response bias (where the survey method indirectly or directly introduces a potential WTP amount), associated range bias (where the survey presents a range of WTP amounts which include the WTP value given by the respondent), relational bias (where a description of the good presents information to the respondent about its relationship to other private or public goods that includes the WTP value given) and importance bias (where the act of being interviewed about the good suggests it must have some value). See RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 22.

<sup>795</sup> **Note:** Compliance bias arises when the survey respondent is led or pushed by the interviewer or wishes to give a WTP value that is different to their true WTP, in order to please the interviewer. RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 26.

<sup>796</sup> **Note:** One approach used to derive WTP values is to use meta-analysis studies. These studies bring a number of VSL studies together, and average out the VSL values to produce an overall VSL value for policy makers. However, an underreported issue associated with this approach is publication selection bias, which occurs when researchers only publish statistically significant and positive VSL values. Because there is a reduced probability that insignificant or negative VSL values are reported and published, WTP values derived using meta-analysis can be problematic. See C Doucouliagos, T D Stanley and M Giles, 'Are estimates of the value of a statistical life exaggerated?', *Journal of Health Economics*, vol. 31, no. 1, 2012, pp. 197, 199, 203, 205.

### 6.3.2 The capacity of respondents to assess and value risk

Another longstanding concern with WTP derived using SP surveys is the capacity of respondents to assess and value risk. The WTP model presumes that people respond rationally to very small variations in the risk of death despite them having no way of knowing these probabilities.<sup>797</sup> Researchers have noted that people are insensitive to the scale of reductions in risk used in CV studies for two reasons: it is difficult in survey questions for respondents to perceive and communicate small probabilities, and it is cognitively difficult to translate small risk reductions into monetary benefit.<sup>798</sup>

Professor Jeff Richardson, the Foundation Director of the Centre for Health Economics within the Faculty of Business and Economics at Monash University advised the Committee of the issues associated with the limited capacity of people to understand and process probabilities in order to assess risk.<sup>799</sup> Professor Richardson explained that large variations in WTP estimates of VSL values could be due to this.<sup>800</sup> He also stated:

*...the numbers you get out of it are deeply problematical...people cannot handle probabilities when they are given them. There are two approaches to this. You could try to look at what people actually do pay, implicit in the wages when they are in a risky job or various other activities, but that is tremendously context specific and gives huge variation in the answers. Another approach to it — the most common one now — is stated preference, and there are very sophisticated techniques to ask people 'What is your willingness to pay when there is risk?'. But people have great difficulty with that.*<sup>801</sup>

The comments of Professor Richardson are supported by empirical evidence. As early as 1993, research undertaken by the Centre for Health Economics Research and Evaluation (CHERE) found that a majority of people are unable to comprehend probability concepts, making their responses to the survey essentially meaningless.<sup>802</sup> Further, other research determined that individuals tend to over-assess low probability events and under-assess high probability events compared to objective risks.<sup>803</sup> There is also a risk of optimism bias. This arises when people who do not experience adverse consequences from their

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<sup>797</sup> L Martin, 'External accident costs of motor vehicles revisited', Paper presented at the *28th Australasian Transport Research Forum*, Staff Paper, Department of Transport and Regional Services, Sydney, 2005.

<sup>798</sup> O Johansson-Stenman and P Martinsson, 'Are some lives more valuable? An ethical preferences approach', *Journal of Health Economics*, vol. 27, no. 3, 2008, p. 740.

<sup>799</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 377.

<sup>800</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 377.

<sup>801</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 379.

<sup>802</sup> R Smith, S Jan and A Shiell, *What are Australians willing to pay for road safety? CHERE Discussion Paper No 21*, Centre for Health Economics Research and Evaluation (CHERE), Sydney, 1993, p. 5; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 12.

<sup>803</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 862.

driving or other activities place a higher value on a negative consequence if one occurs, which has an impact on their WTP.<sup>804</sup> This situation is further complicated by the fact that in some instances people actually gain utility from taking risks.<sup>805</sup>

The capacity of a SP survey to derive accurate WTP values has also been shown to be affected by other issues relating to survey respondents. One issue is protest responses, whereby survey respondents purposefully respond to survey questions in a way that undermines the survey, and does not reflect their true preferences or real WTP value.<sup>806</sup> Another issue is the impact of fatigue on participants which can lead to frustration and afflicted responses.<sup>807</sup> Further, framing effects, where the question is set in a way that makes it positive or negative,<sup>808</sup> can affect survey responses, as can non-response errors.<sup>809</sup>

The inability of survey respondents to answer questions about risk is directly linked to the values produced using the SP method. According to Curtin-MUARC researchers Hendrie and Miller, a central disadvantage of the WTP approach is the inability to obtain reliable estimates. This may explain the wide range of empirical estimates from various studies.<sup>810</sup> A meta-analysis of VSL values published in the *Journal of Health Economics* concluded that while WTP was the 'most suitable method for measuring individual preferences in matters of risk, its theoretical properties are rather fragile'.<sup>811</sup> In assessing different studies as part of their analysis, the researchers found 'wide discrepancies in the values obtained, which poses a problem for public decision-makers'.<sup>812</sup> It was suggested that a

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<sup>804</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 862. See R Tooth, *The cost of road crashes: A review of key issues*, LECG, Sydney, 2010, p. 26.

<sup>805</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 12.

<sup>806</sup> Dr Dennis Petrie, Senior Research Fellow, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 230; RD Smith, AH Harris and JA Olsen, *A review of methodological issues in the conduct of willingness-to-pay studies in health care I: Construction and specification of the contingent market*, Centre for Health Program Evaluation, West Heidelberg, 1999, p. 28.

<sup>807</sup> For a more complete list of biases in stated preference methods, see Accent and RAND Europe, *Review of stated preference and willingness to pay methods*, Competition Commission, London, 2010, p. 33.

<sup>808</sup> For a more complete list of biases in stated preference methods, see Accent and RAND Europe, *Review of stated preference and willingness to pay methods*, Competition Commission, London, 2010, p. 33.

<sup>809</sup> Accent and RAND Europe, *Review of stated preference and willingness to pay methods*, Competition Commission, London, 2010, p. 62.

<sup>810</sup> D Hendrie and T Miller (eds), *Measuring the costs of road trauma and its longer term consequences*, Curtin-Monash Accident Research Centre, Bentley, 2013, p. 17.

<sup>811</sup> F Bellavance, G Dionne and M Lebeau, 'The value of a statistical life: A meta-analysis with a mixed effects regression model', *Journal of Health Economics*, vol. 28, no. 2, 2009, p. 457.

<sup>812</sup> F Bellavance, G Dionne and M Lebeau, 'The value of a statistical life: A meta-analysis with a mixed effects regression model', *Journal of Health Economics*, vol. 28, no. 2, 2009, p. 457.

VSL that does not adequately reflect citizens' WTP may cause public authorities to make incorrect decisions.<sup>813</sup>

**Finding 19:** A key issue associated with stated preference studies, including those conducted using contingent valuation, is the inability of participants to understand and price risk accordingly.

### 6.3.3 The study design of stated preference surveys

The study design of SP surveys can also adversely affect the accuracy of WTP values derived from them. This is particularly relevant to the sample size, with age, demographics (the community one belongs to), wealth or income,<sup>814</sup> union membership (which leads to higher WTP values), the type of job held by respondents (white collar versus blue collar),<sup>815</sup> and the probability of death<sup>816</sup> all being shown to impact on the robustness of WTP values.

Research has shown that VSL values can decrease as age increases.<sup>817</sup> Conversely, a younger person with longer to live is likely to indicate a higher WTP.<sup>818</sup> A person's health status can also affect survey responses (by lowering the VSL value).<sup>819</sup> When coupled with age, these survey respondent attributes can lead to values which are quite different to those of the general population.<sup>820</sup>

The SP method can also be affected by the 'wealth effect' in that wealthier respondents are likely to be willing to pay a higher price, thus increasing the VSL value.<sup>821</sup> One way of controlling this impact was explored in a CV survey carried out in Sweden, in which

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<sup>813</sup> F Bellavance, G Dionne and M Lebeau, 'The value of a statistical life: A meta-analysis with a mixed effects regression model', *Journal of Health Economics*, vol. 28, no. 2, 2009, p. 457.

<sup>814</sup> Dr Dennis Petrie, Senior Research Fellow, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 230.

<sup>815</sup> **Note:** Research also suggests that the availability of workplace-accident compensation can have a role in WTP values derived using hedonic wage based analyses. Jobs with high risk may be less well paid, if there is accident compensation. In this way, salaries are lower thus affecting the hedonic wage compensation. See F Bellavance, G Dionne and M Lebeau, 'The value of a statistical life: A meta-analysis with a mixed effects regression model', *Journal of Health Economics*, vol. 28, no. 2, 2009, p. 450.

<sup>816</sup> F Bellavance, G Dionne and M Lebeau, 'The value of a statistical life: A meta-analysis with a mixed effects regression model', *Journal of Health Economics*, vol. 28, no. 2, 2009, p. 450.

<sup>817</sup> O Johansson-Stenman and P Martinsson, 'Are some lives more valuable? An ethical preferences approach', *Journal of Health Economics*, vol. 27, no. 3, 2008, p. 740.

<sup>818</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 853; Office of Best Practice Regulation, *Best Practice Regulation Guidance Note - Value of statistical life*, Department of Finance and Deregulation, Canberra, 2008.

<sup>819</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 853.

<sup>820</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 854.

<sup>821</sup> See H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 854; R Tooth, *The cost of road crashes: A review of key issues*, LECG, Sydney, 2010, p. 17.

respondents were excluded if they indicated a WTP that exceeded 5% of their household income, among other exclusionary factors.<sup>822</sup> The study found that the types of questions asked also affected WTP valuations. For example, where a respondent first answered a question on their WTP to reduce their background risk prior to answering a specific question about their WTP for a road-mortality risk reduction, the WTP stated was more than 100% higher compared to other respondents.<sup>823</sup> The Committee understands, however, that some academics believe the wealth effect can be overcome by using a representative survey sample that reflects the wealth distribution found in the broader community.

The use of a large, representative sample from which to draw responses is essential to overcome the issues raised above. If a SP study is not well-designed, this in itself may unduly affect any values it produces. The age, licence status, road user group and other demographic factors can all affect the valuations produced in a SP study. For example, the NSW WTP study (discussed in Chapter Seven) only included pedestrians and car drivers.<sup>824</sup> In contrast, a WTP study in Singapore comprised separate SP surveys based on respondents' preferred transport mode (i.e. car, motorcycle, bus, Mass Rapid Transit (MRT) or taxi).<sup>825</sup> Given that the road user population is diverse, with the various groups having a different appreciation of risk,<sup>826</sup> the Committee believes it is important that the study sample reflect this diversity.

A related factor to study design is whether VSL values derived from a sample group, which might include participants affected by age or health conditions, can be applied to the population as a whole, a process referred to as benefit-transfer. The literature suggests it is questionable whether subgroups within the population based on age, sex and race should have their own VSL estimates.<sup>827</sup> Such considerations make demographic

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<sup>822</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 857.

<sup>823</sup> H Andersson, 'Willingness to pay for road safety and estimates of the risk of death: Evidence from a Swedish contingent valuation study', *Accident Analysis & Prevention*, vol. 39, no. 4, 2007, p. 861.

<sup>824</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 33.

<sup>825</sup> H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 7.

<sup>826</sup> **Note:** Different road user groups are likely to have different attitudes towards risk, and therefore its valuation in a WTP survey situation. By way of example, this Committee examined the attitudes towards risk by motorcyclists as part of its *Inquiry into Motorcycle Safety*. It found that motorcyclists had positive attitudes towards the risks of riding (in that they identified that there were risks), but had a higher threshold for risk. Refer to Chapter 7, Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012.

<sup>827</sup> **Note:** While the US Department of Transportation does not believe it is necessary to undertake individual surveys for different groups (see Office of the Secretary of Transportation, *Memorandum To: Secretarial Officers Modal Administrators*, U.S. Department of Transportation, Washington, 2013, p. 3.), other researchers have noted that age is a factor in determining VSL (although that is dependent on the methodology used to derive the values), thus suggesting that this question remain open. For a discussion of these issues, refer to O Johansson-Stenman and P Martinsson, 'Are some lives more valuable? An ethical preferences approach', *Journal of Health Economics*, vol. 27, no. 3, 2008, p. 740. and to J E Aldy and W K Viscusi, 'Adjusting the value of a statistical life for age and cohort effects', *The Review of Economics and Statistics* vol. 90, no. 3, 2006.

diversity a critical component in any survey sample, particularly given the impact of age and road user group on assessments of risk. Given the potential of these factors to impact the final VSL value, the Committee believes these issues would need to be overcome in designing any SP WTP study.

On the basis of the issues identified in this section with the SP method, the Committee believes that WTP studies using this method are likely to produce unreliable and problematic values.

**Finding 20:** Given the issues of bias and the capacity of respondents to evaluate risk, the use of the Willingness-To-Pay approach based on stated preference methods is inappropriate for calculating the costs of crashes in Victoria.

### 6.3.4 Outcomes of methodological issues with the stated preference method

A commonly identified concern with the WTP model is the large variation in VSL values, which arise largely from methodological issues with the SP method. The variability in values has also been noted in international jurisdictions. For example, Canadian WTP values used to calculate crash costs in Ontario are symptomatic of this variability. In 2004 dollars, the Ontario values had an upper band of \$19.7 million, a lower band of \$7.5 million and a mean value of \$13.6 million for a fatality.<sup>828</sup> This issue was also identified by the US Department for Transportation which, using a meta-analysis of VSL estimates, found great variability and excluded some figures on the grounds of them being implausibly high.<sup>829</sup>

The level of variation in crash figures extends to those used in RISs. For example, the RIS drafted for the *Road Safety (Driver) Regulations 2009*, VicRoads, citing the Australian Safety and Compensation Council, referred to value of life figures ranging from \$0.2 million to \$117 million, but recommended a value of \$6 million. VicRoads surmised that this level of variation was due to the different methodologies employed to estimate the components used in valuing life. As an example, it referred to studies that considered tangible costs to society when someone is killed, versus other studies that focused on respondents' WTP to save their own life.<sup>830</sup> For the purposes of the RIS, VicRoads relied on the Austroads' unit person costs as a minimum threshold.<sup>831</sup>

<sup>828</sup> K Vodden, et al., *Analysis and estimation of the social cost of motor vehicle collisions in Ontario*, Transport Canada, Ontario, 2007, p. 31.

<sup>829</sup> Office of the Secretary of Transportation, *Memorandum To: Secretarial Officers Modal Administrators*, U.S. Department of Transportation, Washington, 2013, p. 6.

<sup>830</sup> VicRoads, *Road Safety (Drivers) Regulations 2009: Regulatory Impact Statement - Final Version*, Kew, 2009, p. 44.

<sup>831</sup> VicRoads, *Road Safety (Drivers) Regulations 2009: Regulatory Impact Statement - Final Version*, Kew, 2009, p. 44.



The other issue associated with SP derived WTP values, is that monetary estimates for VSL are considered to be ‘systematically higher than the HC based equivalents’.<sup>832</sup> High crash costs and variations in values are argued to be the ‘main criticism of the WTP approach’.<sup>833</sup> SP survey methods, particularly the more widely used CV method (in both terms of the number of studies and countries in which it has been used), have been shown to result in the highest crash cost estimates, costs which are inconsistent with the valuation of travel time savings and vehicle operating costs.<sup>834</sup> For example, in its *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads noted that the NSW WTP estimates appear to be on the ‘upper band when compared against International WTP estimates’.<sup>835</sup>

In contrast to SP studies, RP studies have been found to produce lower VSL values. This is because RP studies refer to policy measures or choices that are actually implemented, whereas SP studies use hypotheticals.<sup>836</sup>

### 6.3.5 The Revealed Preference method as the alternative

The Committee understands that these factors in terms of study design, as well as the biases discussed earlier, have led some to argue that the RP method, using hedonic wages studies, is superior to the SP method, a point supported by Professor Connelly from the University of Queensland:

*These days my confidence in the hedonic wage studies is reflected due to the fact that the data is very good; it is very reliably collected because workplace stats are well recorded, wages and income information is, for the most part, well captured and the statistical or econometric techniques that are used to try to address these problems of sample selection bias and other things that happen in observational settings where you cannot randomise the intervention are sufficiently sophisticated but the influence of those problems of noise are minimised.*<sup>837</sup>

According to the Netherlands Institute for Road Safety Research, RP studies are preferable to SP studies.<sup>838</sup> Further, the Australian Safety and Compensation Council report, *The health of nations: the value of a statistical life*, noted that RP studies are

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<sup>832</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, Presentation to Committee: 'Valuation of Serious Injury Costs', 22 July 2013. See also L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1089.

<sup>833</sup> Dr Richard Tooth, Director, Sapere Consulting, *Transcript of evidence*, 5 August 2013, p. 153.

<sup>834</sup> H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 3.

<sup>835</sup> F Tan, B Lloyd and C Evans, *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads, Sydney, 2012, p. 28.

<sup>836</sup> A de Blaeij, et al., 'The value of statistical life in road safety: a meta-analysis', *Accident Analysis & Prevention*, vol. 35, no. 6, 2003, p. 984.

<sup>837</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 355.

<sup>838</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: The valuation of human losses of road deaths*, SWOV, Leidschendam, 2012, p. 2.

superior because they measure real-world, empirical, binding market transactions, and are self-validating since the WTP is derived from actual risk taking behaviour.<sup>839</sup> The report also noted, however, that this method has a number of limitations, due to asymmetries and imperfect information in labour markets and variability in the level of base risk. The Committee is also aware that in terms of their applicability to road safety, RP studies can be limited, because the purchase of certain equipment is not a separate choice (i.e. an airbag will be one part of an accessories package) and others are mandatory (i.e. seatbelts).<sup>840</sup> The researchers Kruger and Svensson noted that the RP method relies on the assumption that respondents are aware of the objective risk reductions.<sup>841</sup> However, it appears that the usefulness of this method is limited by people's incapacity to correctly estimate the value of risks, which requires the purchasing of a safety device to reduce them.<sup>842</sup> This is said to be due to risk changes related to a fatal crash being too small to calculate, making it difficult for people to judge them correctly.<sup>843</sup>

Another limitation of the RP method is that it is based on *ex post* analysis of observed behaviour and does not consider the dynamic nature of the decision-making process. The former Roads and Traffic Authority of NSW in its *Economic valuation of safety benefit Serious injury* report found that the RP method was difficult to apply in practice as data on observations of people's travel behaviour are usually not based on choices made in the face of explicit safety risks. It was for these reasons that it chose to use SP surveys when undertaking its own WTP study.<sup>844</sup>

**Finding 21:** Willingness-To-Pay values derived using the revealed preference method is preferable to those derived using stated preference, although it is more limited in what it can price in terms of actual behaviours based on assessments of crash risk.

<sup>839</sup> Access Economics, *The health of nations: the value of a statistical life*, Australian Safety and Compensation Council, Canberra, 2008, p. xvi.

<sup>840</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: The valuation of human losses of road deaths*, SWOV, Leidschendam, 2012, p. 2.

<sup>841</sup> N A Kruger and M Svensson, 'The impact of real options on willingness to pay for mortality risk reductions', *Journal of Health Economics*, vol. 28, no. 3, 2009, p. 563.

<sup>842</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: The valuation of human losses of road deaths*, SWOV, Leidschendam, 2012, p. 2..

<sup>843</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: The valuation of human losses of road deaths*, SWOV, Leidschendam, 2012, p. 2..

<sup>844</sup> PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. 11.

## 6.4 Other models for calculating crash costs

Throughout the Inquiry, WTP and HC were presented to the Committee as the two current approaches to calculate crash costs. However, the Committee is aware of alternative costing methodologies, and investigated their suitability to provide a broader assessment of the most appropriate way to calculate serious injury costs. Some of the areas that calculate costs for policy and compensation purposes are outlined below.

### 6.4.1 Judicial awards in compensation cases

An alternative cost methodology is the use of court-based compensation awards (in torts cases) to measure the value of lost health related quality of life.<sup>845</sup> Citing USA research, researchers Connelly and Supangan suggested that using court-based awards may be a reasonable alternative to WTP methods for the purposes of assessing pain and suffering values.<sup>846</sup> During his appearance before the Committee, Professor Connelly from the University of Queensland explained:

*Once again, there is some literature on this question of whether or not court awards accurately reflect willingness-to-pay values. One of the more recent studies I am aware of used about 1200 settlements in the US for product liability and intentional assault personal injury cases. They use quality-adjusted life year weights, and then they use awards for injuries they are able to identify in the claims database matched to some QALY [Quality-Adjusted Life Years] measure that has been validated by clinicians, and then they impute from that what the value of the statistical life would be, given the proportion of what we refer to in Queensland as whole-person impairment. What they find is that actually the range they estimate is not very far away from the revealed preference studies I have been talking about. By contrast, some of the work on how juries versus judges, for example, award damages is more equivocal, although it tends to show that jury-based awards for general damages, and in particular non-economic loss, tend to be subject to more variance than judge-based rulings.<sup>847</sup>*

The potential of using compensation cases to assess the costs of crashes is an interesting area that has great potential given the focus on pain and suffering in judicial awards. The Committee is of the view that this approach may have future applications in road safety, particularly given the operation of the transport accident compensation scheme which is discussed in the following pages.

<sup>845</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1089.

<sup>846</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1089.

<sup>847</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 353.

## 6.4.2 Quality-Adjusted Life Years and Disability-Adjusted Life Years

As discussed in Chapter Three, Quality-Adjusted Life Years (QALYs) and Disability-Adjusted Life Years (DALYs) are increasingly being identified as providing important tools to measure the impact of road trauma. Some Inquiry participants also advised the Committee of their value in monetising the costs of such trauma, due to their value in assessing health initiatives. Professor Connelly from the University of Queensland outlined how QALYs are employed in the health area for economic analysis:

*In the health sector interventions are rarely assessed by monetising their benefits. Usually a special form of cost-effectiveness analysis is used called cost-utility analysis. It uses a measure that combines the quantity and the quality of life, usually a quality-adjusted life year, as the denominator. The purpose of the cost-effectiveness analysis in the health sector — cost-utility analysis — is to compare the cost per quality-adjusted life year saved. In theory if all the health sector interventions are evaluated in a similar way, then comparisons across those could be made and we could compare quite different interventions that have consequences for the quantity or quality of life or both. Under particular assumptions, that information can be used to maximise the social benefit that is created from the distribution of the health budget across its possible purposes.*<sup>848</sup>

Professor Richardson from Monash University also raised the use of QALYs as an alternative to monetary or VSL based methodologies, noting that its strength over the WTP approach is that it measures the quality of life gained rather than valuing risk.<sup>849</sup> Professor Richardson also considered the QALY/DALY approach to be much less problematic than the WTP model.<sup>850</sup> Similarly, Professor Harris from Monash University, supported the use of QALYs, drawing on its use in the assessment of pharmaceutical drugs:

*...Australia has a very sophisticated and refined system of evaluating pharmaceuticals prior to their reimbursement in the national subsidy scheme, the pharmaceutical benefits scheme. That involves elaborate evidence being presented on each program — each drug, if you like — including economic evaluation and valuations of health outcomes. The technique that has been used since 1993 has been to assume that what we are doing is trying to maximise a budget for health; so, we have a fixed budget for health, and we are trying to maximise health outcomes where health outcomes are measured by life years saved, adjusted for quality — what are called quality-adjusted life years.*<sup>851</sup>

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<sup>848</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 348.

<sup>849</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University Accident Research Centre, Presentation to Committee: 'Presentation to the Road Safety Committee at the Parliament of Victoria', 28 October 2013, p. 22.

<sup>850</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 376.

<sup>851</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 341.

Further, Professor Harris explained the difference between the approaches used in health and road safety:

*...this is in contrast to what has been happening in road safety, which has been using an explicit value for outcomes — a monetary value — and working on the assumption that we can rank programs on the basis of their net benefits. In health what we have been doing is assuming that we have a fixed budget, ranking things in terms of cost per health outcome — quality-adjusted life years — basically running down the list until we run out of money. That has been the allocation process in principle. The practical differences include that we do not have to explicitly put a monetary value on life, which clearly is what has been happening in road safety.<sup>852</sup>*

However, Professor Harris also cautioned that while this approach is worth assessing for its applicability in road safety, there might be limits to it:

*The other issue is that we recognise a constrained budget by this kind of routine economic evaluation of every intervention and looking at its incremental cost and benefits. The disadvantage, I guess, with respect to road safety is that at least in health the outcomes are somewhat singular — it is health — whereas in road safety you may have multiple outcomes, including travel time and other aspects of the road which you take account of. It may well be that the kind of techniques we are using in health may be less appropriate; however, if you are focusing just on road safety, it seems to me they are sufficiently similar that you may want to look at what has been done.<sup>853</sup>*

A concern with employing QALYs to calculate crash costs is that its threshold is undefined by economists which, when assessing the feasibility of investment projects, makes it difficult to determine the point at which they are no longer appropriate for implementation.<sup>854</sup> Further, researchers such as Connelly and Supangan have suggested that while QALYs and DALYs can be used to value the quality of life lost as a result of a crash, these measures are best used when an outcome has been set (i.e. a reduction in road crashes) and the remaining question is the best way to achieve that (in terms of which intervention has the highest QALYs or lowest DALYs). However, when monetising health outcomes, for example as part of a BCA, it is necessary to use values for injuries and deaths.<sup>855</sup>

The Committee notes that based on its recommendations in Chapter Four regarding the use of QALYs and DALYs in the road safety area, it is also worth exploring the feasibility of

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<sup>852</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 341.

<sup>853</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 341.

<sup>854</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University Accident Research Centre, Presentation to Committee: 'Presentation to the Road Safety Committee at the Parliament of Victoria', 28 October 2013, p. 22.

<sup>855</sup> L B Connelly and R Supangan, 'The economic costs of road traffic crashes: Australia, states and territories', *Accident Analysis & Prevention*, vol. 38, no. 6, 2006, p. 1089.

their use to assess road safety interventions. Given that injuries and their prevention is a key concern in both health and road safety areas, the Committee believes that QALYs and DALYs should be explored as methods to calculate the impact, rather than the costs, of crashes.

**Finding 22:** Quality-Adjusted Life Years and Disability-Adjusted Life Years could provide an alternative costing methodology for the purposes of road safety evaluations and regulatory assessments.

### 6.4.3 Cost of Illness studies

In its submission, the Department of Health (DoH) raised the possibility of using the Cost of Illness (COI) approach to calculate crash costs:

*In COI studies the costs arising from the use of health care and other resources due to the occurrence of disease or injury are summarised in monetary terms...COI studies can, in principle, deal with the many other repercussions for the individual, his/her family and society that may ensue following the occurrence of injury.<sup>856</sup>*

Studies using the prevalence approach measure the economic burden of each patient with a particular disease or injury within a given period (usually one year).<sup>857</sup> The Committee notes the use of the COI approach to assess the social costs of injured people due to road crashes in Catalonia, Spain, which used a COI based on the prevalence approach to assess such costs. While it is unclear exactly what application COI approaches could have in Victorian road safety, the Committee wishes to note that such an approach might offer additional insights into the burden of road crashes.

### 6.4.4 Occupational Health and Safety

The Committee understands that calculating the costs of serious injury is uncommon in many areas of regulation, although it is done in the OH&S area.<sup>858</sup> As with transport accident compensation, the OH&S regulator, WorkSafe Victoria, and the Victorian courts make assessments of workplace injuries that include serious injuries. These are made in reference to the *Accident Compensation Act 1985* (Vic) which includes a definition of a

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<sup>856</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 20.

<sup>857</sup> A Riewpaiboon and P Piyauthakit, 'Economic burden of road traffic injuries: a micro-costing approach', *The South East Asian Journal of Tropical Medicine and Public Health* vol. 39, no. 6, 2008, p. 1141.

<sup>858</sup> **Note:** Assessments of the cost of an injury are also undertaken in the personal injury areas (for example injuries suffered by a person in a shop, a sidewalk or a sporting ground), separate to those personal injury claims made in the transport and workplace. In such cases, Victorian courts assess costs (referred to in such cases as special and general damages) by reference to the injury, pain and suffering and loss of income (including future loss) among others. The *Wrongs Act 1958* (Vic) and the common law provide the courts with a framework for making these assessments.

'serious injury'<sup>859</sup> and refers to considerations of pain and suffering and the loss of earning capacity when making assessments.<sup>860</sup>

Compensation for a workplace serious injury can include lost income,<sup>861</sup> medical and like services (i.e. rehabilitation expenses),<sup>862</sup> superannuation,<sup>863</sup> pain and suffering,<sup>864</sup> and non-economic loss.<sup>865</sup> Victorian courts will also make determinations about compensation amounts for a workplace injury where the availability of compensation, or the severity of the injury, is contested.

A well-developed model for calculating the costs of workplace injuries has been established by Safe Work Australia. In its submission, Safe Work Australia provided an overview of that model, which incorporates human costs and uses an incidence and lifetime cost approach. Safe Work Australia proposed that the model could be adapted for use in Victorian road safety.<sup>866</sup> The model was subject to assessment by Access Economics, which subsequently endorsed it. In 2013, the model was adopted for use in Singaporean work, health and safety.<sup>867</sup>

In his presentation to the Committee, Mr Richard Webster, the Assistant Director of the Data Analysis, Policies and Services Branch at Safe Work Australia explained how the model operates:

*It attempts to estimate the cost to the employer, so the cost of not having somebody at work either short term or long term — the cost of replacing a worker who cannot work anymore. It attempts to estimate the costs to the worker as well. Often they are ongoing costs after compensation finishes or, in lots of cases, if there is not any compensation at all, because lots of injuries do not result in a claim, for whatever reason. It also attempts to estimate the cost to the economy as a whole, so health-care costs, taxation costs, lost revenue and also productivity that is lost from workers being either unable to perform their previous duties or unable to perform any duties at all. So it attempts to put a total cost, not just the direct compensation paid to workers but also the ongoing costs that flow from those. [However]...[the model] only cover[s] the human costs, so we are not looking at property damage or anything like that, so obviously one of the outcomes of car accidents is that there is damage to*

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<sup>859</sup> **Note:** A serious injury is defined as one that results in a permanent serious impairment or loss of body function; a permanent serious disfigurement; a permanent severe mental or permanent severe behavioural disturbance or disorder; or the loss of a foetus. See s.123AB *Accident Compensation Act 1985* (Vic).

<sup>860</sup> See s. 134AB (38) *Accident Compensation Act 1985* (Vic).

<sup>861</sup> WorkSafe Victoria, 'Weekly Payments and Current Work Capacity', viewed April 2013, <<http://www.worksafe.vic.gov.au/injury-and-claims/compensation-and-entitlements/current-work-capacity>>.

<sup>862</sup> WorkSafe Victoria, 'Treatment Expenses', viewed April 2013, <<http://www.worksafe.vic.gov.au/injury-and-claims/compensation-and-entitlements/medical-and-rehabilitation-expenses>>.

<sup>863</sup> WorkSafe Victoria, 'Superannuation Entitlements', viewed April 2013, <<http://www.worksafe.vic.gov.au/injury-and-claims/compensation-and-entitlements/superannuation-entitlements>>.

<sup>864</sup> See s. 98A *Accident Compensation Act 1985* (Vic).

<sup>865</sup> See s. 98C *Accident Compensation Act 1985* (Vic).

<sup>866</sup> Safe Work Australia, *Submission*, no. 14, 18 April 2013, p. 6.

<sup>867</sup> Safe Work Australia, *Submission*, no. 14, 18 April 2013, p. 6.

*vehicles, damage to property. We do not have any data on that, so we have solely focused on the human costs.*<sup>868</sup>

According to Dr Fleur de Crespigny, Director of the Data Analysis, Policies and Services Branch at Safe Work Australia, it would be suitable for use in road safety policy because the injury data used to determine the cost of work-related injuries is similar to the data used in road safety.<sup>869</sup> On this basis, the costing methodology could be easily adapted.<sup>870</sup> While the Committee was impressed by the robustness of the Safe Work Australia model, it is unclear whether it is a preferable model to the Hybrid-HC approach and what, if any, issues may reduce its applicability to the road safety area. Clearly, the lack of non-human costs is a disadvantage in terms of trying to quantify the total impact of road crashes. Despite this, the Committee believes that such models may serve a purpose in assessing road safety policy and evaluating interventions, and thus should be monitored closely by road safety agencies.

#### 6.4.5 Transport accident compensation

The transport accident compensation area provides an alternative costs model to HC and WTP, although compensation payments are only available to those injured in a crash that meets the requirements of the *Transport Accident Act 1986* (TAA). Under the TAA, the TAC administers a 'no-fault' principle meaning that road users do not have to prove fault or wrongdoing by any person involved in a crash.<sup>871</sup> The TAA defines a 'serious injury',<sup>872</sup> a 'severe injury'<sup>873</sup> and 'pain and suffering'<sup>874</sup> for the purposes of claiming, with these definitions representing a threshold for assessing compensation claims from qualifying, injured road users.<sup>875</sup> As part of its submission, the TAC provided the Committee with examples of compensation claims for serious injuries, with a soft-tissue injury claim of \$422,000<sup>876</sup> and a quadriplegic injury claim estimate of \$21 million over the claimant's lifetime.<sup>877</sup>

Serious injury compensation payments under the scheme are linked to injury severity and take into account pain and suffering, future care costs for claimants and lost earnings.<sup>878</sup>

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<sup>868</sup> Richard Webster, Assistant Director, Data and Analysis, Policy and Services Branch, Safe Work Australia, *Transcript of evidence*, 6 August 2013, p. 197.

<sup>869</sup> Dr Fleur de Crespigny, Director, Data Analysis, Policy and Services Branch, Safe Work Australia, *Transcript of evidence*, 6 August 2013, p. 193.

<sup>870</sup> Dr Fleur de Crespigny, Director, Data Analysis, Policy and Services Branch, Safe Work Australia, *Transcript of evidence*, 6 August 2013, p. 194.

<sup>871</sup> Transport Accident Commission (TAC), *2013 Annual Report*, East Melbourne, 2013, p. 8.

<sup>872</sup> s. 93(17) and (17A) *Transport Accident Act 1986* (Vic).

<sup>873</sup> s. 3(1) *Transport Accident Act 1986* (Vic).

<sup>874</sup> s. 93(17) *Transport Accident Act 1986* (Vic).

<sup>875</sup> **Note:** A more comprehensive outline of the operation of the TAC can be found in Chapter 8 of Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012.

<sup>876</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 16.

<sup>877</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 17.

<sup>878</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 17.



People who meet the statutory serious injury criteria mentioned earlier are eligible to sue for pain and suffering damages and pecuniary loss damages.<sup>879</sup> According to the TAC, these damages are capped at \$1,096, 020 for a pecuniary loss and \$487,100 for general pain and suffering damages respectively.<sup>880</sup> Further, these are payments of real claims rather than hypothetical risk evaluations as used in SP based WTP studies.

While the TAC's direct claims cost might be used as a starting point to calculate serious injury costs, the Maurice Blackburn Lawyers' submission noted that there were 'considerable non-compensable costs' in the direct TAC claims costs.<sup>881</sup> The Committee notes that compensation costs do not fully capture costs such as non-health resources and property costs among others. Nevertheless, the compensation costs incurred by the accident compensation scheme appear to be worthwhile in better quantifying the costs of serious injuries and may have future applications in calculating crash costs, and in particular, pain and suffering values.

**Finding 23:** A number of alternative models exist for calculating costs, which may provide valuable insights when developing road safety policy in the future. Road safety agencies should keep abreast of developments in these methodologies and explore options for their utilisation in policy development and evaluation.

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<sup>879</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 18.

<sup>880</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 18.

<sup>881</sup> Maurice Blackburn Lawyers, *Submission*, no. 26, 7 May 2013, p. 11.



## CHAPTER SEVEN AT A GLANCE

### OVERVIEW

While Chapter Six provided the background and overview of existing and competing approaches to measuring the economic costs of road crashes, this chapter assesses the merits of adopting the Willingness-To-Pay (WTP) approach for use in Victorian road safety. Specific proposals, such as applying the New South Wales WTP values in Victoria as an interim measure, are analysed and discussed, as well as assessing the efficacy of replacing the current Hybrid-Human Capital approach with WTP.

As part of its assessment, the Committee identifies issues associated with implementing WTP, in road safety, such as disadvantaging other government policy areas which do not use WTP and the potential distortion of safety considerations compared to other considerations in the assessment of transport and road projects. The Committee makes a number of findings and recommendations, among which is that the WTP approach does not present as a better option for calculating the costs of crashes in Victorian road safety.

### FINDINGS

Finding 24: The values derived using the Willingness-To-Pay (WTP) model are prospective values for the reduction of risk. They do not represent the actual costs of crashes, nor the pain and suffering of crash victims. Instead, WTP values reflect the amount individuals wish to pay to reduce their risk, in the context of road safety, of a crash or a crash related injury occurring.

Finding 25: Implementing Willingness-To-Pay in one policy area but not others could produce inequitable distributions of resources across government portfolios.

Finding 26: Willingness-To-Pay is not the appropriate model to calculate the costs of road crashes in Victoria.

Finding 27: Crash cost methodologies should align with current and future Victorian serious injury definitions.

### RECOMMENDATIONS

Recommendation 18: That the Victorian Government does not adopt the New South Wales Willingness-To-Pay values for serious injuries and fatalities for use in road safety projects and investment proposals.

Recommendation 19: That regulatory tools such as Regulatory Impact Statements, policy documents and communication materials need to ensure that any references to Willingness-To-Pay values, if such values are used, are referred to as prices for risk reduction, not the actual value of an injury or fatality.

Recommendation 20: That the Victorian Government continues to use the Hybrid-Human Capital approach for valuing the cost of serious injury.

Recommendation 21: That the Victorian Government does not adopt the Willingness-To-Pay (WTP) approach, including in WTP studies undertaken nationally, to calculate road safety costs.

Recommendation 22: That the Victorian Government, through its position on the Standing Council on Transport and Infrastructure, raise the issues and concerns identified by this Committee with Willingness-To-Pay (WTP), and recommend the national WTP study be re-appraised with reference to these issues.

Recommendation 23: That the Victorian Government ensure that the current costs methodology be updated by using the new tiered trauma definition structure recommended by the Committee in Chapter Four, if that recommendation is adopted by the Victorian Government.

## CHAPTER SEVEN: WHICH COSTING METHODOLOGY FOR VICTORIA?

In addressing Term of Reference (a), the key question raised by Inquiry participants was whether the Human Capital (HC) approach should be replaced by the Willingness-To-Pay (WTP) approach to calculate the cost of crashes. In discussing the use of WTP in Victoria, the two options presented to the Committee were replacing the HC approach with the WTP approach through a nationally agreed project, and adopting the New South Wales (NSW) WTP values in the interim. These options are discussed below, along with some broader concerns that the Committee identified with the potential adoption of WTP in the road safety context.

The Committee acknowledges that various Inquiry participants supported replacing the HC approach as used in Victoria, through the Austroads Road User Effects (RUE) values, with the WTP approach.<sup>882</sup> This is unsurprising given that in recent years there has been growing acceptance of WTP in the transport economics area, and many Organization for Economic Co-operation and Development (OECD) countries have adopted it for the purposes of calculating crash costs.<sup>883</sup> However, there has been limited use of WTP in Australia, outside of NSW and Western Australia (WA), a situation viewed as unusual by some,<sup>884</sup> considering the shift from HC to WTP has been contemplated for some time.<sup>885</sup>

In presenting its views to the Committee, the Transport Accident Commission (TAC) employed a cautious approach, accepting that while ‘the weight of evidence pointed towards adopting WTP in road safety, the practical implications of that adoption require further exploration’. It proposed that the NSW approach be monitored and assessed.<sup>886</sup> It also identified implications that could arise from adopting WTP derived values, which

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<sup>882</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 78; Janet Bolitho, President, Road Safety Action Group Inner Melbourne, *Transcript of evidence*, 22 July 2013, p. 5; Dr Matthew Legge, Road Safety Data Analyst, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 256; Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 23; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 4; Victoria Police, *Submission*, no. 32, 21 June 2013, p. 4.

<sup>883</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 141; Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 4.

<sup>884</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 94.

<sup>885</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 1.

<sup>886</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 4.

provides a useful summary of some of the key issues identified in this chapter. These are summarised below:

- *WTP studies are painstaking and resource-extensive;*
- *WTP surveys could potentially explore various levels of injury severity, for example: catastrophic injury, serious injury...etc;*
- *WTP is based on perceptions of the public, that can change over time and place; hence, there is a need to develop local measures and update them periodically;*
- *WTP values are relatively higher than HC values; the Benefit-Cost ratios will be higher using WTP values; and*
- *If road safety budgets are allocated based on trade-offs between safety and other public health benefits, it is essential to use the same valuing framework.*<sup>887</sup>

VicRoads endorsed the WTP approach for the calculation of social costs, and also recommended that ‘agencies and jurisdictions across Australia collaborate to establish, implement and adopt’ a WTP methodology to derive such costs.<sup>888</sup> It was also suggested by Mr David Shelton, Executive Director of Strategy and Planning and the Road Safety Coordinator at VicRoads, that:

*The federal, New South Wales and Victorian treasuries already support both human capital and willingness-to-pay costs, so it is not really a question of whether treasuries would accept this shift; it is about us developing appropriate confidence in data to make the shift from our current human capital approach to a willingness-to-pay approach.*<sup>889</sup>

## 7.1 The New South Wales Willingness-To-Pay project

The former Roads and Traffic Authority (RTA) in NSW, the predecessor of Transport for NSW, conducted a WTP study in 2007.<sup>890</sup> According to Ms Margaret Prendergast, the General Manager of Policy and Regulation at the Centre for Road Safety at the Transport for NSW, the impetus for the shift from HC to WTP was driven by a number of factors:

*We found that this [the HC approach] was not truly identifying what the community actually costs a death at. It fails to capture the actual value that individuals place on their lives and those of others, over and above current and future earnings. There was a concern that pure life fatality values were undervalued compared to what was*

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<sup>887</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 47.

<sup>888</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 19.

<sup>889</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266.

<sup>890</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

*developing, particularly in the SUN [Sweden, United Kingdom and The Netherlands] countries in northern Europe. There were concerns that projects with really good road safety benefits were missing out on funding because other projects could derive larger benefits that did not really reflect the true cost to the community of road trauma.<sup>891</sup>*

In 2007, the RTA commissioned a number of consultants to develop a WTP methodology that could produce ‘plausible values’ based on the ‘value that the NSW community would be willing to pay or forego in exchange for a reduction in the risk of a crash related injury or death’.<sup>892</sup> The WTP values were developed using the stated preference (SP) method,<sup>893</sup> but instead of survey respondents being asked to value their risk reduction, they were asked to value the reduction of fatal and injury crashes.<sup>894</sup> The injury categories in the survey were: fatalities, serious permanent injury, injury requiring hospitalisation and minor injury.<sup>895</sup> The survey sample comprised 210 participants, 80% of whom were fully licenced, and 70% of whom were working age. The sample also included 14% of urban and 23% of non-urban respondents who knew someone who had been killed in a road crash. The study focused only on car users and pedestrians,<sup>896</sup> with the authors noting that car users are arguably a ‘substantial contributor’ of risk value reductions arising from road crashes.<sup>897</sup> As part of the study, 312 interviews were conducted, comprising 142 responses for car trips within Sydney (urban) and 71 for trips in the Bathurst region (non-urban).<sup>898</sup> The remaining interviews consisted of 99 pedestrian trips with a similar geographic split to those of the car trip respondents.<sup>899</sup>

<sup>891</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

<sup>892</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 131.

<sup>893</sup> D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 695; PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008.

<sup>894</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 33.

<sup>895</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 33.

<sup>896</sup> Margaret Prendergast, General Manager, Centre for Road Safety, Transport for NSW, *Personal communication*, 28 August 2013; PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. 27.

<sup>897</sup> D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 696.

<sup>898</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 36; D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 700; PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. ii.

<sup>899</sup> Austroads, *Social Cost of Road Crashes in Australia: the Case for Willingness-to-pay (WTP) Values for Road Safety*, Austroads, Sydney, 2013, p. 36; PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. ii.

Based on the survey findings, the WTP values for road crashes in NSW are \$5,833,699 for a fatality, and \$471,115 for a severe permanent injury.<sup>900</sup> The Committee notes that while the NSW fatality value is higher compared to the Hybrid-HC value, the NSW serious injury value is lower than the Hybrid-HC value of \$478,126 (as indexed by VicRoads to June 2012 dollars from BITRE's value of \$440,823 in 2010 dollars).<sup>901</sup>

According to VicRoads, from 2010 onwards the NSW WTP figures have been approved by the NSW Treasury for use in road project appraisals, including projects submitted to the Commonwealth Government for funding grants.<sup>902</sup> The Committee also understands that Austroads adopted the NSW WTP methodology and, according to Ms Prendergast, in 2012 'recommended that all states adopt it'.<sup>903</sup>

### 7.1.2 Suitability of the New South Wales model for Victoria

Various Inquiry participants brought the NSW's WTP study to the Committee's attention, with some suggesting that Victoria apply the NSW WTP values to Victorian road safety projects and proposed investments. The WA Office of Road Safety's submission stated that in March 2010 the WA Road Safety Council endorsed the WTP approach for use in road safety evaluations, and was in the process of adopting the WTP values and the model developed by NSW. It also noted that once there were nationally agreed values, WA would adopt them.<sup>904</sup> Dr Matthew Legge, a Road Safety Data Analyst at the Office of Road Safety, provided the Committee with an overview of the situation in WA:

*The idea is that we would be using the New South Wales values until a national value produced by Austroads has been formulated, and that would have the same sorts of problems to a lesser degree. They would be surveying people from all over Australia, but for the moment the values from New South Wales are the only ones available and they are not thought to be too far off what they might be in WA. We think they are reasonable for use here — at least until the Australia-wide ones become available.*<sup>905</sup>

In his presentation to the Committee, Dr Mark Harvey, Research Manager of Regulatory Reform and Investment Analysis at the Bureau of Infrastructure, Transport and Regional Economics (BITRE), advised the Committee he would see no issue with Victoria using the NSW WTP values in the interim but noted that Victorian road users might have different WTP values to those in NSW:

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<sup>900</sup> PricewaterhouseCoopers (PwC), *Economic Valuation of Safety Benefits: Serious Injuries - Final Report*, Roads and Traffic Authority of NSW, Sydney, 2008, p. 27.

<sup>901</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 8.

<sup>902</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 12.

<sup>903</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 132.

<sup>904</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>905</sup> Dr Matthew Legge, Road Safety Data Analyst, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 256.



*...there may be some differences in preferences, willingness to pay by Victorians, as compared with the particular New South Wales road users who were surveyed, but we do not know in what direction that would go. I would see no serious objection to Victoria using the New South Wales values in the interim. In the longer term, though, I think the approach recommended in the Austroads report would be better followed, where we agree to fund a national survey.*<sup>906</sup>

Given that WA has endorsed such an approach, the Committee sought comment from Victorian road safety agencies with regard to Victoria also adopting the NSW WTP values as an interim approach. Mr Shelton of VicRoads responded:

*It has been suggested that we could do that. There is also some data from New Zealand that is relevant. Interestingly, my colleagues in New South Wales in fact would welcome a review of their data before it was adopted more generally. Notably, New South Wales is using both human capital and willingness-to-pay at the moment, if that is an indication that they are really in a pilot phase. If we were to move to adopting it in Victoria, I think that it would best be done as a national approach, and I think that would warrant further surveying to strengthen our confidence in those numbers. As I mentioned earlier, there are some specific areas where the New South Wales figures are, we think, deficient.*<sup>907</sup>

Mr Shelton also indicated that VicRoads had a number of concerns with the NSW WTP figures, drawing on the size of the survey, the limited road user groups, and the potential for values to change substantially once other road user groups, such as heavy vehicle operators, were included.<sup>908</sup> In correspondence to the Committee, Ms Prendergast of NSW for Transport, indicated there were ‘no issues extrapolating the results of motorcyclists’ although she noted that heavy vehicles might need to be considered separately given there may be higher productivity costs, among other considerations.<sup>909</sup> In reference to the issues raised in the previous chapter regarding the importance of using large, representative samples in WTP studies, the Committee acknowledges Mr Shelton’s concerns and questions the capacity of the NSW WTP study to derive true Value of a Statistical Life (VSL) values.

A key concern for Mr Julian Lyngcoln, the Director of Safer Roads at VicRoads regarding the use of the NSW WTP values in Victoria is its low serious injury value:

*One of the other reasons that I guess we have had some caution about the New South Wales figure is that, when you look at the proportion of the value for a serious injury compared to a fatality in New South Wales and compare that to other countries that*

<sup>906</sup> Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 171.

<sup>907</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 268.

<sup>908</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, pp. 265-266.

<sup>909</sup> Margaret Prendergast, General Manager, Centre for Road Safety, Transport for NSW, *Personal communication*, 28 August 2013.

*have adopted willingness-to-pay, it seems to be a much smaller ratio than in a lot of other countries.*<sup>910</sup>

This issue was also raised by Dr Legge of the WA Office of Road Safety, who stated that the lower serious injury value had been noted as a potential problem.<sup>911</sup> VicRoads noted in its submission that while the fatality values under the NSW WTP study were nearly four times higher than the comparable HC value, the serious injury value was a third higher using the HC approach.<sup>912</sup> Mr Shelton explained that this was due to instances in the NSW study where some survey respondents recorded little change in their WTP for both temporary and permanent injuries.<sup>913</sup> Mr Peter Schofield, the Manager of the Road Safety Strategy and Partnerships at VicRoads, drew attention to the question techniques employed in the NSW study:

*I will just add that some of the question techniques that were employed by New South Wales looked at injury severity levels — they looked at four levels — and looking at the results of what they had factored in, there was not much difference between, say, just a general admission to hospital or lifelong impairment. It would seem to suggest that maybe people were not aware of the ramifications of, or understood clearly, what a lifelong disability was as opposed to a normal hospital stay. I think those things need to be clearly looked at, before we embark on any national approach, to make sure that those questionnaires are easily understood by the respondents.*<sup>914</sup>

Similarly, Dr Harvey of BITRE noted the impact of different injury definitions on the NSW WTP values, suggesting that this might explain the lower serious injury value derived in the NSW study:

*If you look at the comparisons between willingness-to-pay and human capital values, you find that there is a much greater difference for fatal crashes than for serious injury crashes. In some cases, looking at comparisons with overseas, the injury crash values are even lower under willingness-to-pay. One of the problems there is that with a fatality, it is pretty clear what a fatality is, but there is a huge range of serious injuries, from quadriplegia at one end to, I suppose, just broken bones at the other end. This was a problem they found with the RTA study: the values for serious injury crashes initially seemed far too low. The lesson learnt from that is that the people who were being surveyed had in mind a much lower level of injury than what the people running the study had in mind, so they actually ended up having to redo the survey a second time because of that.*<sup>915</sup>

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<sup>910</sup> Julian Lyngcoln, Director Safer Roads, VicRoads, *Transcript of evidence*, 11 September 2013, p. 269..

<sup>911</sup> Dr Matthew Legge, Road Safety Data Analyst, Office of Road Safety, Government of Western Australia, *Transcript of evidence*, 10 September 2013, p. 257.

<sup>912</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 15.

<sup>913</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 266.

<sup>914</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 269.

<sup>915</sup> Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, pp. 169-170.

The Committee notes that the key concern with having a low WTP value for serious injuries and a high value for fatalities is that in practical terms there will be a lower emphasis on road safety projects aiming to address crash related serious injury. VicRoads made this point in its submission, noting that using the NSW WTP method would affect the prioritisation of projects, with more emphasis likely to be placed on projects addressing crash related fatalities.<sup>916</sup>

Further, the lower serious injury value as derived in the NSW study appears inconsistent with the ethos underpinning the WTP approach, which aims to place a greater emphasis on pain and suffering than the HC approach. For example, in some cases serious injury is claimed to result in higher community costs than fatalities, a point made by Ms Prendergast from Transport for NSW.<sup>917</sup>

The Committee is aware that while the NSW WTP values have been endorsed by the NSW Treasury, the NSW Government has taken a cautious approach, and uses both the HC and WTP values in its road safety evaluations.<sup>918</sup> According to Ms Prendergast, the intention is to revisit the WTP values in the future. The Committee does not believe the NSW WTP values should be applied in Victoria. In many ways, the NSW study methodology reflects the issues identified in this and the previous chapter, with respect to SP methods and the outcomes of using such studies. In particular, the Committee is concerned by the limitations of the study design and the values produced. For these reasons, it is inappropriate to use the NSW approach for Victorian road safety.

**Recommendation 18:** That the Victorian Government does not adopt the New South Wales Willingness-To-Pay values for serious injuries and fatalities for use in road safety projects and investment proposals.

## 7.2 National Willingness-To-Pay project

Attempts to develop WTP values for road safety for use by all jurisdictions stem from a recommendation in the *National Road Safety Strategy 2011-2020* to ‘develop and adopt suitable WTP values at a national level’.<sup>919</sup> Dr Harvey of BITRE advised the Committee that governments have committed to moving towards a WTP approach.<sup>920</sup> Similarly, Austroads

<sup>916</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 16.

<sup>917</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 130.

<sup>918</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 133.

<sup>919</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. 49; Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 79.

<sup>920</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 168.

noted in its report, *Component costs in transport projects to ensure the appropriate valuing of safety effects*, that ‘there is general agreement that the WTP approach is the most appropriate method for determining crash costs’, and there is interest from all jurisdictions for a ‘coordinated approach to be developed and adopted’ in relation to WTP.<sup>921</sup>

Based on this support for WTP, Austroads commissioned the Australian Road Research Board (ARRB) to conduct a scoping study into the feasibility of a national WTP study.<sup>922</sup> In his presentation to the Committee, Dr Cliff Naude, a Senior Economist at ARRB, outlined the key findings of the study, which included a recommendation that a national WTP study be based on a SP survey, with a choice experiment component.<sup>923</sup> The study also placed a large emphasis on the need for a strong and detailed methodology, which should be tested in a pilot study.<sup>924</sup> In relation to costs and timeframes, Dr Naude advised that:

*In terms of the cost, in 2012 dollars it was around \$1 million over all the components at that stage. In terms of the time frame, we estimated, given previous experience in this area, three to four years, and that goes from issuing a request for proposals through to obtaining proposals, adjudicating them, selecting consultants, going through an experiment design, a pilot study, the actual survey interviews, generating a set of results and reports and then pushing those reports around not only one government department but probably several to obtain their input.*<sup>925</sup>

The report was endorsed by Austroads, and funding options for a national project are currently being investigated.

Support for a national approach to derive values for road safety purposes was expressed throughout the Inquiry. For example, Mr Shelton of VicRoads suggested that the adoption of WTP ‘best be done as a national approach’.<sup>926</sup> Similarly, Mr Michael Nieuwesteeg, the Research Manager, Road Safety and Marketing at the TAC expressed the view that while WTP was viable, it should be subject to a national WTP study.<sup>927</sup>

Given the complexity and issues that a WTP study would deal with, there would also be substantial costs involved in conducting such a study. These costs were raised during the public hearings as an important consideration in assessing the adoption of WTP. According to Dr Harvey of BITRE, estimates of undertaking a national WTP study are as

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<sup>921</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. i.

<sup>922</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 79.

<sup>923</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 79.

<sup>924</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 79.

<sup>925</sup> Dr Cliff Naude, Senior Economist, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 80.

<sup>926</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 268.

<sup>927</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 322.

high as \$1 million, which he considered expensive.<sup>928</sup> That expense was also noted by VicRoads.<sup>929</sup> Ms Prendergast from Transport for NSW provided an explanation of the types of costs involved in conducting a WTP study based on the NSW experience:

*Obviously we did invest the significant cost to do that detailed survey and to do the study because we knew this was leading edge and willingness-to-pay was really important. We have undertaken all of that work and, as I said, we will refresh that in years to come.*<sup>930</sup>

These costs while not insignificant do not appear to be overwhelmingly onerous given the importance of having accurate crash costs in terms of policy development. The costs of a WTP study would need to be considered in terms of any future adoption of WTP in Victoria.

The important question of the best way to calculate a serious injury value using WTP was identified by Mr Rex Deighton-Smith, Director and Principal at Jaguar Consulting.<sup>931</sup> Two approaches to calculating this value were put forward: either to derive the value of a statistical injury directly (through a specific survey) or use a ratio or proportion of the value of a fatality.<sup>932</sup> The Committee believes best practice would arguably be a serious injury value derived from a survey, although it is also of the view that such a question is best answered as part of a national WTP study.

Despite support for a national WTP project, it is unclear to the Committee how such a study, other than one based on the revealed preference method, could feasibly be conducted. This is based on the substantial, complex and yet to be overcome methodological issues identified by leading economists and other Inquiry participants, and which were outlined in the previous chapter. These weaknesses are particularly concerning given the pre-eminence of SP studies, both in Australia and internationally. The Committee acknowledges that in many respects these weaknesses result from the difficulties associated with using surveys, albeit sophisticated ones, to elicit responses from the community on what amounts to an existential threat.

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<sup>928</sup> Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 168.

<sup>929</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 14.

<sup>930</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 133.

<sup>931</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 23.

<sup>932</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 23. Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 180.

## 7.3 Other considerations with Willingness-To-Pay

### 7.3.1 Distinguishing the cost of crashes from valuing risk reductions

A key issue identified by the Committee in the evidence provided by Inquiry participants is that WTP values are conflated with the actual costs of crashes. As mentioned earlier, the VSL is an economic and policy construct, and it does not seek to value an individual, identifiable life. Instead, the WTP is essentially a value provided by survey respondents to reduce their risk of injury or death. However, in both hearings and submissions, as well as in the research literature, that distinction is not immediately apparent. The basis on which many argued WTP was a better model for calculating the costs of crashes in comparison to the HC approach was that the latter did not incorporate a pain and suffering component and when it did, under the Hybrid-HC model, this value was derived arbitrarily. However, in reality neither model represents the actual value of pain and suffering. The WTP approach simply calculates risk reduction. On this basis, it is no better or worse than the Hybrid-HC approach. This distinction was made by Professor Jeff Richardson, the Foundation Director of the Centre for Health Economics within the Faculty of Business and Economics at Monash University, who advised the Committee that WTP was used as a surrogate for actual pain and suffering rather than risk, something which he referred to as a 'semantic fudge'.<sup>933</sup> The TAC submission also drew attention to that fact, noting that the 'expression value of life/injury is an unfortunate abbreviated form of the value of a statistical life/injury'.<sup>934</sup>

According to Professor Richardson, the use of WTP is 'the value of risk reduction' not the value of pain and suffering and that this is a problem that economists are increasingly rectifying.<sup>935</sup> The Committee strongly shares this view but notes that the distinction is widely misunderstood. The Committee believes this distinction requires clarification in the broader road safety policy environment, and particularly in the context of the economic assessment of road safety investment proposals. Given that what is being priced in the WTP model is risk, it is essential that road safety agencies do not conflate the value of reductions in risks with the cost of an actual life or serious injury, or their prevention.<sup>936</sup>

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<sup>933</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University Accident Research Centre, Presentation to Committee: 'Presentation to the Road Safety Committee at the Parliament of Victoria', 28 October 2013, p. 14.

<sup>934</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 43.

<sup>935</sup> J Richardson and R Pope, (*in press*) *Expected utility theory and its misuse in the economic evaluation of health and safety*, Springer, New York, in (ed) M Schlander *Economic Evaluation of Health Care Programs: Current Concepts, Controversies and International Experience*, [scheduled for publication 2014], p. 16.

<sup>936</sup> Office of the Secretary of Transportation, *Memorandum To: Secretarial Officers Modal Administrators*, U.S. Department of Transportation, Washington, 2013, p. 1.

**Finding 24:** The values derived using the Willingness-To-Pay (WTP) model are prospective values for the reduction of risk. They do not represent the actual costs of crashes, nor the pain and suffering of crash victims. Instead, WTP values reflect the amount individuals wish to pay to reduce their risk, in the context of road safety, of a crash or a crash related injury occurring.

**Recommendation 19:** That regulatory tools such as Regulatory Impact Statements, policy documents and communication materials need to ensure that any references to Willingness-To-Pay values, if such values are used, are referred to as prices for risk reduction, not the actual value of an injury or fatality.

### 7.3.2 The need for equity across policy areas

In discussions about the appropriateness of WTP to calculate crash costs, various Inquiry participants raised the potential of it to elevate road safety projects above other transport projects, as well as to create an unfair advantage over other policy areas that do not use WTP for costing purposes.<sup>937</sup> On the other hand, Victoria Police noted in its submission that infrastructure decisions would have increased economic justification if WTP was adopted, particularly for those projects involving a substantial safety component.<sup>938</sup> Similarly, the WA Office of Road Safety identified in its submission the positive implications of adopting WTP in WA, including that higher WTP values would lead to higher benefit-cost ratios (BCR) in road safety projects. It also noted that the priority ranking of projects would change, with projects aiming to address fatalities receiving a higher priority where road safety is the only or primary criteria for prioritisation.<sup>939</sup>

While the WA Office of Road Safety saw these outcomes as preferable, researchers have warned that the WTP approach could ‘unduly skew transport infrastructure projects in favour of safety projects’.<sup>940</sup> In the context of Austroads’ RUEs, WTP could increase the value of the social cost of crashes RUE and potentially reduce the value of the other RUEs in transport project planning and assessment. On this basis, higher values placed on the social cost of crashes could be used to justify large increases in government spending on

<sup>937</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 344; Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, pp. 170-171; H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 3; Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013; D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, pp. 17-18.

<sup>938</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 15.

<sup>939</sup> Office of Road Safety WA, *Submission*, no. 24, 30 April 2013.

<sup>940</sup> H Le, et al., 'Deriving Accident Costs using Willingness-to-Pay Approaches-A Case Study for Singapore', Paper presented at the *34th Australasian Transport Research Forum (ATRF)*, Adelaide, 2011, p. 3.

road safety projects or regulations, which might be wasteful and, possibly, counterproductive.<sup>941</sup> Similarly, Austroads observed in its report, *Component Costs in transport projects to ensure the appropriate valuing of safety effects*, that increasing the value of crashes by using the WTP approach could affect the 'allocation of funding to different types of road crashes and result in the reconsideration of projects that were previously rejected as marginal projects'.<sup>942</sup> Austroads also indicated, however, that simply switching from the HC approach to WTP will not automatically guarantee that road safety projects will secure funding or appear to have greater BCR.<sup>943</sup>

Further, the Committee heard that the WTP model could result in the road safety area appearing to be a more attractive investment area for government when allocating scarce resources compared to other policy areas that use alternative costing methodologies. Given the broader policy implications of this issue, the Committee sought comment from Inquiry participants. Professor Anthony Harris, the Director of the Centre for Health Economics at Monash University indicated that increasing the value of crash injuries would have an impact on resource allocation:

*If decisions are made about the allocation of budgets to agencies on the basis of the value they get for money, then, yes, it will have an influence on that, but I am not clear that is how you are actually making decisions about how much money to give the health department here in Victoria versus VicRoads. It is true that the higher the value of outcomes they choose, and if that has some influence on budgetary decisions, then the more money you will give to areas which use a higher value for outcome for a given cost. That is kind of obvious.*<sup>944</sup>

The Committee also put that question to Professor Luke Connelly, Professor of Health Economics at the Australian Centre for Economic Research on Health, and the Centre of National Research on Disability and Rehabilitation Medicine at the School of Economics, University of Queensland, who stated:

*I think the main implication is, if the willingness-to-pay value is substantially different from the value being used in other areas, then once again you have a problem where an investment that will fail in one portfolio will not fail in another portfolio. The implication then is that you get too much expenditure growth from a social viewpoint in the portfolio that has a higher threshold and too little in the other.*<sup>945</sup>

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<sup>941</sup> R Tooth, *The cost of road crashes: A review of key issues*, LECG, Sydney, 2010, p. 14.

<sup>942</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, pp. 17-18.

<sup>943</sup> D Tsolakis, et al., *Component costs in transport projects to ensure the appropriate valuing of safety effects*, Austroads Inc, Sydney, 2009, p. 18.

<sup>944</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 344.

<sup>945</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 354.



*...at present we see RISs that use willingness-to-pay for valuing a statistical life but human capital approaches for serious injury valuation, again we can underestimate the value of any road safety measures that we might take.<sup>946</sup>*

Turning to one of his areas of expertise, the Pharmaceutical Benefits Scheme (PBS), Professor Connelly explained the potential impact of using WTP in the road safety area and how that could affect resource allocations in other areas:

*This could be a real problem across sectors, especially if the thresholds that are used in, for example, the health sector are lower than those used elsewhere in government. There was some evidence produced a number of years ago based on Pharmaceutical Benefits Advisory Committee decisions. Its actual decisions suggested that listings were highly likely to be recommended to the minister by the PBAC [Pharmaceutical Benefits Advisory Committee] if the cost per QALY was less than \$46 000 in 1998-99 values and highly unlikely if the values were up over about A\$76 000. So there is some evidence that a lower threshold than those being implied in this work is actually being applied in practice in the health sector.*

*For example, if a threshold of \$75 000 per life year were applied to health sector investments or health portfolio investments and a \$225 000 threshold were applied to road safety investments, then some investments that pass the threshold test in the road safety environment would fail the threshold test in the health portfolio and the social return to public investment would not be maximised.<sup>947</sup>*

The Committee notes that other participants were also cognisant of risks with pushing ahead with WTP irrespective of the costing methodologies used in other policy areas. There was a theme in the evidence about the need for such consistency.<sup>948</sup> For example, VicRoads suggested that any implementation of WTP would need to be done in conjunction with other jurisdictions and other government areas:

*...it is important that costs resulting from road crashes be consistent between jurisdictions and with those associated with other areas of safety valuations (e.g. other transport modes or other industries). For consistency, it is also desirable that other components of RUE (that is, travel time costs and environmental costs) are also estimated using the WTP approach. A coordinated approach, therefore, is required, with a lead agency for this shift in approach.<sup>949</sup>*

Associate Professor Stuart Newstead, Associate Director of Injury Analysis and Data at the Monash University Accident Research Centre (MUARC) also shared this view:

*It is interesting to consider road crash costing, because clearly what you are trying to do is mount an economic argument in investment in road safety against investment in other things. I think if you look at it heuristically from a whole-of-society perspective,*

<sup>946</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 354.

<sup>947</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 352.

<sup>948</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 19; Victoria Police, *Submission*, no. 32, 21 June 2013, p. 15.

<sup>949</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 19..

*you would say that as long as we are using the same cost basis for everything maybe that is okay, but at the moment we are not. In fact some people are using willingness-to-pay for this, human capital for that — we really need to have a consistent system.*<sup>950</sup>

Similarly, Dr Harvey of the BITRE, drew attention to the importance of consistent use of WTP across jurisdictions:

*...I think there is some advantage in agreeing on a particular number to use and saying, 'This is the number we will all use'. That way you have comparability between cost-benefit analyses across different projects and different jurisdictions...consistency is also important, as well as the absolute size of the number you are using.*<sup>951</sup>

Dr Gary Dolman, Head of the BITRE suggested it may not make a large difference in practice, given that it was unlikely that budget allocations or investments would be made in the same way in health as they are in road safety.<sup>952</sup> However, Dr Dolman accepted that these issues might apply if the same methods were used for benefit-cost analysis stating that:

*Using the value of a statistical life that was higher for road infrastructure investments in one case and a different value of life in health investments — that is where it could potentially make a difference, but I suspect that in practice that is not exactly how decisions are made.*<sup>953</sup>

The Committee questioned the health economists about the need for consistency across different policy areas, such as health and road safety. Professor Philip Clarke, a Professor of Health Economics from the Centre for Health Policy, Programs and Economics, in the Melbourne School of Population and Global Health, at the University of Melbourne stated that:

*Ultimately the idea would be to try and marry it with decisions made in the health-care sector. Clearly you are basically trying to do the same thing in terms of extending human life and improving human life in a different area with safety. The rational thing would be to try and have as far as possible a common value, unless you can find a reason not to. As I said, the difference between individual versus public safety actions may be a reason.*<sup>954</sup>

Professor Clarke added:

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<sup>950</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 94.

<sup>951</sup> Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 169.

<sup>952</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, pp. 170-171.

<sup>953</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 171.

<sup>954</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 232.

*I suppose the other issue I have noticed in your terms of reference might be consistency across sectors. Clearly this is not consistent in the sense that there is no monetary value of life being used in health; it is a cost per quality-adjusted life year...clearly there is no explicit similarity.<sup>955</sup>*

Agreeing with his colleague, Dr Dennis Petrie, a Senior Research Fellow also at the Melbourne School of Population and Global Health, advised the Committee that:

*Having a consistent number is a fantastic thing, because then we can have consistent decision-making. It does not necessarily have to be the same, but at least then it provides a requirement that you need a rationale about why it is different, and then that can be debated. It makes it more transparent about decision-making.<sup>956</sup>*

However, other health economists such as Professor Harris from Monash University were unreceptive to the use of WTP in the health area, noting instead that alternative models based on Quality-Adjusted Life Years (QALY) and Disability-Adjusted Life Years (DALY) are used for evaluation and regulatory purposes. Further, Professor Connelly from the University of Queensland noted that WTP values were unlikely to be employed in the health sector due, in part, to the reluctance to place an explicit value on health and welfare. Based on the commentary from these health economists, as well as the suggestions made by other Inquiry participants, it seems reasonable to conclude that adopting the WTP model in some but not all policy areas within government may be problematic, particularly when prioritising and allocating government resources. The Committee shares this view and believes that unintended consequences within transport project evaluation as well as between policy areas or government portfolios could occur if Victoria was to adopt the WTP approach.

**Finding 25:** Implementing Willingness-To-Pay in one policy area but not others could produce inequitable distributions of resources across government portfolios.

## 7.4 Final conclusions

Throughout the Inquiry, there was much support for replacing the current HC approach with the WTP model, either by adopting the NSW WTP values in the interim or through a national WTP project. Based on all of the evidence received and considered, the Committee does not believe that WTP is the best way to calculate crash costs. This and the previous chapter discussed a myriad of issues identified in research literature and by Inquiry participants regarding both approaches, but it focused largely on WTP given the

<sup>955</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 341.

<sup>956</sup> Dr Dennis Petrie, Senior Research Fellow, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 233.

prevailing emphasis placed on this model by various submissions and Inquiry participants. Numerous issues were identified with WTP, including methodological problems and its potential impact on the allocation of government resources. Individually, these issues may not appear particularly problematic, however, collectively they make it difficult to justify adopting WTP in Victoria.

Many of the issues associated with WTP, and in particular the SP method, are longstanding. In Australia, the Centre for Health Economics Research and Evaluation (CHERE) at the University of Sydney assessed the use of WTP in its discussion paper *What are Australians willing to pay for road safety* in 1993. Having undertaken a WTP study, it identified problems with response rates, comprehension of risk, and skewed distribution of and wide variation in values.<sup>957</sup> Based on the evidence received in the current Inquiry, these issues appear to remain. The Committee also heard strong criticisms of the approach, with some researchers claiming that WTP estimates have very little credibility.<sup>958</sup> In his concluding remarks to the Committee, Professor Richardson from Monash University observed that presenting WTP as a solution to grateful decision-makers gave rise to ethical considerations.<sup>959</sup> He added that:

*In summary, I think the willingness-to-pay approach, while enormously popular in the transport area because it gives numbers and sophisticated analyses, is highly unreliable and at best is measuring risk. It is not measuring pain and suffering.*<sup>960</sup>

Professor Richardson's sentiments were also shared by others. When asked about the use of WTP in health economics, Professor Harris from Monash University, made the following comments:

*I think it is regarded as experimental. It is not used. There have been a number of studies over the years. I cannot think of a single policy that has been affected by a health economics study that had willingness-to-pay in it, if we are talking about impact. It is regarded as of high academic value and interesting. There are a lot of developments in its use and an increasing belief that it is perhaps less biased than it once was in terms of its technique, but in terms of its policy impact, no country that I am aware of uses economic evaluation to reimburse or pay for health uses cost-benefit analysis, and therefore it does not use willingness-to-pay.*<sup>961</sup>

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<sup>957</sup> R Smith, S Jan and A Shiell, *What are Australians willing to pay for road safety? CHERE Discussion Paper No 21*, Centre for Health Economics Research and Evaluation (CHERE), Sydney, 1993.

<sup>958</sup> L Martin, 'External accident costs of motor vehicles revisited', Paper presented at the *28th Australasian Transport Research Forum*, Staff Paper, Department of Transport and Regional Services, Sydney, 2005..

<sup>959</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University Accident Research Centre, Presentation to Committee: 'Presentation to the Road Safety Committee at the Parliament of Victoria', 28 October 2013, p. 24.

<sup>960</sup> Professor Jeffrey Richardson, Foundation Director, Centre for Health Economics, Faculty of Business and Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 379.

<sup>961</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 342.

Drawing on his own research, Professor Connelly from the University of Queensland, explained to the Committee that in spite of that arbitrariness, the BITRE Hybrid-HC approach was likely to produce better values than those produced using a survey based WTP approach.<sup>962</sup>

The Committee does not believe that the WTP model provides a better measure of pain and suffering than any other costing model. Rather, WTP is a method for deriving values for risk aversion. In many respects, calculating the costs of crashes is better achieved using the Hybrid-HC approach, as incorporated in the Austroads RUE values. As noted in the previous chapter, the Hybrid-HC approach is considered to produce consistent and reliable results. This approach does attempt to value pain and suffering, and the Committee received no evidence to suggest that BITRE's values for serious injuries and fatalities had acted as a barrier to new road safety interventions and investment proposals being approved for implementation. The Committee believes that if this becomes a common occurrence, the BITRE values should be revisited and other costing models should potentially be considered. Despite national agreement for the development of an Australian WTP study, the Committee does not believe that Victoria should support the commencement of such a study.

**Finding 26:** Willingness-To-Pay is not the appropriate model to calculate the costs of road crashes in Victoria.

Adopting what in the Committee's view is a problematic economic model could have unintended consequences for addressing the significant problem of crash related serious injuries. One real possibility is disproportionately reducing the value of serious injuries in comparison to fatalities, as was seen in the NSW WTP study. Given the renewed focus in road safety on serious injuries, nationally and internationally, an issue which is the subject of this entire inquiry, adopting an economic model that would reduce this focus in a policy and resourcing sense is highly problematic. Alternative models such as DALYs and QALYs which are used in the health area appear to be better placed to produce such values, and may well supplant the Hybrid-HC approach in years to come. For these reasons, the Committee recommends that Victoria continue to use the Hybrid-HC approach for calculating the actual costs of crashes.

**Recommendation 20:** That the Victorian Government continues to use the Hybrid-Human Capital approach for valuing the cost of serious injury.

<sup>962</sup> Professor Luke Connelly, Professor of Health Economics, Director of ACERH, Associate Director of CONROD, School of Economics, University of Queensland, *Transcript of evidence*, 28 October 2013, p. 352.

**Recommendation 21:** That the Victorian Government does not adopt the Willingness-To-Pay (WTP) approach, including in WTP studies undertaken nationally, to calculate road safety costs.

**Recommendation 22:** That the Victorian Government, through its position on the Standing Council on Transport and Infrastructure, raise the issues and concerns identified by this Committee with Willingness-To-Pay (WTP), and recommend the national WTP study be re-appraised with reference to these issues.

### 7.4.1 Injury definitions

The Committee also wishes to refer back to the important role that injury definitions play in road safety, and the fact that this role extends to calculating the costs of injuries.

It is particularly important to ensure that injury definitions adopted for crash statistic purposes, especially serious injury definitions, are consistently used when calculating costs because the nature of injuries sustained within each injury category will likely be used in survey questions. If respondents are unable to distinguish between severe and other injuries,<sup>963</sup> there will be a consequential impact on their ability to derive a WTP value. Injury definitions also need to be consistent to ensure that the total number of injury cases being multiplied by a given VSL value reflect the actual burden of injuries. If that does not occur, a VSL value based on a survey definition with a lower or higher injury threshold than that used in crash statistics would distort the burden of injury and undermine regulatory assessments of new or existing interventions.

An additional consideration raised in the MUARC submission<sup>964</sup> and by Associate Professor Newstead of MUARC in his presentation to the Committee, was that calculating crash costs should occur once a new serious injury definition has been defined.<sup>965</sup> Associate Professor Newstead also noted that the better the injury definition, in terms of its injury inclusions and data quality, the greater the capacity of any costing methodology to quantify injury costs.<sup>966</sup> The importance of applying these definitions consistently in determining crash costs was also highlighted by other Inquiry participants.<sup>967</sup> The Committee agrees with this view and believes that if its recommendations in Chapter

<sup>963</sup> D A Hensher, et al., 'Estimating the willingness to pay and value of risk reduction for car occupants in the road environment', *Transportation research part A: policy and practice*, vol. 43, no. 7, 2009, p. 696.

<sup>964</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 28.

<sup>965</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 94.

<sup>966</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 94.

<sup>967</sup> Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, pp. 169-170. SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

Four are accepted, the current and any future methodologies used to derive costs in Victoria should be aligned with the new definitions.

**Finding 27:** Crash cost methodologies should align with current and future Victorian serious injury definitions.

**Recommendation 23:** That the Victorian Government ensure that the current costs methodology be updated by using the new tiered trauma definition structure recommended by the Committee in Chapter Four, if that recommendation is adopted by the Victorian Government.





## PART 3

Chapter 8: Evaluating Cost-Effective Countermeasures

Chapter 9: Reducing Serious Injuries and Fatalities



## CHAPTER EIGHT AT A GLANCE

### OVERVIEW

The purpose of Chapter Eight is to address Term of Reference (e) and provide an overview of some of the key processes employed by the Victorian Government and road safety agencies to formulate policy solutions to road safety issues, including the Macro Estimates for Target Setting model. It also outlines the broader application of economic assessment tools, such as cost-effectiveness analysis and benefit-cost analysis, to guide the prioritisation of road safety countermeasures and resource allocation. The Committee also identifies various other policy considerations that contribute to government decision-making processes in road safety, including safety and reducing disparities in risk, particularly among vulnerable road users.

Chapter Eight also focuses on the evaluation of road safety countermeasures upon implementation and/or completion. As part of this, the Committee identified the importance of planning evaluation studies early in the developmental phase of countermeasures. This is to ensure that the most appropriate evaluation model is applied to the countermeasure in question, allow baseline data to be collected and minimise any potential design weaknesses.

### KEY FINDINGS

Finding 28: The Macro Estimates for Target Setting model is a highly valuable tool to inform the development of road safety strategies.

Finding 29: Cost-effectiveness analysis is an appropriate tool to prioritise road safety countermeasures in certain circumstances, such as when a specific intended outcome has been agreed to and when no adverse side effects are anticipated.

Finding 30: The use of benefit-cost analysis (BCA) for economic evaluation of investment proposals is the Victorian Department of Treasury and Finance's preferred approach. Unlike cost-effectiveness analysis, BCA is used to assess trade-offs of investments against other policy objectives by converting all policy objectives into monetary values. On this basis, BCAs require extensive knowledge about the benefits and costs of investment proposals.

Finding 31: When assessing the efficiency of road safety investments, the Victorian Government should support the use of net present value and benefit-cost ratio tools to maintain flexibility in its decision-making processes.

Finding 32: Economic assessments of road safety investments proposals are not always an appropriate tool to assist governments decide which countermeasures to develop and implement, particularly in instances when the fair distribution of safety among all road user groups is a key objective of governments.

Finding 33: When publicly released, the results of evaluation studies can be useful learning tools that can reduce duplication of effort among other road safety agencies and researchers, contribute to stronger evidence bases around countermeasures, and inform future decision-making. It also reinforces a culture of knowledge transfer and shared responsibility within the road safety sector.

Finding 34: The serious injury definition and the focus on serious casualties in evaluations provide insensitive measures for understanding the impact of countermeasures on reducing injury rates and those of differing severity levels.

Finding 35: The Committee believes that the TAC Enhanced Crash Investigation Study will contribute greatly to the development of stronger road safety policy in Victoria.

Finding 36: Planning post-completion evaluation studies at the developmental stage of countermeasures is necessary to ensure that the most appropriate evaluation design is applied to them. It also allows researchers to collect appropriate baseline data prior to the countermeasure being implemented.

Finding 37: When designing evaluation studies, it is important to minimise study biases, and ensure potential weaknesses do not strongly influence evaluation results.

Finding 38: Crash modification factors (CMF) can be a useful tool to assist road safety agencies accurately predict the estimated effects of infrastructure-based road safety countermeasures. The use of CMFs facilitates international harmonisation through increased sharing and transferability of results across national and international jurisdictions.

Finding 39: Randomised control trials (RCTs) are considered the highest standard of evaluation designs. When designed well, RCTs produce the most reliable results of countermeasure effectiveness through minimising study biases, controlling confounding factors and isolating causation.

Finding 40: Before and after evaluations can be an effective study design to assess the impact of road safety countermeasures when control groups are used to account for the potential influence of extraneous factors on safety outcomes. Without any control group, it is difficult to determine the precise safety effect of countermeasures.

**RECOMMENDATIONS**

Recommendation 24: That the Victorian Government reformulate the existing Macro Estimates for Target Setting (METS) to incorporate the major trauma, admitted to hospital, attended an emergency room and Disability-Adjusted Life Years measures.

Recommendation 25: That the Victorian Government, where possible, translate result findings from previous evaluations of road safety countermeasures from the existing serious injury measure to the major trauma, admitted to hospital and Disability-Adjusted Life Years measures.

Recommendation 26: That the Victorian Government and road safety agencies publicly release existing and future evaluations of road safety countermeasures.

Recommendation 27: That when evaluating road safety countermeasures, Victorian road safety agencies should examine the impact of countermeasures based on separate categories of trauma, as identified in Recommendation One, in addition to the impact of countermeasures on different road user groups.

Recommendation 28: That the Victorian Government and road safety agencies ensure that evaluation frameworks for individual road safety countermeasures be developed and evaluation funding be secured prior to the implementation of countermeasures.

Recommendation 29: That when designing evaluation frameworks for individual road safety countermeasures, the Victorian Government and road safety agencies consider the issues and concerns identified by the Committee in findings 34 to 38. Evaluation designs should reflect high validity and be effective in removing or minimising study biases.

Recommendation 30: That the Victorian Government and road safety agencies build measures of cost-effectiveness into post-completion evaluation studies of road safety countermeasures.



## CHAPTER EIGHT: EVALUATING COST-EFFECTIVE COUNTERMEASURES

A key theme in this inquiry is the importance of high quality road crash data as a tool to measure and cost the impact of road trauma on the Victorian community. Such data is also fundamentally important for policy and decision-making, as it allows road safety experts to identify issues, develop targeted and effective countermeasures, and evaluate outcomes. The European Commission (EC) noted in a 2013 working paper that issues associated with definitions and the collection and reporting of data must be addressed before suitable interventions can be developed:

*The knowledge gap produced by the lack of a common definition, lack of consistent reporting systems and the understandable but widespread under- and misreporting must be closed. Only with a better understanding of the situation can actions and policies be efficiently designed to reduce the number of serious injuries and minimise their long-term consequences.<sup>968</sup>*

Throughout its investigations, the Committee came to understand the impact of the current serious injury definition and its associated issues on the identification of the need for, and subsequent development and evaluation of road safety countermeasures in Victoria. The Committee is strongly of the view, however, that by adopting the recommendations outlined in the previous chapters, the Victorian Government can resolve these issues, which in turn will lead to a more targeted approach to reducing serious injury crashes in this state. In particular, establishing an accurate representation of road trauma and the associated costs will allow road safety agencies and researchers to confidently evaluate the effectiveness of specific countermeasures, compare the benefits of these countermeasures with competing objectives, and allocate road safety resources to where they will have the greatest impact.<sup>969</sup> This chapter discusses these key themes.

In providing evidence to the Committee, Inquiry participants did not typically discuss the specific approaches they employ to formulate policy solutions to road safety issues despite their relevance to Terms of Reference (d), (e) and (f). However, in acknowledging

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<sup>968</sup> European Commission, *Commission staff working document - On the implementation of objective 6 of the European Commission's policy orientations on road safety 2011-2020 - First milestone towards an injury strategy*, Brussels, 19 March 2013, p. 6.

<sup>969</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008.

the complexity and enormity of the task, the Committee shared the view that it would be valuable to provide an overview of some of the key processes involved, with the aim of promoting a consistent and best practice approach. This chapter therefore examines the current approach employed by the Victorian Government to address road trauma, as well as the broader application of economic assessment tools to provide guidance on the prioritisation of government road safety programs and resource allocation, tools which are common to all levels of government and across all policy areas.

The Committee also did not receive any evidence about the processes employed by Victorian road safety agencies and researchers to evaluate road safety countermeasures upon implementation and/or completion. During the Inquiry process, the Committee recognises the role of comprehensive and well-designed evaluation programs in understanding the effectiveness of existing road safety countermeasures, and contributing to the development of improved and new countermeasures in the future. These themes are also discussed in this chapter, along with the various components involved in conducting post-completion evaluations.

## 8.1 The Victorian approach

In Australia, the foundation of comprehensive road safety programs at both the national and state levels is based on the 'Safe System' approach, which comprises a holistic view of the road transport system and focuses on the 'interactions between roads and roadsides, travel speeds, vehicles and road users'.<sup>970</sup> In recognition that road users make mistakes, the Safe System approach requires that the road system be designed to expect and accommodate human error so that when a crash occurs no individual is exposed to crash forces that could result in death or serious injury. This reinforces the approach's central focus on the interaction between infrastructure, speed and physical vulnerability, combined with the notion that responsibility for road safety should be shared by all.<sup>971</sup> This is a point strongly reflected in *Victoria's Road Safety Strategy 2013-2022 (VRSS)*:

*...this strategy takes a new collaborative approach. Government commits to making roads, vehicles and roadsides safer through engineering safer infrastructure, and creating a strong safety environment, but everybody needs to commit to making the right choices and doing the right thing to stay safe. Government will support community to meet this commitment through engineering, education and enforcement.*<sup>972</sup>

The overall vision of VRSS is to achieve zero deaths and zero serious injuries on Victoria roads. To work towards this vision, the Victorian Government set a target to further

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<sup>970</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. 33.

<sup>971</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, p. 108.

<sup>972</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2013, p. 6.



reduce the number of crash related fatalities by 30%, and the number of crash related serious injuries also by 30% over the next decade.<sup>973</sup> The Government's choice of countermeasures to achieve these targets is guided by the Safe System approach, along with modelling the likely effectiveness of a range of countermeasures in order to determine the most appropriate mix to successfully reduce road trauma. This process is outlined below.

### 8.1.1 The use of modelling

Among most state and territory governments and nationally, conducting evidence-based mathematical modelling of predicted countermeasures' performance has become the preferred method for formulating road safety strategies. Modelling the possible impact of road safety countermeasures is also widely used and promoted among international road safety agencies and experts. For example, in a paper prepared for the South Australian (SA) Government on establishing a new road safety strategy, Professor Fred Wegman, the former Managing Director of the Institute for Road Safety Research (SWOV) in the Netherlands, recommended that government conduct modelling to determine what countermeasures and investments would achieve a road safety target. Professor Wegman also recommended establishing a sound methodology for the modelling work, and that the results be accepted by decision-makers.<sup>974</sup>

In Victoria, modelling has been used to assist develop the current and previous road safety strategies. The model used is the Macro Estimates for Target Setting (METS), which is based on a numerical implementation of concepts developed in the late 1990s by researchers from the Monash University Accident Research Centre (MUARC), namely Professor Peter Vulcan and Dr Bruce Corben.<sup>975</sup> The METS model was first used by VicRoads, which in 2005 commissioned MUARC to develop the model to support the development of the Victorian Government's road safety strategy *Arrive Alive 2008–2017*. VicRoads commissioned MUARC again in 2011 to use the model to 'undertake projections for reductions in fatalities and serious injuries (serious casualties) based on a range of potential initiatives that could be considered by the Government'.<sup>976</sup> The Western Australian, Northern Territory, Tasmanian, Queensland and Federal Governments also

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<sup>973</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2013, p. 9.

<sup>974</sup> F Wegman, *Driving down the road toll by building a Safe System*, Government of South Australia, Adelaide, 2012, p. 25.

<sup>975</sup> B. F. Corben, et al., 'Strengthening road safety strategy development 'Towards Zero' 2008-2020 - Western Australia's experience scientific research on road safety management SWOV workshop 16 and 17 November 2009', *Safety Science*, vol. 48 2010, p. 1089.

<sup>976</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 58.

use this model to inform the development of their respective road safety strategies. It is a peer-reviewed model.<sup>977</sup>

Overall, the purpose of the METS model is to estimate the level of serious casualty reduction that can be achieved during the life of a strategy, and to identify the actions required to achieve this. As part of this, the model provides various strategy options of combined countermeasures, the associated benefits of each option, and comparisons against the status quo. It also indicates the percentage reduction in the number of serious casualties at the end of a strategy compared with the average annual number of serious casualties during the baseline period.<sup>978</sup>

The METS model is macro based, which implies that only the most effective countermeasures expected to have a sizeable impact that address the high priority road safety problems are modelled. Furthermore, the model assesses the benefits of countermeasures multiplicatively when they affect the same traffic or behaviour to avoid double-counting the savings, otherwise the countermeasures are assessed additively.<sup>979</sup> Key input factors in the model can be adjusted to predict results in various circumstances, and include:

- Policy countermeasures - individual interventions and cornerstones can be switched on and off;
- Policy aggression e.g. investment levels and implementation timing;
- Effectiveness of countermeasures; and
- Proportion of the serious casualty population that the countermeasure is applied to.<sup>980</sup>

The model is informed by local and international research on the effectiveness of specific road safety countermeasures and is categorised on the Safe System groupings. The strong evidence-base and research driven nature of Victoria's road safety framework, which is informed by the METS model, was a point reaffirmed by Mr David Shelton, Executive Director, Strategy and Planning and the Road Safety Coordinator at VicRoads, in his evidence to the Committee:

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<sup>977</sup> D. Logan and B. Corben, 'METS (Macro Estimates for Target Setting)', viewed December 2013, <<http://acrs.org.au/wp-content/uploads/ACRS-Modelling-workshop-Logan-Corben.pdf>>.

<sup>978</sup> Australian Injury Prevention Network, 'National Road Safety Strategy: research and modelling', viewed December 2013, <<http://www.aipn.com.au>>.

<sup>979</sup> B. F. Corben, et al., 'Strengthening road safety strategy development 'Towards Zero' 2008-2020 - Western Australia's experience scientific research on road safety management SWOV workshop 16 and 17 November 2009', *Safety Science*, vol. 48 2010, p. 59; VicRoads, *Submission*, no. 31, 17 May 2013, p. 1089.

<sup>980</sup> Australian Injury Prevention Network, 'National Road Safety Strategy: research and modelling', viewed December 2013, <<http://www.aipn.com.au>>.

*Significantly adding on to that, the METS that the partners use to assess the impacts of road safety measures or potential countermeasures is all built on and derived from evaluations of individual components and even groupings of components into their safe system elements. Each of the areas that we are looking at has a range of evaluations and scientific research behind it to establish what the likely outcome of introducing any new countermeasure is going to be. We keep making the point in Victoria that we are very evidence based and research driven, and that really comes back to the fundamental of how we establish a road safety strategy. What actions we propose are always based on either best practice or sometimes, because they are so new and different, we are just having a go in some areas. That whole conceptual framework that we operate is always built on history and evaluations.<sup>981</sup>*

In providing evidence to the Committee, MUARC indicated that the METS model is a very rigorous approach to providing formulated strategy advice to road safety agencies. Associate Professor Newstead, Associate Director in Injury Analysis and Data at MUARC, simplified its approach with the following description of what it aims to achieve:

*...Let's identify the problem, let's look at the countermeasures, let's look at the cost of implementing the countermeasures against the effectiveness and work out the best reductions we can get for a level of expenditure.<sup>982</sup>*

**Finding 28:** The Macro Estimates for Target Setting model is a highly valuable tool to inform the development of road safety strategies.

#### 8.1.1.1 Enhancing the Macro Estimates for Target Setting model

While acknowledging the rigorous nature of the METS model, the Committee is aware that there is always a level of uncertainty associated with forecasting. In particular, the Committee notes the following issues can affect forecasting results:

- Quality and consistency of reported fatality and serious injury data;<sup>983</sup>
- Accuracy of effectiveness estimates of the countermeasures included in the modelling;<sup>984</sup> and
- Inconsistent estimates of the social costs of road trauma.

The impact of these limitations is not lost on those who work directly with the model. For example, Associate Professor Newstead from MUARC refers to the challenges associated with using a blunt injury and cost measure, as is currently used in Victoria, to devise a

<sup>981</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 280.

<sup>982</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 101.

<sup>983</sup> B. F. Corben, et al., 'Strengthening road safety strategy development 'Towards Zero' 2008-2020 - Western Australia's experience scientific research on road safety management SWOV workshop 16 and 17 November 2009', *Safety Science*, vol. 48 2010, p. 1093.

<sup>984</sup> B. F. Corben, et al., 'Strengthening road safety strategy development 'Towards Zero' 2008-2020 - Western Australia's experience scientific research on road safety management SWOV workshop 16 and 17 November 2009', *Safety Science*, vol. 48 2010, p. 1093.

refined estimate of the best package of countermeasures that will provide the best return on the dollar investment.<sup>985</sup> Professor Mark Stevenson, the Director of MUARC, in agreeing with Associate Professor Newstead, indicated that there is limited information about the best rate of return on investments for road safety interventions in general.<sup>986</sup>

In the broader literature on the effectiveness of road safety measures, it is acknowledged that 'in the absence of good data on the costs and effectiveness of interventions a great deal can be achieved by modelling the likely impact on safety and costs using best estimates combined with sensitivity analysis'.<sup>987</sup> It is also clear from the literature on the METS model that these uncertainties are built into the model to ensure it is conservative in its estimation of savings in serious casualties:

*...the general philosophy of the modelling process assumes:*

- *lower levels of effectiveness of initiatives;*
- *slower implementation/take-up of initiatives;*
- *higher costs to achieve the predicted savings;*
- *sensitivity testing of predicted traffic growth, generally adopting conservative values.*<sup>988</sup>

As a way forward, the Committee believes that improved collection, collation and reporting of road trauma data, as discussed in Chapter Four, will contribute to greater certainty in the METS model results. It is also important that the METS model be enhanced to enable it to have a more detailed focus on differing injury severity levels when estimating casualty reductions. The current model estimates serious casualty reductions (a combination of fatalities and serious injuries), rather than estimating reductions for fatalities and serious injuries separately. Mr Shelton of VicRoads indicated in his presentation to the Committee that the METS model be expanded or an alternative approach be developed that would provide a better definition of serious and severe injury.<sup>989</sup> MUARC indicated in its submission that recent attempts were made to report these savings separately, although it required making assumptions and consensus estimates regarding the impact of particular countermeasures on fatalities and serious

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<sup>985</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

<sup>986</sup> Professor Mark Stevenson, Director, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

<sup>987</sup> A H Harris, et al., *Monitoring the national road safety strategy: cost effectiveness of road safety measures* Federal Office of Road Safety, Canberra, 1995, p. 3.

<sup>988</sup> B. F. Corben, et al., 'Strengthening road safety strategy development 'Towards Zero' 2008-2020 - Western Australia's experience scientific research on road safety management SWOV workshop 16 and 17 November 2009', *Safety Science*, vol. 48 2010, p. 1093.

<sup>989</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 280.

injuries when there was limited evidence available.<sup>990</sup> Despite these limitations, the Committee believes the METS model should disaggregate these values, particularly as there has been a shift in both the Victorian and national road safety strategies towards a greater focus on crash related serious and severe injuries.<sup>991</sup> Overall, adoption of the tiered trauma definition structure by the Victorian Government, as per Recommendation One, should make it easier the transition of the METS model to estimate more specific injury reductions. The Committee understands that this transition will take time but once achieved, will enhance the overall accuracy of the METS model.

**Recommendation 24:** That the Victorian Government reformulate the existing Macro Estimates for Target Setting (METS) to incorporate the major trauma, admitted to hospital, attended an emergency room and Disability-Adjusted Life Years measures.

The existing focus on serious casualty reductions in the METS model raises a further issue about the lack of program evaluations, both in Australia and internationally, that have examined the effectiveness of countermeasures in reducing serious injuries, and in particular injuries of different severity levels. This issue is discussed in greater detail in section 8.3.2.1, although the Committee notes that MUARC may find it difficult to report on the individual trauma categories in the METS model given that existing evaluations of countermeasures have not based their findings on these categories. Upon the Victorian Government adopting the tiered trauma definition structure, the Committee believes it would be valuable to determine the feasibility of translating the findings of previous countermeasure evaluations that have focused on serious casualties to the major trauma, admitted to hospital, attended an emergency room and Disability-Adjusted Life Years (DALY) measures. This was suggested by Associate Professor Newstead in his presentation to the Committee:

*In fact in the short term to do good strategy modelling based on that new measure you might actually need to do some work translating countermeasure effectiveness on the old measure to the new measure as best you can, so that in the interim you can get at least some translation.*<sup>992</sup>

Similarly, the Transport Accident Commission (TAC) proposed in its submission Inquiry that evaluations of previous road safety countermeasures be viewed in the context of any new road safety specific definitions of serious injury, in addition to revised approaches to valuing life and injury.<sup>993</sup> The Committee acknowledges that this is a challenging task, but is of the view that it will contribute, along with adoption of the Recommendation 24, to

<sup>990</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 29.

<sup>991</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011; State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2013.

<sup>992</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 95.

<sup>993</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 8.

the METS model maintaining its value as other changes are made to the collection, collation and reporting of road trauma data.

**Recommendation 25:** That the Victorian Government, where possible, translate result findings from previous evaluations of road safety countermeasures from the existing serious injury measure to the major trauma, admitted to hospital and Disability-Adjusted Life Years measures.

## 8.2 Decision-making processes

Once modelling is completed, the results are typically presented to government as a comparison of road safety investment choices, with the estimates of serious casualty reductions during the life of a strategy. For example, in the modelling conducted for the VRSS, the strategy options were identified on the basis of achieving a 30% reduction in fatalities and a 30% reduction in serious injuries over a 10-year period.<sup>994</sup> The final decision about which countermeasures to include in the strategy document is made by government, although the process employed to prioritise such investments is rarely straightforward. In theory, in accordance with government principles around ensuring best use of public money, governments undertake economic evaluations of investment proposals to guide resource allocation. However, it is difficult to state the extent to which this occurs in practice.

The *Victorian Guide to Regulation* requires that legislative proposals that are likely to impose a significant economic or social burden on a sector of the public undergo scrutiny and evaluation through the formalised process of a Regulatory Impact Statement (RIS). This is based on an analytical benefit-cost framework that examines the economic, social and environmental impacts of legislative proposals, and considers the merit of other potential approaches.<sup>995</sup> The Committee notes that not all road safety countermeasures involve the introduction of legislation, and are therefore not required to undergo this process. However, as stated by the Department of Treasury and Finance (DTF) in its guidelines, the RIS is a useful tool that departments can use to assess all of the options at the early stage of policy development.<sup>996</sup> Further, in its *Economic Evaluation for Business Cases Technical guidelines*, the DTF offers guidelines to assist agencies conduct economic evaluations of investment proposals, which are intended to form a key component of business cases developed in the 'prove' stages of a project.<sup>997</sup>

<sup>994</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2013, p. 9.

<sup>995</sup> Government of Victoria, *Victorian Guide to Regulation*, Melbourne, 2011, p. 7.

<sup>996</sup> Government of Victoria, *Victorian Guide to Regulation*, Melbourne, 2011, p. 7.

<sup>997</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines*, August 2013, Melbourne, 2013, p. 1.

The two most commonly used economic assessment tools in transport and road safety policy are benefit-cost analysis (BCA) and cost-effectiveness analysis (CEA). At a broader level, the DTF guidelines recommend that BCA should be the preferred economic evaluation method used by agencies, whereas CEA should only be used where decision-makers have already agreed to a specific outcome.<sup>998</sup> While the Committee is aware that the Victorian Government typically applies BCA when considering larger infrastructure investment proposals, it is unsure to what extent it undertakes economic evaluation to prioritise road safety investments. In the report *Barriers to the use of efficiency assessment tools in road safety policy*, Elvik and Veisten stated it is ‘reasonable to assume that more fatalities and injuries could be prevented if road safety policy priorities were based on well-performed efficiency analyses’.<sup>999</sup> Furthermore, in his presentation to the Committee, Mr Bruce Prosser, the Director of Information and Funding Systems at the Department of Health (DoH), recommended measuring the costs and benefits to inform the prioritisation of new countermeasures:

*With countermeasure evaluation, basically we are recommending that we take a comprehensive approach to identifying, measuring and valuing the costs and benefits of intervention so that you get an understanding of the full societal impact of health and safety interventions, including ones directed particularly at injury reduction. We think that is the basis on which we should be prioritising new countermeasures, because you are looking at the full range of impacts and benefits.<sup>1000</sup>*

The following sections outline the purpose and objectives of CEA and BCA, and how these assessment tools can contribute to decision-making processes. Other factors that governments may consider when prioritising road safety investments are also considered in recognition that investment decisions rarely focus only on economic criteria.

## 8.2.1 Economic assessment tools

### 8.2.1.1 Cost-effectiveness analysis

The key purpose of CEA is to determine the effectiveness of a countermeasure in achieving a specified outcome. In the road safety context, it is described as:

*Combining the notions of the effect of a countermeasure on crash and injury risk, with the whole-of-life costs of the countermeasure, leads to the concept of cost-effectiveness and how to measure it. Reliable estimates of cost-effectiveness facilitate*

<sup>998</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines*, August 2013, Melbourne, 2013, p. 3.

<sup>999</sup> R Elvik and K Veisten, *Barriers to the use of efficiency assessment tools in road safety policy*, Institute of Transport Economics, Oslo, 2005, p. i.

<sup>1000</sup> Bruce Prosser, Director, Information and Funding Systems, Department of Health, *Transcript of evidence*, 22 July 2013, p. 52.

*rational decision-making, and ultimately, the achievement of the best safety gains from available resources.*<sup>1001</sup>

CEA analysis compares the relative costs of different policy options regarding the agreed outcome by decision-makers, such as reducing road crash serious injuries. As noted earlier, it is only on this basis that the DTF proposes that CEA be employed as an economic evaluation method, as it does not provide information on whether the preferred option provides a net benefit to the community, nor can it compare alternative policy options that could achieve greater net benefits by targeting different outcomes.<sup>1002</sup> In the area of road safety, the use of CEA could be deemed appropriate as it is usually the case that a specific outcome has been agreed to, such as the 30% fatality and serious injury reduction targets reflected in the VRSS.

The CEA's method of evaluating social programs requires that results be framed in a single measure of outcome, such as cost per life year saved or cost per injury avoided.<sup>1003</sup> The cost-effectiveness ratio, an estimate of the CEA, is represented in the following equation:

$$\text{Cost-effectiveness ratio} = \frac{\text{Number of accidents (injuries or fatalities) prevented}}{\text{Cost of measure}}$$

The following information is required to undertake this calculation and obtain an accurate cost-effectiveness ratio:

- A definition of suitable units for implementation of the measure;
- An estimation of the effectiveness of the countermeasure, such as the number of crashes or the fatalities/injuries it is expected to prevent per unit implemented of the countermeasure; and
- An estimate of the costs of implementing one unit of the measure.<sup>1004</sup>

The CEA tool is considered less complex and much easier to calculate than other economic assessment tools because it does not require benefits to be valued in monetary terms.<sup>1005</sup> However, as a consequence of this simplicity, various limitations arise from its application in the policy environment. For example, CEA cannot estimate the absolute efficiency of a countermeasure. While it can screen and rank alternative investment

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<sup>1001</sup> J Oxley, et al., *Cost-effective infrastructure measures on rural roads*, Monash University Accident Research Centre, Clayton, 2004, p. xix.

<sup>1002</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 3.

<sup>1003</sup> A H Harris, et al., *Monitoring the national road safety strategy: cost effectiveness of road safety measures* Federal Office of Road Safety, Canberra, 1995, p. 2.

<sup>1004</sup> V Gitelman and A.S. Hakkert, *Economic evaluation of road safety measures: the framework, testing and future needs*, Transportation Research Institute, Technion - Israel Institute of Technology, 2006, p. 2.

<sup>1005</sup> ROSEBUD Thematic Network, *Framework for the assessment of road safety measures*, European Commission, 2006, p. 13.



projects, it cannot provide an absolute criterion for accepting or rejecting a project.<sup>1006</sup> Furthermore, unlike other economic assessment tools, CEA only seeks to achieve one policy objective and therefore cannot be used to make trade-offs against other policy objectives.<sup>1007</sup> Despite these limitations, there is a consensus in some of the road safety literature that CEA can sometimes be sufficient in prioritising road safety measures, particularly when no significant side effects are anticipated.<sup>1008</sup> It is also claimed that CEA provides a more transparent and systematic approach to program budgeting, which is easy to communicate among decision-makers and to the broader community.<sup>1009</sup>

**Finding 29:** Cost-effectiveness analysis is an appropriate tool to prioritise road safety countermeasures in certain circumstances, such as when a specific intended outcome has been agreed to and when no adverse side effects are anticipated.

### 8.2.1.2 Benefit-cost analysis

As stated earlier, the Victorian DTF states that BCA is the preferred approach to economic evaluation to investment proposals as it:

*...provides a robust method for evaluating the costs and benefits (including both market and non-market impacts) of a project or policy change in today's dollars to society as a whole. The estimated net benefits (total benefits minus total costs), and any significant impacts that cannot be valued, are used to help decision-makers rank and assess options, and decide whether to implement them.<sup>1010</sup>*

Based on welfare economics, the overall aim of BCA is to determine whether the investment proposal in question is economically efficient, and its scale of efficiency. It achieves this by asking the question: do the benefits exceed the opportunity costs of the resources used to implement them?<sup>1011</sup> In theory, the only criterion by which a road safety countermeasure should be prioritised is when the economic returns of the countermeasure are greater than the costs.

The outcomes of BCAs are typically presented in the form of two or more policy options, with one option reflecting the business as usual case, which describes the situation that would develop without implementation of the proposed investment. This comparison to

<sup>1006</sup> ROSEBUD Thematic Network, *Framework for the assessment of road safety measures*, European Commission, 2006, p. 13.

<sup>1007</sup> R Elvik and K Veisten, *Barriers to the use of efficiency assessment tools in road safety policy*, Institute of Transport Economics, Oslo, 2005, p. 3.

<sup>1008</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Cost-benefit analysis of road safety measures*, SWOV, Leidschendam, 2011, p. 1.

<sup>1009</sup> A H Harris, et al., *Monitoring the national road safety strategy: cost effectiveness of road safety measures* Federal Office of Road Safety, Canberra, 1995, p. 7.

<sup>1010</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 3.

<sup>1011</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Cost-benefit analysis of road safety measures*, SWOV, Leidschendam, 2011, p. 1.

the business as usual case is essential in any BCA, as according to Austroads in its *Guide to Project Evaluation*, it is 'meaningless to ask the value of an option without first defining a reference point against which to measure it.'<sup>1012</sup>

### *Benefits and costs for Inclusion*

Unlike CEAs, BCAs can be used to assess trade-offs against other policy objectives by converting all policy objectives into monetary values. Essentially, BCAs are most useful in policy areas that comprise multiple policy objectives, and where those policy objectives are in conflict. In the context of road safety, the key conflicting objectives relate to mobility, transport costs, and the environment. Despite not all of these objectives having a market price, BCA requires that valid and reliable monetary valuations of all relevant costs and benefits be obtained. This is a key challenge in conducting a BCA as some costs and benefits are uncertain, some are difficult to value in monetary terms, and some are both.<sup>1013</sup> An example of this is the difficulty in calculating the social costs of serious road injuries. As discussed in Chapter Seven, if these costs are not accurately estimated, it can adversely influence BCA outcomes for particular countermeasures.

In recognition of these issues, Austroads devised monetary unit values for Road User Effects (RUE) to be used in the economic evaluation of road transport projects in Australia.<sup>1014</sup> They are endorsed by the Standing Council on Transport and Infrastructure (SCOTI) and are represented in the following key areas, divided into impacts on users and impacts on non-users:

#### 1. Impacts on users

- Vehicle operating costs (VOC) – these are incurred by road users and road service providers, and refer to fuel prices and other costs associated with lubricating oil, tyre use, repairs, maintenance, and vehicle depreciation. These costs are expressed as a rate per vehicle-kilometre.
- Travel time valuation – refers to unit travel time costs presented in the form of occupancy rates, the value per occupant, and freight travel time.
- Crash costs – refers to the social cost of crashes to the community, comprising human costs arising from crashes, vehicle damage costs, and general costs associated with, among other factors, travel delays, insurance administration, and police.

#### 2. Impacts on non-users

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<sup>1012</sup> N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012, p. 3.

<sup>1013</sup> A H Harris, et al., *Monitoring the national road safety strategy: cost effectiveness of road safety measures* Federal Office of Road Safety, Canberra, 1995, p. 13; ROSEBUD Thematic Network, *Framework for the assessment of road safety measures*, European Commission, 2006, p. 17; SafetyNet, 'Cost-Benefit Analysis', viewed May 2013, <[http://ec.europa.eu/transport/road\\_safety/specialist/knowledge/pdf/cost\\_benefit\\_analysis.pdf](http://ec.europa.eu/transport/road_safety/specialist/knowledge/pdf/cost_benefit_analysis.pdf)>, p. 12.

<sup>1014</sup> F Tan, B Lloyd and C Evans, *Guide to Project Evaluation Part 4: Project Evaluation Data*, Austroads, Sydney, 2012.

- Environmental and other externalities – refer to situations where transport users do not pay for the full costs of their transport activity or do not receive the full benefits. In the context of environmental externalities, the key road transport externality types include:
  - Air pollution;
  - Greenhouse gases;
  - Noise pollution;
  - Water pollution;
  - Nature, landscape and urban separation;
  - Upstream and downstream costs;
  - Congestion delays (and may also include the by-products of increased emissions and social activity disruption); and
  - Heavy vehicle pavement damage.
  
- Knowledge gaps regarding the benefits of investment proposals are also common due to limited information about countermeasure effectiveness.

The issue of knowledge gaps was noted by Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, at the Melbourne School of Population and Global Health in the University of Melbourne, in his presentation to the Committee:

*Often economists are accused of only being concerned about costs. That is not true; we are also concerned about benefits, and in many ways trying to measure benefits is the hardest part to do. Obviously you can observe costs, such as the costs of upgrading highways and other safety measures, but trying to assess the benefits and then value them occupies most health economists' time.<sup>1015</sup>*

The Committee notes that BCAs require extensive knowledge, some of which is not available for many road safety countermeasures. While this can affect the reliability of BCA outcomes, agencies can undertake sensitivity analyses to compensate for potential uncertainties in results. Sensitivity analysis provides information about how changes to key variables, such as costs and benefits that involve uncertainty, will affect the overall outcome of an investment proposal. Overall, it tests the impact of the uncertainty of the value of particular variables on BCA outcomes, and identifies critical assumption.<sup>1016</sup>

The *Victorian Guide to Regulation* also suggests including a multi-criteria analysis (MCA) in economic assessments when it is not possible to quantify and assign monetary values to

<sup>1015</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 228.

<sup>1016</sup> Department of Finance and Deregulation, *OBPR Guidance Note - Cost-Benefit Analysis*, Parkes, 2013, pp. 7-8; Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines*, August 2013, Melbourne, 2013, p. 34.

all of the costs and benefits of an investment proposal.<sup>1017</sup> Austroads refers to MCA as neither an alternative nor an extension to BCA but rather as an adjunct to BCA.<sup>1018</sup>

The Committee also notes that the monetary assessment of new and innovative countermeasures can be challenging as not all of the potential impacts are known. The EC's ROSEBUD<sup>1019</sup> Thematic Network states that this missing input data, such as the expected impacts of a countermeasure on serious injury crashes, can be estimated through modelling by computer simulations or conclusions by analogy, which can then be quantified by the use of crash costs. To assess the reliability of results, the ROSEBUD Thematic Network claims that the theoretical derivation of impacts and values can be validated by field tests and test runs, in addition to conducting sensitivity analyses. These processes can be challenging, although the Network argues there is no methodological barrier against the economic assessment of innovative countermeasures. On the contrary, these assessments can 'sometimes demonstrate the economic efficiency of a new, innovative measure and facilitates its implementation'.<sup>1020</sup>

**Finding 30:** The use of benefit-cost analysis (BCA) for economic evaluation of investment proposals is the Victorian Department of Treasury and Finance's preferred approach. Unlike cost-effectiveness analysis, BCA is used to assess trade-offs of investments against other policy objectives by converting all policy objectives into monetary values. On this basis, BCAs require extensive knowledge about the benefits and costs of investment proposals.

### *Discount rates*

A key component of any BCA is the discounting of benefits and costs that are received at different points in time. This allows future and existing benefits and costs to be compared in present values. An important feature in such analyses is that various options are compared over a period of time, depending on the length of the project.<sup>1021</sup>

In the research literature, there is limited agreement on the appropriate discount rate to convert values in one period to values in another period, although it is widely recognised that the discount rate can affect the overall assessment of the present value of a project. Typically, a low discount rate favours projects with long-term benefits and short-term costs, whereas a high discount rate favours projects with benefits that occur early in its

<sup>1017</sup> Government of Victoria, *Victorian Guide to Regulation*, Melbourne, 2011, p. 85.

<sup>1018</sup> N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012, p. 20.

<sup>1019</sup> **Note:** Acronym for Road Safety and Environmental Benefit-Cost and Cost-Effectiveness Analysis for Use in Decision-Making.

<sup>1020</sup> ROSEBUD Thematic Network, *Framework for the assessment of road safety measures*, European Commission, 2006, p. 23.

<sup>1021</sup> SWOV Institute for Road Safety Research, *SWOV Fact Sheet: Cost-benefit analysis of road safety measures*, SWOV, Leidschendam, 2011, p. 2.

life. In providing evidence to the Committee, Professor Clarke at the University of Melbourne indicated it might be necessary to review Australia's existing discount rates, particularly when assessing projects with up-front costs and longer-term benefits:

*...one might re-examine that in terms of reprioritising programs. The lower the discount rate, the more you will favour, as it were, long-term preventative strategies. There is perhaps a need to have a think about this, given that Australia's discount rates tend to be higher for programs than other countries, such as the United Kingdom.*<sup>1022</sup>

In the context of public transport infrastructure projects, both Austroads and the Victorian DTF recommend a rate of 7%, which according to DTF is based on a risk free rate plus a modest risk premium depending on the project's sensitivity to economic circumstances.<sup>1023</sup> The DTF also stipulates, however, that because no single discount rate can precisely meet the characteristics of every public sector project, the results should be subject to a sensitivity test using a range of discount rates. In particular, projects where a discount rate of 7% has been applied should be sensitivity tested using real rates of 4% that represents a risk-free rate plus a very small risk premium, as well as 9% which represents a long-term average market return.<sup>1024</sup>

#### *Quantitative assessment tools*

The findings of BCAs can be represented in a number of quantitative assessment tools, with the tools of the net present value (NPV) and the benefit-cost ratio (BCR) most commonly used in the transport and road safety sectors.<sup>1025</sup> The NPV measures the net benefits expected over the life of an investment proposal minus the present value of all capital and current costs.<sup>1026</sup> When an investment proposal produces a NPV greater than zero, the estimated total benefits exceed the estimated total costs, and the investment should therefore be pursued.<sup>1027</sup>

<sup>1022</sup> Professor Philip Clarke, Professor of Health Economics, Centre for Health Policy, Programs and Economics, Melbourne School of Population and Global Health, The University of Melbourne, *Transcript of evidence*, 10 September 2013, p. 229.

<sup>1023</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 25; N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012, p. 7.

<sup>1024</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 26.

<sup>1025</sup> **Note:** Other assessment tools, such as the first year rate of return (FYRR) and the internal rate of return (IRR), can also be used to represent BCA results. For further information on these tools, refer to Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013; N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012.

<sup>1026</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 28; N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012, p. 19.

<sup>1027</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 29.

A BCR refers to the present benefits of an investment proposal divided by the present values of all costs. An investment proposal with a BCR greater than one implies a positive NPV, and is the basis for proceeding with an investment.<sup>1028</sup> The BCR tool is widely used in the transport sector, with ranking by BCR considered a useful assessment tool when there are many investment proposals to consider and limited resources. However, Austroads advises that it is an approximation that only works well when certain conditions are satisfied.<sup>1029</sup> Similarly, the Victorian DTF advises that it is not suitable to use on its own as it is biased towards small projects and those that provide early returns.<sup>1030</sup>

The NPV is the preferred assessment tool of both DTF and Austroads, with the latter stating it should be reported for all evaluations.<sup>1031</sup> The DTF suggests reporting the BCR simultaneously in order to provide additional information to decision-makers.<sup>1032</sup> In recognition that NPV measures can create bias towards larger investment proposals, the Committee supports the use of both tools to assess the efficiency of investment proposals to maintain flexibility if there are circumstances when investment in smaller projects is the preferred option for the Victorian Government. This process is also supported by the ROSEBUD Thematic Network:

*If there is a choice between a large investment and several smaller ones, the monetary assessment has to be carried out for every available measure, and the choice made by comparing the results of the assessments. But it is not enough to compare just the net present values or the amount of road safety impacts (in terms of accident reductions) of the single measures, for this will certainly prefer the large investment.*

*Rather the cost-benefit-ratios of the single measures have to be compared. The ratio describes the amount of benefits of a measure in relation to its costs. By ranking small measures according to their ratio (until the amount of the fixed budget will be exploited) a set of highly efficient measures [can be found]. The accumulated net present value of this set of small measures has to be compared to the net present value of the large investment. [If] the accumulated net present value [is] higher than the single one of the large investment, the set of smaller measures will exploit the fixed budget in the most efficient way. This procedure can guarantee that smaller projects with a high efficiency get the chance for implementation.*<sup>1033</sup>

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<sup>1028</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 30.

<sup>1029</sup> N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012, p. 19.

<sup>1030</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 31.

<sup>1031</sup> N Rockliffe, S Patrick and D Tsolakis, *Guide to Project Evaluation Part 2: Evaluation Methodology*, Sydney, 2012, p. 19.

<sup>1032</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines, August 2013*, Melbourne, 2013, p. 28.

<sup>1033</sup> ROSEBUD Thematic Network, *Framework for the assessment of road safety measures*, European Commission, 2006, p. 25.

As noted earlier, MCA can also be used in instances when it is not possible to quantify all the impacts of an investment proposal. According to the DTF, it is a second best method of analysis compared to quantitative estimates of costs and benefits of a proposal, particularly when the relevant data is available for inclusion in assessments.<sup>1034</sup> In its *Economic Evaluation for Business Case Technical guidelines*, the DTF also stipulates that the use of MCA should be limited to smaller projects.<sup>1035</sup>

**Finding 31:** When assessing the efficiency of road safety investments, the Victorian Government should support the use of net present value and benefit-cost ratio tools to maintain flexibility in its decision-making processes.

## 8.2.2 Other policy considerations

While the Committee acknowledges the value of economic assessment tools, it is also cognisant of other considerations, particularly in the area of road safety, that contribute to government decision-making processes. In reality, the decision about which road safety countermeasures to implement goes beyond economic analyses, and is more likely to be influenced by the political realities present at the time, including community expectations and the acceptance of particular countermeasures, or the impetus to target particular road user groups. These are discussed in further detail below.

### 8.2.2.1 Safety as the paramount consideration

Demonstrating the potential safety effects of countermeasures was more of a concern to some of the road safety agencies that gave evidence to the Committee than applying economic assessment tools in the traditional sense to road safety countermeasures. Ms Margaret Prendergast, General Manager of Policy and Regulation at the Centre for Road Safety, Transport for NSW, told the Committee that the Centre incorporates a higher weighting to safety over other policy objectives in their evaluation analyses, with the intention of selecting projects that would have a greater impact on reducing crash related trauma :

*We have now adopted a different sort of evaluation for some projects whereby we do not even do the pure economics, the old BCR. We do 10 per cent or 20 per cent BCR and 80 per cent or 90 per cent of the reduction in the totality or injury, and we do that based on a detailed crash reduction matrix. There are other ways to do it, and what we will find over time is that those projects that were selected using that will truly impact on road safety and reduce the level of injury and death.*<sup>1036</sup>

<sup>1034</sup> Government of Victoria, *Victorian Guide to Regulation*, Melbourne, 2011, p. 85.

<sup>1035</sup> Department of Treasury and Finance, *Economic Evaluation for Business Cases: Technical guidelines*, August 2013, Melbourne, 2013, p. 46.

<sup>1036</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 134.

Similarly, Ms Samantha Cockfield, the Acting Senior Manager of Road Safety and Marketing at the TAC advised the Committee that when making decisions, the TAC is aware of the need to balance community expectations around safety with other community issues, such as mobility:

*...it is not so much a trade-off, but you are actually trying to balance a range of community issues in terms of mobility and in terms of community expectation. It is more the community expectation that when they actually travel on or use a road system as a pedestrian, cyclist et cetera, they are going to be safe, so we have to...more consider that as our no.1 priority.<sup>1037</sup>*

The issue highlighted by Ms Cockfield also reinforces the notion that community expectations and likely public acceptance of a countermeasure are important considerations for government. Such political realities can influence the decision-making process, and in the meantime reduce the contribution of BCAs to final policy decisions.

The Committee is also aware of one paradigm, which suggests that applying economic assessments to the area of road safety is inappropriate because ‘the very idea of putting a monetary value on human life does not make sense and is ethically unacceptable’.<sup>1038</sup> Similarly, the Committee heard from some witnesses that if governments are to truly prioritise road safety and the objective of achieving zero fatalities and serious injuries as part of its decision-making process, trade-offs between safety and other policy objectives would be unnecessary as all measures with proven effectiveness in reducing the risk of fatal and injury crashes would be implemented.<sup>1039</sup> In practice, however, this is not always feasible and it is more likely that governments aim to achieve a balance between the competing policy objectives when deciding on which countermeasures to implement. In his presentation to the Committee, Mr Michael Nieuwesteeg, Research Manager of Road Safety and Marketing at the TAC indicated that this is a challenge that VicRoads faces every day, ‘to somehow try to balance those economic mobility gains against the economic road safety gains.’<sup>1040</sup>

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<sup>1037</sup> Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 329.

<sup>1038</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, p. 119.

<sup>1039</sup> Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 20; Dr Mark Harvey, Research Manager, Regulatory Reform and Investment Analysis, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 73; Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 319.

<sup>1040</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 328.



### 8.2.2.2 Reducing disparities in risk

#### *Vulnerable road users*

The core efficiency objectives in BCAs can result in inequitable outcomes to an aggregation of costs and benefits across the community without regard to the equal distribution of these costs and benefits:

*A CBA implicitly counts a dollar gain to one person as cancelling a dollar loss to another. It assumes a dollar is worth the same to everyone. In other words, CBA is directed at whether the proposal delivers a net gain in dollar value to society as a whole, rather than who receives the benefits or who pays the costs.*

*The 'dollar to dollar' assumption separates a policy's efficiency or resource allocation effects from its equity or distributional effects. This separation is useful, as there is no consensus about the weight to be attached to equity effects. Ultimately, it is up to decision makers to decide the trade-off between equity and efficiency.<sup>1041</sup>*

In the context of road safety, BCA outcomes can lead to the needs of certain road user groups being ignored. For example, BCAs are less likely to favour investment proposals that target vulnerable road users, as the most cost-effective projects typically provide greater benefits to motorists and fewer to pedestrians, bicyclists and motorcyclists. This can create a dilemma for decision-makers, especially with growing community expectations around the need to focus on these less protected road users.

Aside from the fact that there are fewer vulnerable road users on the roads compared to motor vehicle occupants, economic assessments may undervalue projects targeting vulnerable road users because not all of the benefits of such projects are known or can be valued. As a consequence, not all benefits are factored into economic analyses, potentially leading to biases and inaccurate results. This issue was raised by Elvik and Veisten in their 2005 paper *Barriers to the use of efficiency assessment tools in road safety policy*, where they suggested that the following impacts arising from pedestrian and bicyclist related countermeasures are likely to be excluded from BCAs:

- Savings in travel times is estimated only for motorised travel, and not for bicyclists and pedestrians;
- No adequate monetary valuation of increased feelings of safety that might be provided by separate walking and cycling facilities; and

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<sup>1041</sup> Department of Finance and Deregulation, *OBPR Guidance Note - Cost-Benefit Analysis*, Parkes, 2013, p. 12.

- Limited understanding of the benefits to public health resulting from increased walking and cycling as a form of exercise.<sup>1042</sup>

Mr Julian Lyngcoln, the Director of the Safer Roads at VicRoads, also advised the Committee that projects targeting vulnerable road users are likely to be undervalued in BCRs because of the limited focus on varying injury severity levels in road safety policy more generally. Mr Lyngcoln indicated that despite the tendency for vulnerable road users to suffer from higher levels of severity in crashes due to being unprotected, this is not accurately captured because only one value for serious injury is applied. Mr Lyngcoln claimed, however, that a greater focus on injury severity levels would draw more attention to the needs of pedestrians and cyclists:

*At the moment, in the way that they would be accounted for in the BCR, we are just using a figure for a serious injury. So if vulnerable road users tend to have a higher level of severity in the crashes, then potentially that is being sort of underfactored...if you like, in BCRs in looking at projects to deal with that issue. That is why getting a better handle on severity becomes so important for us. We would expect that once we have that better handle on levels of severity we would probably be able to better identify that there are some particular road user groups, like those vulnerable ones you mention, that we might need to put a particular focus on.*<sup>1043</sup>

In recognition of the challenges in addressing these various biases, the Committee is of the view that decision-makers may need to make a trade-off between efficiency and equity to ensure that the promotion of safety among all road user groups is distributed fairly. The Committee acknowledges that the economic appraisal of countermeasures should not be the only criterion employed by decision-makers to develop road safety policy.

**Finding 32:** Economic assessments of road safety investments proposals are not always an appropriate tool to assist governments decide which countermeasures to develop and implement, particularly in instances when the fair distribution of safety among all road user groups is a key objective of governments.

### *Effective countermeasures*

Another reason why decision-makers might choose to steer away from the results of economic assessments is that they wish to implement a countermeasure that is estimated to provide the largest reduction in the risk of fatal and injury crashes, but which is not deemed to be the most cost-effective solution. This is not a common occurrence but may arise in the context of larger infrastructure-type countermeasures that have high implementation costs. Examples include separated bicycle lanes on roads, such as the

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<sup>1042</sup> R Elvik and K Veisten, *Barriers to the use of efficiency assessment tools in road safety policy*, Institute of Transport Economics, Oslo, 2005, p. 31.

<sup>1043</sup> Julian Lyngcoln, Director Safer Roads, VicRoads, *Transcript of evidence*, 11 September 2013, p. 279.

‘Copenhagen style bike lanes’, or grade-separated intersections that are effective in eliminating intersection crashes.<sup>1044</sup> The Committee notes that such investments can be justified on high traffic volume roads with relatively high crash risks, but would be unlikely to be justified if proposed on roads with low traffic volume and higher crash risk, when compared to less labour intensive solutions.<sup>1045</sup>

The Committee also notes that international research suggests road safety countermeasures with the most favourable BCRs are not necessarily those that will have the greatest impact on minimising road related trauma.<sup>1046</sup> This notion was reaffirmed in the Conference of European Directors of Roads’ (CEDR) *Best Practice for Cost-Effective Road Safety Infrastructure Investments*, which advised that overall cost-effectiveness of an infrastructure investment is not always in direct correlation with the safety effect. In making this point, it compared the BCR of roundabouts to the BCR of traffic signals:

*Roundabouts have very high safety effects, which are not directly reflected in the cost-benefit ratios available. On the other hand, cost-benefit ratios of traffic signals are higher than those of roundabouts, although the safety effects of traffic signals are much less impressive. In this case, a comparison of cost-benefit ratios only might lead the less-informed reader to the misleading conclusion that traffic signals are more efficient than roundabouts, whereas what is indicated is that they are simply more cost-effective.*<sup>1047</sup>

On this basis, the CEDR recommended that BCRs and safety effects always be examined in conjunction with each other to identify the appropriate solution for a specific road safety problem in specific conditions with specific objectives.<sup>1048</sup>

### 8.3 Post-completion evaluation of countermeasures

Having a comprehensive understanding and knowledge about the effectiveness of various countermeasures in reducing crash related trauma is a key factor in conducting assessments to prioritise road safety measures and in guiding resource allocation. For example, the METS model and the economic assessment tools of CEA and BCA all draw on the results of evaluation studies to inform their analyses about future directions. Without these tools, the reliability of predicted benefits would be limited. On a broader scale, the systematic monitoring and evaluation of countermeasures is of critical importance to determine their ongoing relevance and value for money. Evaluations determine whether

<sup>1044</sup> J Oxley, et al., *Cost-effective infrastructure measures on rural roads*, Monash University Accident Research Centre, Clayton, 2004, p. xxiv.

<sup>1045</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, p. 154.

<sup>1046</sup> R Elvik, *Prospects for improving road safety in Norway*, Transportøkonomisk institutt, Oslo, 2007, p. 73.

<sup>1047</sup> G Yannis, P Evgenikos and E Papadimitriou, *Best Practice for Cost-Effective Road Safety Infrastructure Investments - Summary report*, Conference of European Directors of Roads, Paris, 2008, p. 26.

<sup>1048</sup> G Yannis, P Evgenikos and E Papadimitriou, *Best Practice for Cost-Effective Road Safety Infrastructure Investments - Summary report*, Conference of European Directors of Roads, Paris, 2008, p. 26.

projects are delivering the intended outcome, which is critical to government when there is a need to maximise the benefits from a limited budget. Evaluations also assist to build a reliable knowledge base about project effectiveness to contribute to the improvement of existing and development of new countermeasures in the future. According to Austroads, fostering a post-completion evaluation culture is highly beneficial:

*Post-completion evaluations are likely to encourage organisational processes that focus on learning about project performance. It is just as important to know if implemented projects achieved what they intended, as it is to know if projects were not successful. Similarly, these evaluations would greatly assist in recognising important factors for success in the planning, evaluation and implementation of new projects. Learnings from post-completion evaluations, for example, should help to reduce the risk of pursuing projects with a low probability of success at significant cost to the community.*<sup>1049</sup>

Governments can employ different types of evaluations to review and assess publicly funded policies and programs. These include: formative evaluations that provide information on how new policies might be developed or how existing policies can be improved; process evaluations that assess whether a policy has been implemented as intended; and outcome evaluations that determine whether the policy had demonstrable effects on the defined target outcomes.<sup>1050</sup> For the purpose of this discussion, the key focus is on the latter evaluation type in the specific context of measuring the outcomes of road safety countermeasure.

### 8.3.1 Evaluations in Victoria

During its investigations, the Committee was informed that road safety in Victoria is based on a culture of evidence-based policy.<sup>1051</sup> While the Committee acknowledges this point, it also notes a recurring theme in some of the submissions received regarding the limited availability of evaluations on road safety countermeasures. The Road Safety Action Group Inner Melbourne (RSAGIM) argued in its submission that the Victorian approach to evaluation 'compares poorly with international best practice and lacks rigour and sharing of evaluations'.<sup>1052</sup> Further, the Australian Road Research Board (ARRB) indicated that the available evidence from around the globe on crash reductions expected from road and roadside-based safety treatments is patchy, and that the design of research supporting many of these countermeasures is inadequate.<sup>1053</sup> VicRoads' submission added to this perspective, stating that despite Victoria being a world leader in

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<sup>1049</sup> D Tsolakis, et al., *Guide to Project Evaluation Part 7: Post-completion Evaluation*, Sydney, 2005, p. 13.

<sup>1050</sup> NSW Government, *NSW Government Evaluation Framework*, Sydney, 2013, p. 7; NSW Government, *NSW Government Evaluation Framework*, Sydney, 2013, pp. 17-18.

<sup>1051</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 280.

<sup>1052</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 16.

<sup>1053</sup> ARRB Group Ltd, *Submission*, no. 23, 26 April 2013, p. 3.

developing and implementing innovative countermeasures, there is a limited understanding of the total benefits of these measures.<sup>1054</sup>

In contrast to these views presented in submissions, evidence received by the Committee during public hearings offered an alternative insight into the extent and quality of evaluation studies conducted in Victoria. Mr Peter Schofield, Manager of Road Safety Strategy and Partnerships at VicRoads told the Committee:

*...I would say that quite a lot of evaluations are undertaken in Victoria not just by VicRoads but also by TAC and the Department of Justice. Importantly too MUARC, on behalf of the road safety partners, undertakes a lot of evaluations.*<sup>1055</sup>

Similarly, in response to claims that countermeasures evaluations in Victoria are limited, Associate Professor Newstead of MUARC stated:

*I guess a tour of the MUARC website would show the breadth of the evaluation work that we have done. I think there has perhaps been a little too much focus on road infrastructure and black spot improvements recently. We look at everything and have looked at everything historically — bicycle helmets, motorcycle interventions; you name it, we have been there.*<sup>1056</sup>

The Committee shares the views of Mr Schofield and Associate Professor Newstead but is concerned that some stakeholders in the broader road safety community believe there is a lack of evaluation sharing in Victoria.<sup>1057</sup> In this context, the issue relates more to the transparency surrounding evaluation studies and sharing results with others, rather than whether evaluations are conducted in the first place. Similarly, Mr Shelton of VicRoads indicated that the agency is increasingly focusing efforts on its evaluations but evaluation reports are not necessarily being made publicly available, an issue which Mr Shelton stated VicRoads could be doing more to rectify.<sup>1058</sup>

The Committee also heard from Professor Rebecca Ivers, Director of the Injury Division at the George Institute for Global Health that there has been a tendency across state governments not to publicly release government-funded road safety research, particularly when they result in unfavourable outcomes. Professor Ivers indicated, however, that this creates missed opportunities to learn from others' mistakes. She was highly supportive of publicly releasing both internally and externally funded research:

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<sup>1054</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 67.

<sup>1055</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, pp. 279-280.

<sup>1056</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 102.

<sup>1057</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 16.

<sup>1058</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 279.

*...clearly I am a researcher, so I am always going to focus on the importance of research, but if we want evidence-based policy, we actually have to make public the research so that people like us can access it and look at what has been done.*<sup>1059</sup>

The Committee shares this view, and believes it is imperative for the results of evaluation reports to be made publicly available. Evaluations are useful learning tools that when shared with others reinforce a culture of knowledge transfer and shared responsibility, two attributes which the Committee believes should be at the foundation of road safety policy in Victoria. Sharing evaluation results can also reduce duplication of effort, contribute to learning and the development of stronger evidence bases, and inform future decision-making.<sup>1060</sup> On this basis, communicating and disseminating evaluation results will be highly valuable to community-based road safety organisations and local governments, many of which have limited resources to conduct their own research. The Committee also believes it reflects good governance, promoting the principles of transparency and accountability through:

- *communicating expenditure choices and outcomes to the community*
- *providing Cabinet with the necessary information to base decisions on*
- *contributing to quality assurance processes, as methods and findings are open to scrutiny*
- *contributing to publically accessible evidence bases, which may be used in other research and evaluation activities and to inform the design of future services.*<sup>1061</sup>

**Finding 33:** When publicly released, the results of evaluation studies can be useful learning tools that can reduce duplication of effort among other road safety agencies and researchers, contribute to stronger evidence bases around countermeasures, and inform future decision-making. It also reinforces a culture of knowledge transfer and shared responsibility within the road safety sector.

**Recommendation 26:** That the Victorian Government and road safety agencies publicly release existing and future evaluations of road safety countermeasures.

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<sup>1059</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 143.

<sup>1060</sup> ACT Government, *ACT Government Evaluation Policy and Guidelines*, Canberra, 2010, p. 14; NSW Government, *NSW Government Evaluation Framework*, Sydney, 2013, p. 11.

<sup>1061</sup> NSW Government, *NSW Government Evaluation Framework*, Sydney, 2013, p. 13.

### 8.3.2 The question of road crash data systems

As noted earlier, poor data can compromise evaluation studies. Reliable crash data is essential to understanding crash and injury risks and determining how to reduce those risks. This is relevant to analysing injury risk for different body regions and severity levels, as well as analysing fatality and injury risks for various road user groups. These issues are explored further below.

#### 8.3.2.1 Serious injury definitions and data

Throughout its investigations, the Committee received evidence that the existing definition of serious injury and serious injury data was limiting the capacity of road safety agencies and research groups to monitor and evaluate the performance of countermeasures, particularly the impact of countermeasures on differing injury severity levels.<sup>1062</sup> Associate Professor Newstead told the Committee:

*In fact it may be very insensitive to monitoring progress in road safety as well, because you might have countermeasures that are brilliant in eliminating brain injury but that do not eliminate the hospital admissions. If you use that as your measure, in your trends you will see essentially no improvements, yet you have made a substantial improvement. Conversely you might have other things coming up that are causing very serious injuries that are still all hospitalisations but are at the other end of the spectrum, so it really is not helping people monitor how we are tackling the road safety problem either.*<sup>1063</sup>

The 2012 MUARC evaluation of vehicle side airbag system effectiveness by D'Elia, Scully, and Newstead provides a useful example of how the existing serious injury definition and the data collected around that definition limited analysis of the countermeasure's effectiveness.<sup>1064</sup> The evaluation comprised two stages of analysis, with the first based only on injury outcomes from police reported crash data from New Zealand and five Australian states, and the second analysis using detailed and validated injury data by body region linked to police reported crash data.

D'Elia et al reported that in the first analysis, despite the availability of relatively large quantities of police reported crash data, the results were inconclusive due to the inadequacy of that data. On the other hand, the data used in the second analysis enabled a comprehensive assessment of the effectiveness of airbags in achieving the intended outcomes, and in particular reducing injuries to the body regions of the head, neck, face and thorax. According to the researchers, a clear advantage of using high resolution injury

<sup>1062</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, pp. 7,12; VicRoads, *Submission*, no. 31, 17 May 2013, pp. 19,44.

<sup>1063</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 86.

<sup>1064</sup> A D'Elia, J Scully and S Newstead, *Evaluation of Vehicle Side Airbag System Effectiveness*, Monash University Accident Research Centre, Clayton, 2012, p. 14.

data obtained from the International Classification of Disease (ICD) codes was that it provided consistent and validated measures of injury, allowing clearer outcomes to be achieved. Furthermore, the second analysis, through its identification of injuries according to body region, provided an insight into potential areas of improvement. For example, the study reported torso-only airbags are less effective than combination airbags, with an indication that they could increase the odds of death and injury to the thorax region, and thus require further investigation.<sup>1065</sup>

Mr Shelton of VicRoads indicated that road safety agencies would benefit from future evaluations providing a much more in-depth understanding of the impact of countermeasures on reducing injury rates and those of different severity levels.<sup>1066</sup> As noted earlier, evaluations typically focus only on serious casualty reductions, a combination of fatality and serious injury data.<sup>1067</sup> The Committee agrees with Mr Shelton's view and that of Associate Professor Newstead that the serious injury definition provides an insensitive measure, as does the serious casualty measure.

**Finding 34:** The serious injury definition and the focus on serious casualties in evaluations provide insensitive measures for understanding the impact of countermeasures on reducing injury rates and those of differing severity levels.

The Committee believes that the tiered trauma definition structure, as proposed in Recommendation One, in providing a comprehensive and accurate system of categorising crash related trauma will provide more sensitive measures. If adopted by the Victorian Government, it will encourage road safety agencies to tailor post-completion evaluations to determine the impact of countermeasures on one or more of the trauma categories. This in turn will contribute to agencies employing a more targeted approach to the development of future interventions and in particular, refine the focus of countermeasures to reduce the risk of specific crash related injuries.

### 8.3.2.2 Road user groups

The Committee believes that a greater examination of the impact of countermeasures on different road user groups in post-completion evaluations could contribute to improved road safety policy development in the future. Such consideration at the developmental stage of countermeasures is also a sign of strong road safety policy, and is discussed in further detail in Chapter Nine in the context of transport and infrastructure policy, land use and urban planning schemes.

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<sup>1065</sup> A D'Elia, J Scully and S Newstead, *Evaluation of Vehicle Side Airbag System Effectiveness*, Monash University Accident Research Centre, Clayton, 2012, p. 15.

<sup>1066</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267.

<sup>1067</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 4.



In the context of post-completion evaluation studies, the Committee is aware that countermeasures are commonly evaluated in the context of one road user group. The Committee first became aware of this issue in its previous *Inquiry into Motorcycle Safety*, where there was a strong consensus in the evidence received about the potential danger of wire rope safety barriers to motorcyclists despite them reducing the risk of serious casualty crashes for motor vehicle occupants.<sup>1068</sup>

In 2009, MUARC researchers, Candappa, D'Elia, Corben and Newstead, conducted an evaluation into the effectiveness of wire rope barriers on Victoria roads. The original aim was to analyse the barrier impacts on different road user groups, however a lack of data limited the researchers' capacity to undertake any meaningful road user analysis.<sup>1069</sup> The evaluation results concluded that the barriers were associated with significant reductions in the risk of both casualty and serious casualty crashes, but did not consider the impact of the barriers on specific road user groups, such as motorcyclists. Research undertaken for the motorcycle inquiry found that based on international research, wire rope barriers do not contribute greatly to fatality rates among motorcyclists, although they may present serious risks to motorcyclists, with the barrier support posts in particular multiplying the injury severity by a factor of five compared to the average motorcycle crash.<sup>1070</sup>

Dr Mike Bambach, a Research Fellow at the Transport and Road Safety (TARS) Research at the University of New South Wales, advised the Committee that while cable barriers have been shown to be highly effective in reducing the severity of vehicle crashes, it had been much more difficult to understand the impact of cable barriers on motorcyclists.<sup>1071</sup>

The example of the MUARC study illustrates the constraints that Victoria's road safety data system has on the way evaluations are conducted. The study also provides a useful example of a countermeasure showing clear success in reducing the risk of fatal and serious injury crashes for vehicles but at closer examination does not truly reflect the safety effects for all road user groups.

Once the Victorian Government improves its collection, collation and reporting of injury statistics, researchers will be better placed to expand the depth of evaluations to examine the impact of countermeasures on multiple road user groups. It will not always be feasible to do so, particularly in instances where countermeasures specifically target one road user group. Where it is feasible, evaluations that focus on more than one road user group will assist to identify ways that countermeasures can have a wider safety impact.

<sup>1068</sup> **Note:** refer to pages 299 to 302, *Inquiry into Motorcycle Safety*, for discussion on wire rope safety barriers.

<sup>1069</sup> N Candappa, et al., *Evaluation of the Effectiveness of Flexible Barriers Along Victorian Roads*, Monash University Accident Research Centre, Clayton, 2009, p. 3.

<sup>1070</sup> Road Safety Committee, *Inquiry into Motorcycle Safety*, Parliament of Victoria, Melbourne, 2012, p. 301.

<sup>1071</sup> Dr Mike Bambach, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 123.

**Recommendation 27:** That when evaluating road safety countermeasures, Victorian road safety agencies should examine the impact of countermeasures based on separate categories of trauma, as identified in Recommendation One, in addition to the impact of countermeasures on different road user groups.

### 8.3.3 The question of causality

Another key challenge in conducting post-completion evaluation studies is determining the actual effectiveness of countermeasures once they are implemented and have been in operation long enough for the desired benefits to have taken effect. Evidence provided by VicRoads and the TAC indicated the difficulties in doing this, particularly as the causal factors of injury crashes are not well-understood.<sup>1072</sup> Along with issues around the serious injury definitions and data, the lack of adequate information about the factors that contribute to serious injury crashes is another known limitation to developing targeted countermeasures and conducting comprehensive evaluations. In *The Handbook of Road Safety Measures*, Elvik et al referred to the merits in conducting such an in-depth study to determine crash factors:

*The chief merit of in-depth accident studies is that they provide more detailed accident data than ordinary accident records do. Clearly, ordinary accident records are not sufficiently detailed for studying the role of human factors in road accidents. Besides, in-depth studies are often conducted by scientific teams or trained experts. This means that the recording of information will often be more complete and more accurate than it is in the case of ordinary accident reporting by the police.*<sup>1073</sup>

The Committee was pleased to note that earlier this year, the TAC launched the Enhanced Crash Investigation Study (ECIS), which is being undertaken by MUARC in consultation with international experts. The ECIS will investigate 400 Victorian serious injury crashes, with researchers analysing 5000 pieces of information to understand why and how these crashes occurred.<sup>1074</sup> According to the TAC, this data will enhance the capacity of decision and policy-makers to develop policies and countermeasures that will aim to prevent these crashes from occurring in the future.<sup>1075</sup> It will achieve this by ‘understanding the underlying cause of serious injury’.<sup>1076</sup>

<sup>1072</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 279; Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 328.

<sup>1073</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, p. 92.

<sup>1074</sup> Transport Accident Commission, *Serious injuries in focus as Victoria cements status as world leader*, 14 March 2014, accessed May 2014 at <http://www.tac.vic.gov.au/about-the-tac/media-room/news-and-events/current-media-releases/enhanced-crash-investigation-study>

<sup>1075</sup> Transport Accident Commission, *Serious injuries in focus as Victoria cements status as world leader*, 14 March 2014, accessed May 2014 at <http://www.tac.vic.gov.au/about-the-tac/media-room/news-and-events/current-media-releases/enhanced-crash-investigation-study>

<sup>1076</sup> Hafez Alavi, Senior Data Analyst, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 328.

However, the Committee also notes that until the TAC's ECIS is complete, the lack of adequate information about the factors that contribute to serious injury crashes will continue to act as a barrier to road safety agencies developing targeted countermeasures, and evaluating those countermeasures in a comprehensive manner.

**Finding 35:** The Committee believes that the TAC Enhanced Crash Investigation Study will contribute greatly to the development of stronger road safety policy in Victoria.

In recognition of the difficulty in evaluating countermeasures when there is a limited understanding of crash causes, Mr Shelton of VicRoads advised the Committee:

*...if we take our starting point as being that all crashes are multicausal, then the value of an evaluation or the ability to evaluate will depend on the strength of that particular countermeasure to focus on a very specific causal relationship. If that is a very strong relationship, then an evaluation is highly valid. For example, if you are doing something that is more diffuse, like road safety education, and the link between your countermeasures and behaviour change and hence the causes of crashes is a much more tenuous or poorly understood one, then the evaluation becomes very difficult.<sup>1077</sup>*

Mr Nieuwesteeg of the TAC referred to similar challenges in evaluating TAC campaigns, and disentangling their effectiveness from those other countermeasures that are also operating, such as police enforcement.<sup>1078</sup> In its *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatment*, Austroads advises that in circumstances where a number of countermeasures are introduced at the same time, it is likely to require that they be evaluated as a package rather than individually.<sup>1079</sup> The Committee notes that evaluating some countermeasures as part of a broader package might be preferred because the overall effectiveness might not have been achieved without the other countermeasures, such as the use of public education campaigns to complement the introduction of enforcement initiatives. However, this rule cannot be applied to the evaluation of all countermeasures.

A common theme in a number of submissions was the idea that countermeasures should be assessed collectively or in a systematic way.<sup>1080</sup> The DoH submission cautioned that it would be limiting and simplistic to consider countermeasures independently on the basis that gains attributed to one countermeasure might be due to a set of countermeasures

<sup>1077</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 279.

<sup>1078</sup> Michael Nieuwesteeg, Research Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 327.

<sup>1079</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 5.

<sup>1080</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 28; Transport and Road Safety (TARS) Research, *Submission*, no. 33, 22 May 2013, p. 6.

implemented across policy areas.<sup>1081</sup> This idea was also supported by the RSAGIM, which stated that ‘the right combination of measures has a significantly greater reduction on fatalities and serious injuries than any one measure by itself’.<sup>1082</sup>

In recognition of this issue, the Committee raised the question with various witnesses about the appropriateness of evaluating the combined impact of countermeasures over the impact of individual countermeasures. Overall, a mixed response was received from witnesses, although it was generally agreed to be a complex issue. Dr Jan Garrard, Senior Lecturer in Public Health at the School of Health and Social Development, Deakin University, referred to the benefit in establishing a specific relationship between a countermeasure and a reduction in road trauma. However, she also claimed that the inability to distinguish the actual effect of a single countermeasure from the overall effect of a package of countermeasures, particularly when the effect is likely to be small, should not prevent policy and decision-makers from implementing those countermeasures. Dr Garrard also noted that while single measures may produce small effects, it is the combination of countermeasures implemented together that produces a higher effect size.<sup>1083</sup>

In contrast, Mr Rex Deighton-Smith, Director and Principal of Jaguar Consulting, asserted that reviewing a package of countermeasures was inappropriate as it does not establish which countermeasures are effective, or even whether the overall effect is solely attributable to the countermeasures or external factors:

*I am nervous of arguments that suggest we should look at the combined impact of countermeasures. That is because it gives us a black box...we need to know which countermeasures are working and which are not. We need to draw links — both logical links and links in terms of demonstrated impact — between a particular measure and the outcome. A lot of the costs of these countermeasures are intangible, and I fear that they are ignored because they are intangible.<sup>1084</sup>*

Both Dr Liz DeRome, Senior Research Officer at Neuroscience Australia and Professor Ivers of the George Institute for Global Health, advised the Committee that the ability to determine the effectiveness of a single countermeasure in contrast to the effectiveness of a package of countermeasures depends on the countermeasure itself.<sup>1085</sup> According to Professor Ivers, legislated interventions can be hard to assess, although a sophisticated evaluation technique, such as series modelling, could be used to determine their effectiveness. Professor Ivers also provided the example of the Graduated Driver

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<sup>1081</sup> Department of Health, *Submission*, no. 30, 14 May 2013, p. 24.

<sup>1082</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, p. 12.

<sup>1083</sup> Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 20.

<sup>1084</sup> Rex Deighton-Smith, Director and Principal, Jaguar Consulting, *Transcript of evidence*, 22 July 2013, p. 26.

<sup>1085</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 115; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, pp. 148-149.

Licensing Scheme (GLS), and the difficulty in measuring the effectiveness of its individual components due to them being implemented as a package. Overall, she stated it is impossible to say whether individual measures should be evaluated on their own or as a group because it depends on the timing and what else is going on.<sup>1086</sup>

In the context of health, Professor Anthony Harris, Director of the Centre for Health Economics at Monash University, stated that many of the preventative interventions are multifaceted and there are evaluation techniques which value the whole package of measures together, and if well-designed, the evaluation can disentangle the effects of each of the measures. Professor Harris warned the Committee, however, that such studies are difficult to design, expensive and could generally not be undertaken retrospectively:

*...it is possible in well-designed studies to disentangle the individual components from a complex intervention. What it means is that the study would tend to be designed before the intervention, it would be a randomised study, it would involve a much bigger group of locations possibly and it would be quite expensive. I do not know how expensive; I have never tried to do it in this sphere. But it would be more expensive than the kind of thing that you are doing now, which is just, 'Let's put this barrier in. Let's see what the crashes are now and let's compare them with what they were before', which seems to be what has been typically done.*<sup>1087</sup>

The Committee acknowledges the evidence that suggests that it is not always feasible to evaluate the effectiveness of single measures, but it remains concerned that when countermeasures are assessed collectively it becomes difficult for policy and decision-makers to discern what works from what does not. To do so is likely to require the use of a more sophisticated evaluation approach to establish a countermeasure's actual effect. This requires forethought and planning on behalf of those devising the countermeasure and of course the evaluator. Clearly it would not be deemed feasible to conduct a complicated and expensive evaluation study if the countermeasure in question is small in scale. The Committee understands that in these instances, public funds could be more appropriately allocated. However, it is important that these issues be considered and resolved at the planning stage of the countermeasure in question. The importance of planning post-completion evaluations is discussed in the following section.

### 8.3.4 Planning project evaluation

A common theme in the road safety literature is the importance of planning post-completion evaluation studies as part of the business case for the development of countermeasures. This is the approach advised by Austroads to ensure clear mechanisms

<sup>1086</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 149.

<sup>1087</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 345.

are put in place to measure project performance.<sup>1088</sup> Professor Ivers of the George Institute for Global Health also highlighted the importance of having a clear evaluation framework, with consistent measures of injury and high-quality research, being built around the implementation of policies and programs.<sup>1089</sup>

More broadly, the Committee notes that government evaluation frameworks and guidelines reinforce the importance of building evaluations into program designs and before a program is implemented in order to ‘strengthen the rationale for the program, improve the design of the program, and increase the power of the evaluation’.<sup>1090</sup> They also refer to the need to engage with evaluators at the design stage to ensure programs are developed in a way that allows them to be evaluated.<sup>1091</sup> In particular the United Kingdom Her Majesty’s (HM) Treasury’s guidance for evaluation, *The Magenta Book*, advises:

*The earlier that an evaluation can be planned in the policy development process, the more likely it will be possible to...choose the most appropriate evaluation. The later in the policy process the evaluation is considered the fewer options there are for undertaking it. Judgement needs to be made during the development of the policy on the scale and form of evaluation that is required, which might even extend to considering whether policy implementation might be adjusted to make a stronger evaluation more feasible. This judgement will involve some technical issues and should therefore be made in consultation with analytical specialists who can advise about the trade-offs involved and implications of different choices.*<sup>1092</sup>

Planning evaluation studies early in the development phase is essential to ensure the most appropriate evaluation approach is applied to the countermeasure in question, and is designed with attention to the specific characteristics of the countermeasure. Another guiding principle in choosing an evaluation methodology is that it match the research question, which should also be established at the design stage when the purpose of the evaluation is decided upon.<sup>1093</sup> Research questions in outcome evaluations focus on whether there were any observed changes, and to what extent these changes could be attributed to the countermeasure as opposed to other factors. Some examples of other research questions include:

- Whether the countermeasure met community expectations;
- What, if any, unanticipated benefits or costs arose; and

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<sup>1088</sup> D Tsolakis, et al., *Guide to Project Evaluation Part 7: Post-completion Evaluation*, Sydney, 2005, p. 3.

<sup>1089</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 143.

<sup>1090</sup> NSW Government, *NSW Government Evaluation Framework*, Sydney, 2013, p. 9.

<sup>1091</sup> NSW Government, *NSW Government Evaluation Framework*, Sydney, 2013, p. 9.

<sup>1092</sup> Her Majesty’s Treasury, *The Magenta Book: Guidance for evaluation*, London, 2011, pp. 13-14.

<sup>1093</sup> A H Harris, et al., *Monitoring the national road safety strategy: cost effectiveness of road safety measures* Federal Office of Road Safety, Canberra, 1995, p. 35.

- The overall cost-effectiveness of the countermeasure was.<sup>1094</sup>

In addition to choosing the appropriate evaluation methodology, early planning of evaluations ensures that baseline data can be collected prior to the countermeasure being implemented. Without this baseline data, the quality of evaluations and the final results are likely to be compromised and of limited use. Mr Peter Carver, the Project Director of Health Strategy at the DoH reiterated to the Committee the importance of collecting data at the appropriate time to support evaluations:

*...in my view what often does not happen when you create an initiative is that your evaluation criteria around cost-effective countermeasures is not set in concrete from the start. In doing that you need to make sure that, whatever you decide is the best way to evaluate the effectiveness, you collect the appropriate data. Quite often what happens in data is that you go back in two years and think, 'Rats! I should have been collecting that', and I think that is something that is very important.<sup>1095</sup>*

**Finding 36:** Planning post-completion evaluation studies at the developmental stage of countermeasures is necessary to ensure that the most appropriate evaluation design is applied to them. It also allows researchers to collect appropriate baseline data prior to the countermeasure being implemented.

The choice of evaluation methodology will also typically depend on the amount of resources invested in the overall countermeasure.<sup>1096</sup> According to HM Treasury's *The Magenta Book*, evaluations need to be proportionate to the risks, scale and profile of the policy, with certain circumstances not calling for an evaluation at all.<sup>1097</sup> Overall, however, large-scale and relatively important interventions that are expected to have a significant impact should be subject to a comprehensive and robust evaluation. In road safety policy, where governments have an ongoing responsibility to reduce crash related trauma and are investing high levels of public resources to meet that objective, evaluations are an essential tool to inform governments about what is working, what is not, and why. An example of such an evaluation is the Victorian GLS, which is currently underway. In the interim evaluation report, it is clear that the evaluation methodology was comprehensively planned and designed on the basis of the high levels of investment in the actual GLS:

*A critical element of the GLS program is its evaluation. Given the level of investment in the program and the substantive changes that were introduced into the licensing system as part of the new program, great care was taken in developing an evaluation design to validly and reliably measure the most important indicators of program success.*

<sup>1094</sup> Her Majesty's Treasury, *The Magenta Book: Guidance for evaluation*, London, 2011, p. 19; D Tsolakis, et al., *Guide to Project Evaluation Part 7: Post-completion Evaluation*, Sydney, 2005, p. 6.

<sup>1095</sup> Peter Carver, Project Director, Health Strategy, Department of Health, *Transcript of evidence*, 22 July 2013, p. 62.

<sup>1096</sup> D Tsolakis, et al., *Guide to Project Evaluation Part 7: Post-completion Evaluation*, Sydney, 2005, p. 5.

<sup>1097</sup> Her Majesty's Treasury, *The Magenta Book: Guidance for evaluation*, London, 2011, p. 35.

*A panel of international experts (involved in evaluating graduated licensing initiatives in overseas jurisdictions) was consulted to ensure that best practice was being adopted and importantly that the evaluation was well placed to assess those program outcomes that would be most influential in improving the safety of novice drivers in Victoria.*

*The aim of the evaluation is to compare the road safety situation in Victoria following the GLS changes with the road safety situation that would have existed if the changes had not been made. In order to allow for the changing influence of extraneous factors (such as the economy, enforcement patterns and road safety campaigns) between the before and after periods, the evaluation includes a comparison/control driver group that is as closely matched as possible to the target driver group that is expected to exhibit the consequences of the GLS changes.<sup>1098</sup>*

The Committee notes that the costs associated with conducting evaluations can be prohibitive, and that governments are under constant budgetary pressures to tighten resources or to allocate them to other policy areas. The Committee does not believe this is a reason to limit evaluation funds but rather it reinforces the need to carefully plan evaluation activities to produce reliable and relevant information.<sup>1099</sup> On this basis, incorporating these costs into the business case of countermeasures is likely to minimise the risk of evaluations being compromised due to limited funds.

Further, evaluation reports can lead to future savings by helping to reduce the likelihood of others pursuing projects with limited effectiveness and which could be a significant cost to the community.<sup>1100</sup> This was a point reiterated in the UK Treasury's *The Magenta Book*:

*But even after the overall affordability is queried, it is important to consider the opposite question – can one afford not to do a proper evaluation? Skimping on the research can have serious consequences. It is almost certain to be more cost-effective to conduct a robust evaluation, rather than have to repeat an evaluation because it was not adequately resourced. Furthermore, without a solid basis of evidence, there is a real risk of continuing with a programme which has negligible or even negative impact, or of not continuing with a cost-effective programme.<sup>1101</sup>*

**Recommendation 28:** That the Victorian Government and road safety agencies ensure that evaluation frameworks for individual road safety countermeasures be developed and evaluation funding be secured prior to the implementation of countermeasures.

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<sup>1098</sup> D Healy, J Catchpole and W Harrison, *Victoria's Graduated Licensing System evaluation interim report*, VicRoads, Kew, 2012, p. 10.

<sup>1099</sup> ACT Government, *ACT Government Evaluation Policy and Guidelines*, Canberra, 2010, p. 6.

<sup>1100</sup> D Tsolakis, et al., *Guide to Project Evaluation Part 7: Post-completion Evaluation*, Sydney, 2005, p. 13.

<sup>1101</sup> Her Majesty's Treasury, *The Magenta Book: Guidance for evaluation*, London, 2011, p. 35.



### 8.3.5 Evaluation techniques

In designing evaluation methods prior to implementing countermeasures it is important to choose the right evaluation methodology to ensure strong results. While the Committee's investigations led it to understanding that post-completion evaluations are common practice in road safety policy, particularly in Victoria, questions were also raised about the quality of some evaluation designs and their capacity to provide valid estimates of countermeasure effectiveness. Dr Peter Cairney, Principal Behavioural Scientist at the ARRB, advised the Committee that poor study design was a key contributing factor to the many gaps in knowledge around the effectiveness of engineering treatments as 'people do not really understand what they are doing and as a result they draw quite the wrong conclusion sometimes.'<sup>1102</sup> On the other hand, in response to evidence received during the public hearings, the Committee also understood that some road safety agencies are working to improve the quality and processes surrounding their evaluations.<sup>1103</sup> For example, Ms Cockfield of the TAC advised the Committee:

*...it is what we are becoming better at because we certainly understand the need to work prior to the introduction of an intervention — having some sort of baseline... where we are at now, what the intervention proposes to do, how we are actually going to measure that and then at some stage eventually doing usually a full-stage evaluation with somebody like a Monash University or an ARRB.*<sup>1104</sup>

This section below identifies the key contributing factors to high quality evaluation studies, including an overview of the main evaluation methodologies that are employed to measure the effectiveness of road safety countermeasures.

#### 8.3.5.1 Validity

According to Austroads, the quality of an evaluation design is equated to its validity, which refers to 'the extent to which the evaluation process approximates the truth'.<sup>1105</sup> As noted earlier, there are many challenges to conducting a comprehensive evaluation but despite these challenges there is a responsibility on behalf of those designing the countermeasure and those designing the evaluation to ensure that study biases are minimised and causality is isolated as much as possible. To achieve this, the chosen methodology must meet certain criteria to ensure a high standard and reliable, accurate final results. The following list describes the four types of validity, which are important

<sup>1102</sup> Dr Peter Cairney, Principal Behavioural Scientist, ARRB Group Ltd, *Transcript of evidence*, 11 September 2013, p. 334.

<sup>1103</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 279; Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 328.

<sup>1104</sup> Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 329.

<sup>1105</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 11.

measures of evaluation quality. It is taken from Elvik et al's *The Handbook of Road Safety Measures*:<sup>1106</sup>

- *Statistical conclusion validity* is achieved when the results of statistical analyses cannot be attributed to randomness or bias of the measurements (such as under-reporting or over-reporting of crashes), and if they represent a known population of units. This type of validity is assessed on the basis of an evaluation study's sampling technique, sample size, reporting of statistical uncertainty in results, measurement errors, and the specification of accident or injury severity.
- *Theoretical validity*, otherwise known as construct validity, refers to the causal theory underlying the potential impact of an intervention. The criteria for this type of validity are identification of relevant concepts and variables, hypotheses describing the relationships between variables, and knowledge of causal mechanism. According to Elvik et al, most evaluations of road safety measures do not rely explicitly on stated theoretical foundation. While studies may test stated hypotheses, these are not necessarily based on a well-established theory.
- *External validity* refers to whether the study results can be generalised to different settings than those settings in the study. It is difficult to assess the external validity of a single study. It is more appropriate to compare the results of studies that have been made in different settings findings, and if the results are similar it can be concluded that external validity of that set of studies is high.
- *Internal validity* relates to the extent to which evaluation findings can reliably infer a causal relationship between the countermeasure in question and the effect. According to Elvik et al, internal validity is very important on the basis that the objective of evaluations of road safety countermeasures is to determine their effects on safety. The criteria for achieving internal validity includes statistical association between countermeasure and effect, clear direction of causality, dose-response pattern, specificity of effect, and control of confounding factors.

Weaknesses in evaluation studies are inevitable, although it is important to be confident that those weaknesses do not strongly influence the results. This requires an understanding of the potential threats to validity and making informed decisions about which evaluation methodology is the most appropriate to maximise validity.<sup>1107</sup> It is clear from the road safety evaluation literature that road safety agencies and researchers are aware of the issues surrounding statistical conclusion validity, particularly the likely bias in evaluation findings resulting from the inadequate collection of serious injury data. In addition, the lack of specificity in evaluation findings regarding crash and injury severity is

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<sup>1106</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, pp. 100-104.

<sup>1107</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 11.

often recognised by agencies and researchers as limiting the quality of some evaluation studies. Elvik et al state that:

*Studies that specify the severity of the accidents or injuries to which results apply are rated as better than studies that do not specify accident or injury severity. Firstly, the effects of many road safety measures have been found to vary, depending on accident severity. Secondly, fatalities and severe injuries are regarded as a more serious problem than minor injuries or accidents that result in property damage only.<sup>1108</sup>*

Another commonly identified threat to the validity of evaluation studies is the regression to the mean (RTM). Dr Cairney of the ARRB brought this to the attention of the Committee, describing it as follows:

*All that means is that it is sites that suddenly have high accident rates that get the treatments, and then the crash rates come down. If you had left them alone, in all probability the results would have come down anyway. Maybe not quite as much as they would have without the treatment, but they probably still would have come down a fair bit. There are quite a few studies that show this, and one study in particular measured the effect and found that the regression-to-the-mean effect was roughly the same as the actual effect of the treatments. So we get a very exaggerated effect of the effectiveness of the treatments if we do not take account of this.<sup>1109</sup>*

Further, the International Road Assessment Program (iRAP), referred to RTM as occurring when crash numbers at specific sites fluctuate from year to year, regardless of whether a countermeasure has been implemented. After a high number of crashes occurring in a year, the site might revert back to its normal number of crashes in the following year, potentially leading to an overstatement of a countermeasure's actual effect. The iRAP claims it is not unusual for around 20 to 50% of the apparent reduction to be the consequence of the RTM effect.<sup>1110</sup> It is therefore essential that evaluations account for this potential effect when measuring the effectiveness of infrastructure based safety countermeasures.

In its *An Introductory Guide for Evaluating the Effectiveness of Road Safety Treatments*,<sup>1111</sup> Austroads identified the following threats to validity that can weaken evaluation studies of road based safety countermeasures:

- *Changes in traffic flow* – these can have substantial impacts on evaluation studies as traffic flow may fluctuate for reasons unrelated to the evaluation, or the countermeasure itself might contribute to such fluctuations. Austroads advised that because fluctuations in traffic flow typically influence crash numbers, these

<sup>1108</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, p. 101.

<sup>1109</sup> Dr Peter Cairney, Principal Behavioural Scientist, ARRB Group Ltd, *Transcript of evidence*, 11 September 2013, p. 335.

<sup>1110</sup> S Lawson, *Before-and-after studies using crash data and iRAP protocols*, iRAP, Hampshire, 2011, p. 6.

<sup>1111</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012.

changes should be taken into account when estimating changes in crash numbers resulting from the countermeasure being evaluated.

- *General crash trends* – crash trends on roads unrelated to the countermeasure in question, such as increasing fuel prices or the introduction of safer vehicles, can affect the number of crashes at the treatment site. This can be controlled in evaluation studies through the inclusion of comparison sites with similar characteristics to the treatment site. It is assumed that without the countermeasure, crash trends would continue to be same for the treatment and comparison sites.
- *Crash risk migration* – this refers to instances where countermeasures may reduce crashes at the treatment site, but crashes may increase in other places.<sup>1112</sup> According to Austroads, crash migration is often the result of changes in traffic flow associated with the installation of treatments.
- *Adjustment period* – following the implementation of a countermeasure, an adjustment period typically follows until drivers return to their previous behaviours once they realise there are no effective sanctions for non-compliance, nor do they perceive any benefit in continuing to comply with the new countermeasure. This is common in visible speed enforcement countermeasures, where drivers reduce speed limits while enforcement is present but the speed limits typically rise again after the enforcement is no longer present.

**Finding 37:** When designing evaluation studies, it is important to minimise study biases, and ensure potential weaknesses do not strongly influence evaluation results.

### 8.3.5.2 Types of evaluation studies

As noted earlier, a post-completion evaluation study should be designed and tailored to match the specific characteristics of the countermeasure being used. According to Austroads, there are at least three possible ways to evaluate road safety countermeasures, including examining changes in road user behaviour, community reactions to the introduction of countermeasures, and crash reductions. Austroads claims that crash reductions are the most direct measure of the effectiveness of road safety countermeasures.<sup>1113</sup>

Determining crash reductions in evaluation studies is typically measured through crash modification factors (CMF), which in the context of infrastructure-based countermeasures refer to the ‘multiplicative factor used to compute the expected number of crashes after

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<sup>1112</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, p. 105.

<sup>1113</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 5.

implementing a given countermeasure at a specific site'.<sup>1114</sup> In a well-designed and comprehensive evaluation study, the final CMF should accurately reflect the precise effectiveness of a countermeasure, which at a strategic level can be used in future as an estimate of the effects that the countermeasure is likely to produce if implemented in similar situations.<sup>1115</sup> In its submission to the Inquiry, VicRoads referred to its application of crash reduction factors (CRF), similar to CMFs, to particular road safety treatments in order to provide a simple and quick way to estimate crash reductions, and in part to determine a relevant BCR. VicRoads stated that these are constantly reviewed following evaluations of infrastructure programs.<sup>1116</sup> In its *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads indicated that most key international jurisdictions have replaced the use of CRFs with CMFs on the basis that CMFs do not presume that treatments will result in a reduction in crashes, and therefore they avoid the awkwardness of negative reduction factors when crashes actually increase. It recommended that Australian jurisdictions employ the same practice, which would also facilitate greater international harmonisation and the sharing of research outcomes.<sup>1117</sup>

The Committee notes the growing evidence around CMFs and their fundamental role in assisting road safety agencies to identify the most cost-effective countermeasures. In 2012, the Organization for Economic Co-operation and Development's (OECD) International Transport Forum, an intergovernmental organisation with 54 member countries, recommended in its *Sharing Road Safety* research report that an:

*...international group be composed under an existing organization to foster dialog among researchers and practitioners on CMF research and reporting standards with the aim of increasing transferability of results. Coordination of research across countries on top priority countermeasures should be considered.*<sup>1118</sup>

**Finding 38:** Crash modification factors (CMF) can be a useful tool to assist road safety agencies accurately predict the estimated effects of infrastructure-based road safety countermeasures. The use of CMFs facilitates international harmonisation through increased sharing and transferability of results across national and international jurisdictions.

In discussing post-completion evaluation studies with key witnesses, the Committee noticed a reoccurring theme around the concept of a 'gold standard' evaluation or in

<sup>1114</sup> F Gross, B Persaud and C Lyon, *A guide to developing quality crash modification factors*, FHWA-SA-10-032, Washington, DC, USA, 2010. cited in P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 6.

<sup>1115</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 7.

<sup>1116</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 60.

<sup>1117</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 6.

<sup>1118</sup> International Transport Forum, *Sharing Road Safety: Developing an International Framework for Crash Modification Functions (Summary document)*, OECD Publishing, Paris, 2012, p. 7.

other words, best practice for evaluation design studies.<sup>1119</sup> The Committee understands that an evaluation study that minimises bias is considered best practice. Not every evaluation technique is equal in its capacity to minimise bias but, as has been explored in this chapter, budgetary, data and other constraints can restrict the capacity of road safety agencies and researchers to design evaluation studies that ensure the most valid results. The three key evaluation designs that are commonly referred to in the road safety research literature and broader evaluation literature are experimental studies, before-after studies and cross-sectional studies. These are outlined below, in the order of the design that offers the strongest measure of countermeasure impact.

### *Experimental design in evaluations*

The key experimental evaluation design is a randomised controlled trial (RCT), which involves evaluators taking an active role in influencing where countermeasures are implemented to allow them to randomly allocate sites or participants to the treatment group or the control group. In the literature and evidence received, RCTs are widely regarded as the most robust evaluation method due to their capacity to balance out the differences between the treatment and control groups, and to control any confounding factors across the two groups.<sup>1120</sup> As a consequence, evaluators can conclude that any statistical differences between the two groups are due to the countermeasure and not due to pre-existing systematic differences between the treatment and control groups.<sup>1121</sup>

In their presentations to the Committee, both Dr de Rome of Neuroscience Research Australia and Professor Ivers of the George Institute for Global Health referred to the evaluation of VicRide, the VicRoads on-road motorcycle coaching program, which is currently being conducted through a RCT by the George Institute for Global Health.<sup>1122</sup> Professor Ivers told the Committee:

*This is a big, randomised controlled trial involving nearly 2500 motorcyclists. We basically expose people to getting a program or not and then follow them up over*

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<sup>1119</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 346; Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 115; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 143; Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 122.

<sup>1120</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 25.

<sup>1121</sup> Department for Transport (UK), *Guidelines for Evaluating Road Safety Education Interventions*, London, 2004, p. 30.

<sup>1122</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 115; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 140.

*time. It is a great investment for the Victorian Government and the VMAC [Victorian Motorcycle Advisory Council].<sup>1123</sup>*

She continues:

*I do think that the VicRoads-funded trial that we are working on is a great example of really high-quality, long-term research because it is going to give us a definitive answer, one way or the other. It is actually important to know whether something works or does not work, because we spend a lot of money putting in place programs and not really knowing whether they are effective or not.<sup>1124</sup>*

The Committee applauds VicRoads for investing the resources into evaluating the program in such a comprehensive manner. The evaluation comprises three components: an outcome evaluation, a process evaluation and an economic evaluation. The outcome evaluation comprises a RCT of motorcyclists who recently obtained their motorcycle licence in Victoria. All study participants will have completed a baseline interview, and are randomly allocated to either the intervention group or the control group, with the intervention group required to complete the VicRide program within four weeks of the baseline interview. Both groups will be required to complete two follow-up interviews at four months and thirteen months after the baseline interview, with the outcomes compared to determine if there are observable differences between the two groups. According to the George Institute for Global Health, the results from the evaluation will be used to:

*...make decisions about the future of the program, its roll-out to other areas and adjustments that should be made to its content and delivery. They will allow evidence based refinement of the program to further improve outcomes. Economic evaluation results will also help decision making in the best use of the limited resources available for improved road safety outcomes.<sup>1125</sup>*

In the health context, Professor Harris of Monash University referred to double-blind RCTs as providing the best quality evidence on the basis of internal validity. Professor Harris indicated, however, that these types of studies can have issues meeting external validity criterion due to the typical small size of such studies and the limited capacity to generalise the findings to the broader population:

*...the gold standard is a double-blind randomised control trial...Anything other than that runs the risk of bias. On the other hand, the problem with randomised control trials is that usually they are small, the context is usually very tight and we tend to have to make them very constrained, so the realism becomes less, if I can put it that way – in other words, what we call in the formal literature their 'external validity'.*

<sup>1123</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 140.

<sup>1124</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 143.

<sup>1125</sup> George Institute for Public Health, 'Evaluation of VicRide On-Road Coaching Program', viewed December 2013, <<http://www.georgeinstitute.org.au>>.

*Your ability to generalise from them is more limited the more you tighten them up. The more you tighten them up, the less bias there is and the better quality of evidence on exactly what you have done in that population at that time. But if you want to transfer it from an urban to a non-urban population with older drivers and not young drivers, then you may not be able to do that.*<sup>1126</sup>

The Committee is aware that while RCTs are a common evaluation method employed in laboratory settings, they are rarely used in the area of road safety. This is largely due to countermeasures being assigned to particular sites or road user groups in an informed manner rather than randomly. In this context, it is argued that the design of a RCT is at odds with the desire of policy and decision-makers to focus the efforts of countermeasures in a targeted manner.<sup>1127</sup> Often there are political and community pressures to implement countermeasures in high risk areas, which reduces the applicability of a RCT. On the other hand, if a countermeasure by intention is experimental, randomised allocation would be more appropriate, potentially through a pilot where the countermeasure is implemented in a restricted number of areas only.<sup>1128</sup>

The Committee notes there might be ethical concerns that restrict the use of a RCT in the evaluation of road safety countermeasures, as such countermeasures are usually allocated on the basis of perceived need and justification. In the context of an infrastructure-based safety treatment, the random allocation of the treatment would leave some sites untreated, and potentially result in a greater number of serious injury or fatality crashes than would have occurred if the sites had been chosen on the basis of need.<sup>1129</sup>

Despite these concerns with RCTs, the Committee strongly believes that road safety agencies, where appropriate, should increase their use of RCTs to evaluate certain countermeasures.

**Finding 39:** Randomised control trials (RCTs) are considered the highest standard of evaluation designs. When designed well, RCTs produce the most reliable results of countermeasure effectiveness through minimising study biases, controlling confounding factors and isolating causation.

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<sup>1126</sup> Professor Anthony Harris, Director, Centre for Health Economics, Monash University, *Transcript of evidence*, 28 October 2013, p. 346.

<sup>1127</sup> Her Majesty's Treasury, *The Magenta Book: Guidance for evaluation*, London, 2011, p. 103.

<sup>1128</sup> Her Majesty's Treasury, *The Magenta Book: Guidance for evaluation*, London, 2011, p. 103.

<sup>1129</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 26.



*Before and after evaluation studies*

The before and after evaluation is considered one of the simplest evaluation designs, and is the most commonly used design in road safety evaluations.<sup>1130</sup> The typical before and after evaluation does not include any control sites or participants. Rather it bases its results on a comparison of the sites or participants before a countermeasure is implemented, with the same sites or participants after implementation. In the context of an educational based countermeasure, this type of evaluation would involve comparing the knowledge and attitudes of people before participating in the program, with their knowledge and attitudes after completing the program.<sup>1131</sup>

As there is no control group, it is highly likely that confounding factors will invalidate the evaluation results. The RTM or extraneous factors are also not considered under this design method, making it very difficult to determine the precise safety effect of countermeasures.<sup>1132</sup>

The capacity of before and after evaluation designs to enhance the validity of research findings increases with the use of control or comparison groups, with the intention of accounting for the potential influence of extraneous factors on safety outcomes.<sup>1133</sup> The treatment and the control sites need to be closely matched so they have similar characteristics. This allows evaluators to assume both sites are subject to the same extraneous influences, and in addition, general background trends, such as changes in traffic flow, are controlled for. The only difference is that the control site does not receive the countermeasure. Therefore, any observable difference in safety outcomes, once the countermeasure has been implemented in the treatment site, is concluded to be the result of the countermeasure rather than any extraneous variables.<sup>1134</sup>

A useful example of a before and after evaluation study is the *Evaluation of the crash effects of Victoria's fixed digital speed and red-light cameras* by MUARC in 2011.<sup>1135</sup> The purpose of the evaluation was to measure the crash effects of 87 signed fixed digital speed and red light (FDSRL) cameras and accompanying warning signs placed at 77 signalised intersections across Victoria. Control sites were incorporated into the evaluation design, and were selected on the basis of reflecting similar characteristics and

<sup>1130</sup> Department of Transport and Main Roads, *A guide to evaluating road safety education programs for young adults*, Queensland Government, Brisbane, 2009, p. 27.

<sup>1131</sup> Department of Transport and Main Roads, *A guide to evaluating road safety education programs for young adults*, Queensland Government, Brisbane, 2009, p. 27.

<sup>1132</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 22.

<sup>1133</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 22.

<sup>1134</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 22.

<sup>1135</sup> L Budd, J Scully and S Newstead, *Evaluation of the Crash Effects of Victoria's Fixed Digital Speed and Red-light Cameras*, Monash University Accident Research Centre, Clayton, 2011.

local influences on casualty crash frequency at the treatment sites other than the FDSRL cameras. Further, control intersection sites were chosen on the basis of being geographically close so they would share similar traffic patterns and volumes. Matching these sites also ensured local influences on crash frequency in intersection crashes on roads of the same general geometry, size and traffic volume were reflected. A poisson regression was also used to calculate the adjusted percentage reduction in the number of casualty crashes at treated sites in the post-treatment period when compared with the pre-treatment period, adjusted for parallel changes in the control group.

The evaluation comprised a large sample size to achieve power for statistical testing and to produce estimates that could be considered representative of the likely effectiveness of FDSRL camera enforcement in other locations. The use of a large control set also attempted to minimise the effects of confounders, such as RTM, which was a key consideration throughout the evaluation final report.

In August 2011, the Victorian Auditor-General's Office published its review of the Road Safety Camera Program, which included an examination of this MUARC evaluation to determine the reliability of the evaluation results. It confirmed a high level of confidence in the results based on the following:

- *The methodology was sound, with a large number of camera sites appropriately compared to a larger sample of control sites, over extended pre- and post-camera periods.*
- *The design assessed all crashes at the intersections, as well as those most likely to be affected by the initiative such as right-angle, right-turn and rear-end crashes. It has been common for evaluations of this type to only assess crashes that occur on the leg of the intersection where the camera is situated and only consider specific crash types.*
- *Findings are consistent with findings of evaluations of independent red-light cameras and fixed speed camera programs in other jurisdictions.*
- *Conclusions drawn based on findings and results were appropriate.*<sup>1136</sup>

**Finding 40:** Before and after evaluations can be an effective study design to assess the impact of road safety countermeasures when control groups are used to account for the potential influence of extraneous factors on safety outcomes. Without any control group, it is difficult to determine the precise safety effect of countermeasures.

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<sup>1136</sup> Victorian Auditor General's Office, *Victorian Auditor-General's Report: Road Safety Camera Program*, Melbourne, 2011, p. 19.

### Cross-section studies

Another observational evaluation design is a cross-sectional study, which are those studies conducted at a particular point in time. Dr Peter Cairney of the ARRB advised the Committee that this method is used often in road safety. He provided the following example of how a cross-sectional study could be used to evaluate road based safety treatment:

*Let us say you wanted to study the safety effects of roundabouts using existing roundabouts. You might just collect information on all the roundabouts in Victoria — for example, look at the crash rates and then try to separate the roundabouts by the amount of traffic they cater for, the number of entrances and the diameter of the roundabouts and on that basis try to come up with some sort of conclusions as to the effectiveness of roundabouts of different size in relation to the amount of traffic they carry.*

*That sort of gives you an answer, but the problem with that is that you are dealing with only the existing situations and it probably does not take account of confounding variables very well. For example, the really big roundabouts are probably carrying different sorts of traffic from what the smaller roundabouts are carrying; the effect of roundabout size gets confused with the type of traffic. It is not a great method to try to pin down causes.<sup>1137</sup>*

The Committee notes from the road safety literature that this method of evaluation is not recommended.<sup>1138</sup> It typically involves comparing treatment sites with control sites but only once the countermeasure has been implemented. Cross-sectional studies are often employed when no baseline data has been collected or is available for the purpose of performing an evaluation.<sup>1139</sup> The Committee is of the view that this is likely the consequence of evaluations not being planned in the early developmental stage of countermeasures.

Validity can be enhanced through selecting control sites that have similar characteristics to the treatment sites, however, this can be difficult to achieve and without those similarities it is difficult to determine the actual effects of the countermeasure.<sup>1140</sup> For this reason, cross-sectional studies should be avoided if possible.

<sup>1137</sup> Dr Peter Cairney, Principal Behavioural Scientist, ARRB Group Ltd, *Transcript of evidence*, 11 September 2013, pp. 338-339.

<sup>1138</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 19.

<sup>1139</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 19.

<sup>1140</sup> P Cairney, B Turner and L Steinmetz, *An Introductory Guide for Evaluating Effectiveness of Road Safety Treatments*, Austroads, Sydney, 2012, p. 19.

**Recommendation 29:** That when designing evaluation frameworks for individual road safety countermeasures, the Victorian Government and road safety agencies consider the issues and concerns identified by the Committee in findings 34 to 38. Evaluation designs should reflect high validity and be effective in removing or minimising study biases.

### 8.3.5.3 Incorporating cost-effectiveness measures into evaluation studies

The first half of this chapter explored the two key methods of evaluating the economic viability of countermeasures, with CEA identified as a simpler way to value countermeasure effectiveness. As noted earlier, its method of evaluating social programs requires that results be framed in a single measure of outcome, such as cost per life year saved or cost per injury avoided.<sup>1141</sup> This type of assessment is considered particularly useful when comparing the relative costs of different policy options.

The Committee is of the view that the cost-effectiveness measure should be conducted upon implementation and/or completion of countermeasures as part of its broader evaluation. This task should be relatively simple to complete as the impact of countermeasures should be known and can be compared with their overall costs. Professor Ivers of the George Institute for Global Health proposed this to the Committee:

*...there is the importance of evaluations and building in measures of cost-effectiveness. We need to make sure we look at the cost-effectiveness of road safety interventions. When you are putting programs in place and evaluating them, you need to make sure that cost-effectiveness is built in from the start.*<sup>1142</sup>

In his presentation to the Committee, Dr Gary Dolman, the Head of the Bureau of Infrastructure, Transport and Regional Economics (BITRE) indicated that the evaluation of the National Black Spot Programme included a measure of cost-effectiveness:

*That included just over 2000 different treatments of a whole range of different types. What we did as part of that evaluation is look at the effectiveness of the different treatments, including the cost-effectiveness. That was done on a cost-benefit basis. We could tell how many accidents were prevented and which treatments were most effective in preventing those accidents, and we also had a measure of how much those measures cost.*<sup>1143</sup>

The Committee also notes that in the VicRoads submission it refers to the MUARC evaluation of the Safer Roads Infrastructure Program, which outlines the Benefit-Cost

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<sup>1141</sup> A H Harris, et al., *Monitoring the national road safety strategy: cost effectiveness of road safety measures* Federal Office of Road Safety, Canberra, 1995, p. 2.

<sup>1142</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 144.

<sup>1143</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 178.

Ratio (BCR) for each of the key Program stages: a BCR of 2.1 for stage one, a BCR of 3.6 for stage two, and a BCR of 2.4 for stage three.<sup>1144</sup>

**Recommendation 30:** That the Victorian Government and road safety agencies build measures of cost-effectiveness into post-completion evaluation studies of road safety countermeasures.

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<sup>1144</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 62.



## CHAPTER NINE AT A GLANCE

### OVERVIEW

Chapter Nine addresses Term of Reference (ToR) (d), although the Committee found it difficult to determine the correlation between reductions in fatalities and serious injuries resulting from different countermeasures. Rather, the chapter highlights some of Victoria's key achievements in road safety, and examines how the Victorian Government can enhance the focus on crash related serious injuries in the future and achieve best practice in road safety management.

Chapter Nine also addresses ToR (f). As part of this, it provides an overview of how the Safe System approach has been implemented in Victoria and makes recommendations to ensure the Victorian Government fully complies with this approach. A key component of this is the need for road safety policy to be integrated into broader government objectives around health, justice, planning, transport, environment and education. The Committee believes this will contribute to long-term reductions in serious injuries.

### KEY FINDINGS

Finding 41: The use of an enhanced data system as proposed by the Committee in Chapters Four and Five relating to the improved collection, collation and reporting of crash related injury data will contribute to long-term reductions in road trauma.

Finding 42: A partnership approach to road safety, along with strong political desire to address road trauma and a matching budget, will contribute to Victoria working towards a steady decline in crash related serious injuries.

Finding 43: In future, there may be a growing reliance on new and existing vehicle technologies to modify road user behaviours and ensure compliance with the law.

Finding 44: It is essential that road safety policy be integrated into broader government policy to effectively respond to distinct but continuing problems within particular communities.

Finding 45: To date, the Safer Roads Infrastructure Program (SRIP) has contributed to significant reductions in road trauma in Victoria. The Committee believes that continued funding of the SRIP will assist Victoria to achieve the 30% reduction targets in both serious injuries and fatalities.

Finding 46: There is scope for VicRoads to investigate the feasibility of incorporating the Australian National Risk Assessment Model and the Australian Road Assessment Program into its decision-making processes regarding future road projects and upgrades.

Finding 47: To continue making significant progress in reducing road trauma, the Victorian Government needs to explore a wider range of opportunities to integrate road safety objectives into other policy areas, such as health, transport, justice, environment, education and planning.

## **RECOMMENDATIONS**

Recommendation 31: That the Victorian Government recommend to the Standing Council on Transport and Infrastructure that an online, searchable road safety handbook be developed which reports on the efficacy and cost-effectiveness of countermeasures that address road related road trauma through meta-analysis of Australian and international studies.

Recommendation 32: That the Victorian Government publish a bulletin, accompanied by a media release, on a quarterly basis outlining the latest fatality, major trauma and admitted to hospital road tolls.

Recommendation 33: That the Victorian Government incorporate the major trauma and admitted to hospital measures into *Victoria's Road Safety Strategy 2013-2022* and accompanying action plans through the establishment of major trauma and admitted to hospital targets, and that such targets be broken down into road user groups.

Recommendation 34: That the Victorian Government recommend to the Standing Council on Transport and Infrastructure that a national benchmarking study be conducted into the road safety performance of all Australian jurisdictions, against agreed key performance indicators.

Recommendation 35: That the Victorian Government identify the Victorian State Trauma System as a countermeasure in the *Victorian Road Safety Strategy 2013-2022* and include it in accompanying, future, action plans. This is in recognition of its role in addressing road related trauma.

Recommendation 36: That the Victorian Government work with the Victorian State Trauma Committee to undertake an audit of the Victorian State Trauma System with the aim of devising a schedule and funding plan to upgrade its equipment.

Recommendation 37: That the Victorian Government develop terms of reference for an inquiry into bicycling, its challenges and opportunities, to be conducted by the Victorian Parliamentary Road Safety Committee.

Recommendation 38: That the Victorian Government continue its policy decision to require all new light passenger government fleet vehicles to be five star rated, and encourage the purchase of five star rated vehicles among the community, and vehicles equipped with proven technologies not yet mandated.



Recommendation 39: That the Victorian Government take a leading role in convening a regular forum for government agencies (including Federal), industry, academics and other key stakeholders to facilitate discussion around existing and emerging Intelligent Transport System technologies and vehicle safety. The forum should be convened within 12 months of this report being tabled and meet on a bi-annual basis thereafter.

Recommendation 40: That *Victoria's Road Safety Strategy 2013-2022* and accompanying action plans should acknowledge the objectives of *Cycling into the future 2013-2023* and the Principal Pedestrian Network to create pedestrian and cycling friendly infrastructure. In this context, the Victorian Government should explore ways to contribute to reduced safety risks on the roads.

Recommendation 41: That the Victorian Government develop an online e-book for local government that investigates the feasibility and cost-effectiveness of various infrastructure-based measures that provide greater separation between bicyclists, pedestrians and motorists. The handbook should identify best practice examples within Victorian local municipalities, other jurisdictions and overseas.

Recommendation 42: That VicRoads increase *SmartRoads'* focus on road safety objectives in order to increase the integration and consideration of road safety in planning and transportation policies.

Recommendation 43: That the Victorian Government integrate road safety objectives into the assessment of Victorian Government major transport and infrastructure projects, as well as land use and urban planning projects.



## CHAPTER NINE: REDUCING SERIOUS INJURIES AND FATALITIES

Over the past three decades there has been substantial progress in road safety in Victoria through the development and implementation of various countermeasures that have enhanced roads, increased the safety of vehicles, and improved road user behaviours. There is a clear understanding among those who work in the road safety area that significantly investing in the prevention and reduction of road trauma is cost-beneficial. Such investments are cheaper for government and the broader community than dealing with the repercussions and costs of road crashes. Improving road safety also has broader public health implications for the community:

*...improving road safety would allow resources to be saved by reducing hospital admissions, the severity of injuries, rehabilitation needs and demand on emergency services. Improving safety for cyclists and pedestrians would also help to create conditions that can facilitate the choice of healthier lifestyles, thereby contributing to reducing risks for many noncommunicable diseases.<sup>1145</sup>*

The Inquiry's Term of Reference (ToR) (d) required the Committee to determine the correlation between reductions in fatalities and serious injuries resulting from different road safety countermeasures. This was a challenging task for the Committee. While many Inquiry participants provided evidence about ways to reduce road trauma, they did not distinguish between countermeasures that had been proven to reduce actual road trauma and countermeasures that were likely to reduce the risk of road trauma. The Committee does not wish to dismiss any of these latter countermeasures, particularly as the Safe System approach takes a proactive stance to road safety and is based on general understandings of risks in the road system.<sup>1146</sup> However, until more information is known about the causal factors contributing to serious injury crashes, it is difficult to make recommendations about ways to reduce those crashes.

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<sup>1145</sup> F Racioppi, et al., *Preventing road traffic injury: a public health perspective for Europe*, World Health Organization Regional Office for Europe, Copenhagen, 2004, p. 59.

<sup>1146</sup> F Wegman, *Driving down the road toll by building a Safe System*, Government of South Australia, Adelaide, 2012, p. 39.

The previous chapter examined the processes and tools employed by the Victorian Government and road safety agencies to determine the most appropriate ways to reduce road trauma, and to provide guidance on the prioritisation of resource allocation. This chapter takes a more direct approach, examining how the Victorian Government can enhance the focus on serious injuries, and investigating ways to achieve best practice in road safety and manage long-term serious injury reductions. This chapter also provides an overview of how the Safe System approach has been implemented in Victoria, outlining key initiatives referred to in the evidence received throughout the Inquiry.

In the context of ToR (f), it was clear to the Committee by the end of its investigations that improving the collection, collation and reporting of crash related injury data will contribute to long-term reductions in road trauma. An enhanced data system will allow road safety professionals to develop a comprehensive understanding of road trauma, including crash causal factors and their impact on different injury severity levels. This in turn will facilitate the development of targeted countermeasures and the evaluation of those countermeasures using accurate data and well-designed evaluation methodologies. It is noted that the findings of the Transport Accident Commission's (TAC) Enhanced Crash Investigation Study (ECIS) will contribute to the comprehensiveness of the data system.

**Finding 41:** The use of an enhanced data system as proposed by the Committee in Chapters Four and Five relating to the improved collection, collation and reporting of crash related injury data will contribute to long-term reductions in road trauma.

## 9.1 Serious injuries versus fatalities

Until recently, the key focus in road safety has been on fatalities, with the road toll consistently published in newspapers and referred to in public discussions around road safety. Consequently, it is commonly known that crash related fatality rates have been steadily falling. On the other hand, there is limited community understanding and knowledge about crash related serious injuries. There is a general consensus in the evidence that while serious injuries are declining, they have not done so at the same rate as fatalities. This phenomenon is claimed to be occurring throughout Australia and internationally, with research by the Institute for Road Safety Research (SWOV) in the Netherlands indicating it is common in many other jurisdictions.<sup>1147</sup> The Committee notes, however, that caution is required when drawing any conclusions about serious injuries due to limitations in the accuracy of injury data.

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<sup>1147</sup> Institute for Road Safety Research (SWOV), *Decrease in traffic injuries requires more accurate registration*, Netherlands, 2012, p. 1.

The disparity between the fatality and injury rates was brought to the Committee's attention throughout the Inquiry, with various key participants raising it in their submissions. For example, the TAC advised there had been an 8.3% increase in the number of TAC-compensated injuries involving acute hospital admissions in 2011/2012 as compared to the 10 year average between 2001/2002 to 2010/2011. This is in contrast to Victoria posting its fifth consecutive record low road toll in 2012. The TAC claimed that while there is no consensus as to why injuries have not decreased as rapidly as the road toll, the following observations are a possibility:

- *Decrease in the underreporting of injury road crashes;*
- *Improvement of the road crashworthiness of vehicles;*
- *Improvements of the road crashworthiness of [the] built environment, especially roads and roadsides;*
- *Improved trauma care;*
- *Change in the composition of road users (more motorcyclists/cyclists; aging population);*
- *Lower speed limits.*<sup>1148</sup>

The SWOV also raised this point in its submission, drawing on research conducted in South Australia (SA) that compared the causes of fatal crashes and non-fatal crashes, and determined that the causes differ considerably.<sup>1149</sup> This research, conducted by the Centre for Automotive Safety Research (CASR) at the University of Adelaide, investigated the relative contribution of system failures<sup>1150</sup> and extreme behaviour<sup>1151</sup> in SA crashes. It was determined that 43% of fatal crashes were considered to involve extreme behaviour and 57% of fatal crashes involved system failures.<sup>1152</sup> On the other hand, extreme behaviours were found to only constitute a small proportion of non-fatal crashes, while 74% of rural non-fatal crashes and over 85% of metropolitan non-fatal crashes involved system failures.<sup>1153</sup> The SWOV submission concluded that based on these findings, 'policy aiming to reduce the number of serious road injuries needs to be different policy than that aimed at a reduction of road fatalities.'<sup>1154</sup>

<sup>1148</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 57.

<sup>1149</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

<sup>1150</sup> **Note:** For the purposes of the research, 'system failure' referred to incidents where complying road users may have made an error that led to a crash.

<sup>1151</sup> **Note:** For the purposes of the research, 'extreme behaviour' referred to high levels of alcohol use and speeding, among others, by road users.

<sup>1152</sup> L N Wundersitz and M R J Baldock, *The relative contribution of system failures and extreme behaviour in South Australian crashes*, Centre for Automotive Safety Research, University of Adelaide, Adelaide, 2011, p. 10.

<sup>1153</sup> L N Wundersitz and M R J Baldock, *The relative contribution of system failures and extreme behaviour in South Australian crashes*, Centre for Automotive Safety Research, University of Adelaide, Adelaide, 2011, p. 13.

<sup>1154</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

Similarly, Dr Liz de Rome, a Senior Research Officer at Neuroscience Research Australia, stated in her appearance before the Committee that violation behaviour is linked to violation crashes, although if you remove that behaviour, the risk of having a crash relates more to errors.<sup>1155</sup> In contrast, Dr Rebecca Mitchell and Dr Mike Bambach, Senior Research Fellows, at Transport and Road Safety (TARS) Research, University of New South Wales (NSW), indicated in their presentation that their research found similar factors around fatigue, alcohol and speeding contributing to both serious injury and fatality crashes.<sup>1156</sup>

The idea that contributing factors to fatality crashes may differ from those contributing to serious injury crashes was of strong interest to the Committee, particularly in the context of developing appropriate policy responses. When questioned about the matter, Associate Professor Stuart Newstead, the Associate Director of Injury Analysis and Data at the Monash University Accident Research Centre (MUARC), stated:

*I could not agree more...so many jurisdictions' mono focus on fatalities as the outcome in road safety is incredibly unhealthy because, firstly, we live in a relatively safe road environment in Australia...there are quite different mechanisms that drive serious injury and long-term outcomes potentially compared to fatalities, and that needs to be acknowledged, which is why a mono focus on fatalities is probably taking us in the wrong direction in terms of our strategy of priorities. I absolutely concur with what SWOV have said.*<sup>1157</sup>

The Committee believes it is essential that road safety agencies build a strong knowledge base around how and why countermeasures targeting different crash types should differ. In the context of serious injury crashes, it is necessary for this knowledge to also expand to injury severity levels. According to Professor Fred Wegman, the former Managing Director of SWOV, fatality crashes are poor predictors of injury crashes, and both fatal crash data and injury crash data are required to inform road strategies.<sup>1158</sup> A similar sentiment was expressed by the Victorian Department of Health (DoH), which stated in its submission that 'road-related injury reduction strategies must be based on a full understanding of real-world accident data'.<sup>1159</sup>

The Committee believes that the accuracy and comprehensiveness of serious injury data will improve as a result of the Victorian Government adopting the Committee's

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<sup>1155</sup> Dr Liz de Rome, Senior Research Officer, Neuroscience Research Australia, *Transcript of evidence*, 5 August 2013, p. 115.

<sup>1156</sup> Dr Mike Bambach, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 124; Dr Rebecca Mitchell, Senior Research Fellow, Transport and Road Safety (TARS) Research, The University of NSW, *Transcript of evidence*, 5 August 2013, p. 124.

<sup>1157</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 102.

<sup>1158</sup> F Wegman, *Driving down the road toll by building a Safe System*, Government of South Australia, Adelaide, 2012, p. 28.

<sup>1159</sup> Department of Health, *Submission*, no. 30, 14 May 2013.

recommendations outlined in Chapter Four around defining crash related injuries, and the compiling and reporting of injury data. These enhancements, along with the research findings from the TAC's ECIS, will assist road safety agencies and researchers determine the most appropriate responses to prevent crashes from occurring in the first place and reduce the severity of injuries when crashes do occur. Road safety agencies and researchers could also conduct investigations into whether countermeasures proven to reduce fatality crashes have similar effects on serious injuries.<sup>1160</sup>

There is significant scope for the Victorian Government to increase its investment in countermeasures specifically targeting serious injuries, by taking a similar approach to that used for fatalities. The Committee is of the view, however, that an increased focus on serious injuries should not compete with fatalities but rather the two policy objectives should complement each other. This is already reflected in the individual 30% reduction targets for fatalities and serious injuries in the *Victorian Road Safety Strategy 2013-2022* (VRSS). Again, a more complete picture of injury data, including information about crash causal factors, should influence the Victorian Government's focus on serious injuries and coinciding investment levels.

Further, the Committee notes the recommendation from the SWOV submission that a road safety handbook for serious injuries be developed drawing on results from Australian research, similar to Rune Elvik's *The Handbook of Road Safety Measures*. This should be considered by the Victorian Government once the data issues are rectified and the capacity to measure the effectiveness of countermeasures has improved. The Committee believes that development of such a handbook would be best undertaken at the national level to ensure it is a comprehensive document that will be of use to all jurisdictions.

**Recommendation 31:** That the Victorian Government recommend to the Standing Council on Transport and Infrastructure that an online, searchable road safety handbook be developed which reports on the efficacy and cost-effectiveness of countermeasures that address road related road trauma through meta-analysis of Australian and international studies.

### 9.1.1 Raising the profile of serious injuries

The Inquiry's ToR (f) specifically referred to raising the profile of the serious injury burden as an example of how to manage long-term reductions in serious injuries. Consequently, it was a matter commonly discussed in submissions and among Inquiry participants,<sup>1161</sup>

<sup>1160</sup> SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013.

<sup>1161</sup> Chika Sakashita, Project Manager, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013; Department of Health, *Submission*, no. 30, 14 May 2013; Dr Liz de Rome, Senior Research Officer, Neuroscience

with many agreeing with the need to do so. For example, the TAC submission advised that the community should be kept aware of the serious injury burden and the part they can play to avoid serious injury crashes. It also proposed investigating the potential impact of community pressure to initiate more drastic road safety actions.<sup>1162</sup> Similarly, Ms Chika Sakashita, a project manager at the George Institute for Public Health, stated in her presentation to the Committee:

*Best practice would be to have the profile of serious injuries raised, and this will help us raise community awareness of their risk of serious injuries and also community demand of the government to do more for road safety.*<sup>1163</sup>

Some participants referred to the potential role of the media in helping create awareness around the serious injury burden. In particular, the DoH noted that the media's approach to reporting about serious injuries is likely to influence community perceptions of the riskiness of certain behaviours, as is the case with the currently reported road toll.<sup>1164</sup> In its submission to the Committee, Victoria Police stated that while the profile of crash fatalities receives significant media attention, it has been 'historically difficult to influence the media to report on serious injury with these outlets instead running story lines associated with fatalities'.<sup>1165</sup> The Committee acknowledges this point but believes more effort is required from the Victorian Government and road safety agencies to talk publicly about serious injury crashes that occur on Victoria's roads and release more information publicly and to the media about the rate of serious injuries in Victoria.

Mr David Shelton, the Executive Director of Strategy and Planning and the Road Safety Coordinator at VicRoads, advised the Committee that VicRoads' communications need to focus more strongly on the serious injury burden as distinct from fatalities.<sup>1166</sup> The Committee believes this, along with other agencies promoting the serious injury message, is a key component of ensuring the community does not become complacent about road safety. In 2005, the TAC ran the public awareness campaign 'Hidden Toll', which aimed to draw attention to those seriously injured on Victorian roads. While there is a place for such campaigns, the Committee shares the view that efforts to raise community awareness about serious injuries need to occur on a more consistent and long-term basis. Some Inquiry participants proposed that a serious injury toll be regularly published, alongside the existing road toll. However, given the complexity of serious injury data,

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Research Australia, *Transcript of evidence*, 5 August 2013, p. 145; VicRoads, *Submission*, no. 31, 17 May 2013; Victoria Police, *Submission*, no. 32, 21 June 2013.

<sup>1162</sup> Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 65.

<sup>1163</sup> Chika Sakashita, Project Manager, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 145.

<sup>1164</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

<sup>1165</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 38.

<sup>1166</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 268.



there are limitations to a serious injury toll being reported on a weekly basis. The Committee shares the view of the DoH, which asserted that:

*Any serious road injury toll-type measure adopted for the publicly-oriented monitoring and reporting purposes would need to be 'straightforward' to explain, collected/updated in a timely way so that it can be reported at regular intervals, and underpinned by relevant expertise and data specifications.<sup>1167</sup>*

The Committee also agrees that any attempts to raise the profile of the serious injury burden should coincide with its recommendations around the new definition system, reporting responsibilities and timelines. Under the proposed tiered trauma definition structure, the existing serious injury definition will be renamed 'admitted to hospital' and serve only as a resource-use measure rather than as a proxy to measure seriousness. Further, the existing Victorian major trauma definition will become the standard definition of what constitutes a serious injury, and the DoH and the Victorian State Trauma Outcomes Registry and Monitoring group (VSTORM) will be responsible for reporting this data and providing it on a quarterly and annual basis to the Victorian Government and relevant road safety agencies. It is also recommended in Chapter Four that VicRoads and the TAC publish this data on their websites in order to advance the community's understanding of road trauma and facilitate informed debate.

The Committee recommends that the Victorian Government take this one step further and publish a bulletin on a quarterly basis outlining the latest fatality, major trauma and admitted to hospital road tolls. This will create opportunities for the Government and road safety agencies to publicly discuss the serious injury burden, as well continuously draw the media's attention to the issue. Further, by reporting the injury data alongside the fatality data, it will make it easier for media outlets to draw comparisons between the three tolls, which in turn could increase community awareness around the need to address crash related serious injuries and major trauma as a separate issue from fatalities. It will also allow reductions in the tolls to be monitored in a public and transparent way.

**Recommendation 32:** That the Victorian Government publish a bulletin, accompanied by a media release, on a quarterly basis outlining the latest fatality, major trauma and admitted to hospital road tolls.

### 9.1.2 Serious injury reduction targets

The importance of road safety targets is widely discussed in the road safety literature in the context of their necessity for effective road safety management. The Organization for

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<sup>1167</sup> Dr Pradeep Philip, Secretary, Department of Health, *Personal communication*, 3 October 2013.

Economic Co-Operation and Development (OECD) recommends that targets be established for the following reasons:

*The setting of quantitative targets communicates the importance of road safety, motivates stakeholders to act and holds managers of all components of the road transport system accountable for achieving defined positive results. By establishing a target, the message is conveyed that the government is serious about reducing the current road toll. Setting targets for sub-national levels of government (i.e. province/state, municipality) can widen the sense of ownership by creating greater accountability at all levels, establishing more partnerships and generating more action. Further, ambitious targets raise media and public awareness and hence motivate politicians to support proposed policy and legislative changes and allocate sufficient resources to major problem areas.<sup>1168</sup>*

The Committee strongly supports setting road safety targets, and commends the Victorian Government for establishing separate targets for the reduction of fatalities and serious injuries. As noted in Chapter Four, upon the Victorian Government adopting the tiered trauma definition structure as per Recommendation One, the VRSS and accompanying action plans will require updating to reflect the new definitions and replace the existing serious injury target with a major trauma target and an admitted to hospital target. Increased promotion of these targets will contribute to raising community awareness of the issue.

The Committee also believes that with improvements to injury data, there will be scope to break the targets down into road user groups. This will allow the Victorian Government and road safety agencies to determine whether its strategy is achieving a level of safety among all road user groups. It will also inform the development of new countermeasures or improvement of existing countermeasures to target specific groups that may not be experiencing declines in trauma rates as compared to other road users.

**Recommendation 33:** That the Victorian Government incorporate the major trauma and admitted to hospital measures into *Victoria's Road Safety Strategy 2013-2022* and accompanying action plans through the establishment of major trauma and admitted to hospital targets, and that such targets be broken down into road user groups.

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<sup>1168</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, pp. 37-38.

## 9.2 Best practice in road safety

### 9.2.1 Identifying and sharing best practice

There is a growing recognition among road safety professionals of the value in gaining insight into other countries' road safety activities to identify new and innovative ways to improve their own road safety practices. Similarly, it is important to share local successes with others. The Committee understands that this knowledge transfer around best practice can contribute to ongoing efforts, both locally and internationally, to reduce the impact of road trauma on individuals and the broader community. In its report *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, the OECD highlighted the value of knowledge transfer within and across national boundaries:

*Research and development and knowledge transfer concerns the creation, codification, transfer and application of knowledge that contributes to the improved efficiency and effectiveness of the road safety management system...knowledge transfer can be viewed as an ongoing process that transfers existing knowledge and creates new knowledge to achieve continuous improvement in performance.*<sup>1169</sup>

The most recent and widely publicised initiative to share best practice in road safety is the *United Nations (UN) Decade of Action for Road Safety (2011-2020)*. This campaign, launched in 2010, recognises that the 'devastating scale of road traffic injuries is a global public health and development concern'.<sup>1170</sup> The objective of the Decade of Action is to stabilise and reduce road traffic fatalities, and save an estimated five million lives in the set period. The Decade of Action's key target audiences are middle and low-income countries where there are increasing trends in road fatalities. Its *Global Plan of Action* provides a guiding framework for road safety policy and comprises the five key pillars of:

- Road safety management;
- Safer roads and mobility;
- Safer vehicles;
- Safer road users; and
- Post-crash responses.<sup>1171</sup>

<sup>1169</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, p. 99.

<sup>1170</sup> World Health Organization, *Global status report on road safety 2013: supporting a decade of action*, Luxembourg, 2013, p. v.

<sup>1171</sup> World Health Organization, *Global status report on road safety 2013: supporting a decade of action*, Luxembourg, 2013, p. 2.

Monitoring the progress of the Global Plan is undertaken through comprehensive assessments of road safety globally, with a *Global status report on road safety* being published every two to three years. The reports contain one-page profiles on all contributing countries which outline rates of fatalities and serious injuries, the existence of strategies and targets, enforcement activities, and the state of post-crash care.<sup>1172</sup>

Another international initiative promoting best practice is the SUNflower Project, a road safety benchmarking study that:

*...explores the question "What exactly makes a country improve road safety?". Which measures, interventions, developments are beneficial, which operational aspects or which underlying concepts can be determined and, a key-element in this approach, what is the possibility for transfer from one country to other countries? So, the core of the SUNflower approach is comparing safety practices of different countries based on a good insight into the relationship between the developments of road risks and road safety policies, programmes, and measures. This insight might conceivably identify key factors, which could further improve the current safety practice of a country.*<sup>1173</sup>

The study first reported in 2002 and compared the safety strategies of Sweden, the United Kingdom (UK) and the Netherlands. These countries were at the time and still are considered to be the top three performing road safety countries. In 2006, the Project was expanded to include six additional European countries (the Czech Republic, Greece, Hungary, Portugal, Slovenia and Spain). Overall, the purpose of the SUNflower project is to 'develop a knowledge-based framework for comprehensive benchmarking of road safety performance and developments of a country or sub-national jurisdictions'.<sup>1174</sup>

The key conclusion drawn from the first SUNflower study was that the three countries achieved similar levels of safety through targeted policies in the areas of vehicles, roads and road users. The implementation of those policies differed between the three countries as a result of the different relative sizes of crash type groups and 'differences in the structure of road safety capability which influences its ability to deliver different types of policy'.<sup>1175</sup> Other areas of similarity between the three countries included 'a willingness to debate road safety issues in parliament, a strong lead agency with good coordination at national and local levels, supportive funding, and well supported non-governmental and non-profit groups that have a strong influence on road safety decision-making'.<sup>1176</sup> The report also concluded that each of the three countries had areas requiring

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<sup>1172</sup> World Health Organization, *Decade of Action for Road Safety 2011-2020 Global Launch*, Luxembourg, 2011, pp. 10-11.

<sup>1173</sup> F Wegman, et al., *A comparative study of the development of road safety in the SUNflower+6 countries: final report*, Leidschendam, 2005, p. 1.

<sup>1174</sup> F Wegman, et al., *SUNflowerNext: Towards a composite road safety performance index*, SWOV Institute for Road Safety Research, Leidschendam, 2008, p. VII.

<sup>1175</sup> M Koonstra, D Lynam and G Nilsson, *SUNflower: a comparative study of the development of road*, SWOV, Leidschendam, 2002, p. VII.

<sup>1176</sup> L Mooren, R Grzebieta and S Job, 'Can Australia be a global leader in road safety?', Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Brisbane, 2013.

improvement and scope to learn from one another to 'ensure collective experience is used effectively'.<sup>1177</sup> The Committee shares the view that this is an important function of identifying and sharing best practice, and having the formal avenue to do this through benchmarking.

In the Victorian context, effectively addressing a stagnated serious injury rate will require the Victorian Government and road safety agencies to employ an innovative approach to modify existing countermeasures to enhance their effectiveness and develop new and untested countermeasures. Both these measures might be informed by developments in other countries and jurisdictions. Within Australia, sharing and learning could be partly achieved through benchmarking to compare road safety performances at state and national levels. Professor Wegman made a similar point in the context of SA road safety efforts in his paper *Driving down the road toll by building a Safe System*:

*Comparing the safety performance of different states or countries is interesting because of what we can learn. It is instructing to find the answer about why the mortality rate in Victoria is lower than in South Australia... Comparing the safety performance of South Australia with other states and countries, studying our own history and trying to understand why we have made progress, is very important in my opinion. This also sheds light on how we can make further progress and I recommend intensified efforts in this endeavour.*<sup>1178</sup>

Generally, benchmarking aims to improve one's own performance by learning through:

1. Identifying;
2. Understanding; and
3. Adapting exceptional practices from countries considered best practice.<sup>1179</sup>

Benchmarking using the SUNflower approach is based on a target hierarchy for road safety model (see Diagram 6). The layers are connected, particularly the four top layers, the relationship between them described by Professor Wegman as:

*...a better put road safety strategy, better implemented, should result in better safety performance indicators and, in turn, less people killed and injured with a lower cost to society.*<sup>1180</sup>

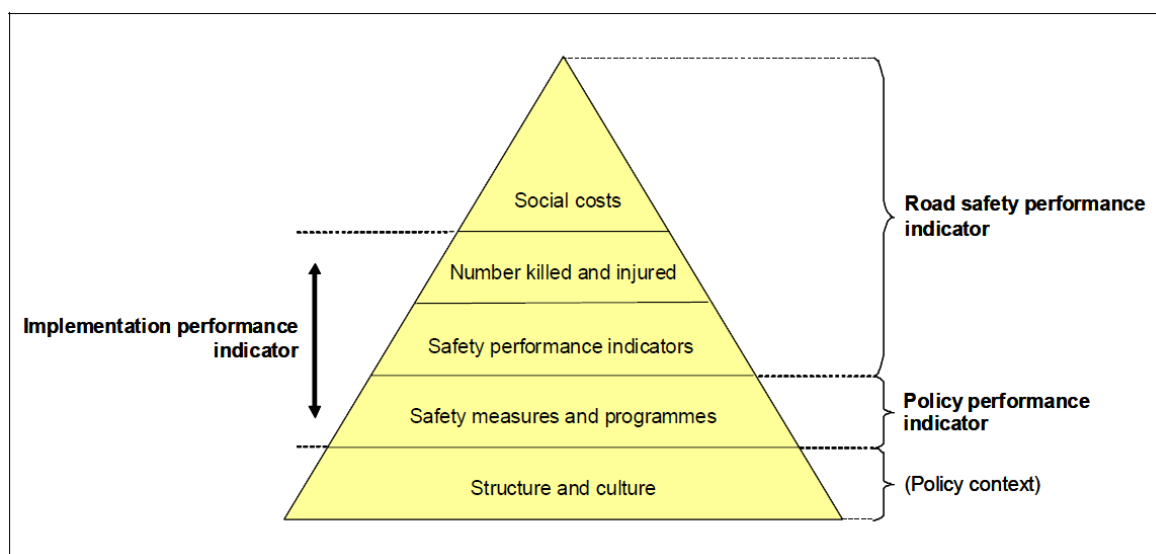
<sup>1177</sup> M Koornstra, D Lynam and G Nilsson, *SUNflower: a comparative study of the development of road*, SWOV, Leidschendam, 2002, p. VII.

<sup>1178</sup> F Wegman, *Driving down the road toll by building a Safe System*, Government of South Australia, Adelaide, 2012, p. 45.

<sup>1179</sup> F Wegman, et al., *SUNflowerNext: Towards a composite road safety performance index*, SWOV Institute for Road Safety Research, Leidschendam, 2008, p. 2.

<sup>1180</sup> F Wegman, *Driving down the road toll by building a Safe System*, Government of South Australia, Adelaide, 2012, p. 45.

**Diagram 6: SUNflower’s target hierarchy for road safety model<sup>1181</sup>**



A key aspect of the SUNflower approach is its focus on the three performance indicators of road safety, policy and implementation which, as reflected in Diagram 6, covers all layers of the hierarchy model.<sup>1182</sup> The road safety performance indicator is an outcomes indicator and refers to the fatality and serious injury rates, safety performance indicators, and social costs. The implementation performance indicator, also known as the process indicator, relates to the quality of implementation of road safety policies, and in the hierarchy model, it follows a vertical line linking the three indicators of fatality and serious injury rates, safety performance indicators, and safety measures and performance. The policy performance indicator refers to the quality of the policy response to address issues around road safety.<sup>1183</sup>

In its submission to the Committee, VicRoads referred to the need to establish strong performance indicators within the Safe System approach:

*The Safe System approach requires considerable attention to be paid to the development and management of performance indicators, and the re-orientation of these indicators to the systems and interventions that are going to create the greatest safety value. As outlined in this submission, greater emphasis will need to be placed on establishing effective performance measures for serious injuries together with the more traditional indicators developed to monitor reductions in fatalities.<sup>1184</sup>*

<sup>1181</sup> F Wegman, *Driving down the road toll by building a Safe System*, Government of South Australia, Adelaide, 2012, p. 46.

<sup>1182</sup> F Wegman, et al., *SUNflowerNext: Towards a composite road safety performance index*, SWOV Institute for Road Safety Research, Leidschendam, 2008, p. 26.

<sup>1183</sup> F Wegman, et al., *SUNflowerNext: Towards a composite road safety performance index*, SWOV Institute for Road Safety Research, Leidschendam, 2008, p. 17.

<sup>1184</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 72.

In particular, VicRoads stated that performance indicators should coincide with the ‘full aspiration of the Safe System approach’, including 5 star users, 5 star vehicles, 5 star roads and 5 star speed limits.<sup>1185</sup>

The Committee agrees with VicRoads about the value of establishing sound performance indicators. It is important for individual jurisdictions to have their own indicators, although it would also be highly valuable to establish them at a national level for benchmarking purposes. As with the SUNflower approach, there is also merit in developing indicators related to policy implementation and policy performance.

The Committee was not in a position to assess the suitability of the SUNflower approach for a benchmarking project in Australia. However, it believes the approach offers a useful insight into how such benchmarking can occur and on a large scale. The Committee strongly supports the view that benchmarking the road safety performance of jurisdictions ‘as a basis for learning and speeding up positive developments can be considered a promising step in improving road safety’.<sup>1186</sup> In Australia, a benchmarking project in the short-term and continual benchmarking and comparisons between jurisdictions in the long-term will contribute to national and state and territory road safety targets being met. It also mirrors the results focus in the *National Road Safety Strategy 2011-2020* (NRSS):

*A stronger results focus and improved performance assessment for road safety will help bring all elements together (a long term vision to eliminate serious road trauma, interim targets over the next decade as a step towards that vision, and a series of interventions to achieve those targets) into a management approach that will ensure this strategy is delivered.*<sup>1187</sup>

**Recommendation 34:** That the Victorian Government recommend to the Standing Council on Transport and Infrastructure that a national benchmarking study be conducted into the road safety performance of all Australian jurisdictions, against agreed key performance indicators.

### 9.2.2 Victoria’s achievements in road safety

In discussing best practice in road safety, it is important to acknowledge the achievements and strong policy work in Victoria’s road safety sector, some of which is often recognised internationally as best practice. In 2013, Victoria experienced its lowest

<sup>1185</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 72.

<sup>1186</sup> F Wegman, et al., *SUNflowerNext: Towards a composite road safety performance index*, SWOV Institute for Road Safety Research, Leidschendam, 2008, p. 25.

<sup>1187</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. 97.

road toll on record with 242 deaths. This follows a steady decrease since 2008 where the road toll sat at 303.<sup>1188</sup> The Victorian Government acknowledged this success in the VRSS:

*Victoria has already made significant improvements, leading the world with high-impact measures such as seatbelts in the 1970s, random breath testing in 1976, and speed cameras in 1985, as well as with big infrastructure improvements such as the \$240 million statewide Blackspot Program started in 2000 and more recently the Transport Accident Commission (TAC) funded Safer Road Infrastructure Program.<sup>1189</sup>*

Victoria's experience in bringing down the road toll was the subject of review in the 2006 paper, *Halving Roadway Fatalities*, which was sponsored by the United States Department of Transportation.<sup>1190</sup> The paper identified the following four critical success factors as contributing to the State's declining fatality rate:

1. A sound and realistic plan - based on evidence and which included countermeasures that have proven to be effective, along with clear objective targets and mechanisms for monitoring progress;
2. Political and bureaucratic leadership;
3. Integrated implementation - coordinated implementation across the key agencies was considered imperative to Victoria's success, in addition to the capacity of the TAC to invest in integrated safety programs; and
4. Enabling factors.<sup>1191</sup>

One of the key enabling factors identified was:

*Strong relationships have long existed between the traffic safety research community and policymakers in each of the key government agencies, facilitating evidence-based planning and target setting.<sup>1192</sup>*

This enabling factor was evident to the Committee throughout the Inquiry and the relationship between the key agencies working across policy, research and enforcement has been a constant in Victoria. This point was also raised in the VicRoads' submission:

*Achieving road safety results requires long-term governmental ownership, leadership and political will. Victoria has long had an internationally recognised road safety management framework that has clear identification of a lead agency, a core group*

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<sup>1188</sup> Transport Accident Commission, 'Road Toll - Annual', viewed February 2014, <<http://www.tac.vic.gov.au/road-safety/statistics/road-toll-annual>>.

<sup>1189</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2013, p. 2.

<sup>1190</sup> I Johnston, *Halving Roadway Fatalities: A Case Study from Victoria, Australia, 1989-2004*, Office of International Programs, Washington, 2006.

<sup>1191</sup> I Johnston, *Halving Roadway Fatalities: A Case Study from Victoria, Australia, 1989-2004*, Office of International Programs, Washington, 2006, p. 17.

<sup>1192</sup> I Johnston, *Halving Roadway Fatalities: A Case Study from Victoria, Australia, 1989-2004*, Office of International Programs, Washington, 2006, p. 17.



*of government ministries, agencies and departments involved with roles and responsibilities defined and high-level strategic review of performance.*<sup>1193</sup>

The Committee commends the Victorian Government's establishment of the Ministerial Council for Road Safety that is chaired by the Minister for Police and Emergency Services, and includes the Attorney-General, the Minister for Roads, and the Assistant Treasurer who is responsible for the TAC.<sup>1194</sup> Commitment to road safety at the highest level of government is essential to ensuring it remains a top priority and secures necessary funding. Without this commitment, the capacity of road safety agencies and other interested stakeholders to maintain a sense of urgency around and awareness of road safety issues among the broader community is limited.

The partnership approach referred to above, along with a strong desire to address road trauma at a political level and a matching budget, are important contributing factors to Victoria working towards a steady decline in crash related serious injuries, and for continued improvements in road safety more broadly.

**Finding 42:** A partnership approach to road safety, along with strong political desire to address road trauma and a matching budget, will contribute to Victoria working towards a steady decline in crash related serious injuries.

### 9.2.2.1 Victorian State Trauma System

Aside from the more widely recognised countermeasures that have contributed to Victoria's road safety success, the Committee wishes to draw attention to the Victorian State Trauma System (VSTS). As mentioned in Chapter Two, the VSTS is a world leading trauma system that was established in 2000 and is now regarded as a 'benchmark for advanced trauma system design'.<sup>1195</sup> According to Alfred Health, the establishment of the VSTS was the result of professional organisations, academic institutions and government working together, with bipartisan political support, to develop a world-class system to meet the needs of severely injured Victorians.<sup>1196</sup> The system comprises the following key elements:

1. Designation of two adult major trauma services at The Alfred and the Royal Melbourne Hospitals, in addition to a major trauma service at the Royal Children's Hospital. It is these three hospitals where case volume and investment in facilities and expertise is concentrated;
2. Triage and transport protocols to ensure injured patients are taken to the right hospital according to their injuries and need for timely care;

<sup>1193</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 71.

<sup>1194</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2012, p. 9.

<sup>1195</sup> Alfred Health, *Submission*, no. 20, 22 April 2013, p. 2.

<sup>1196</sup> Alfred Health, *Submission*, no. 20, 22 April 2013, p. 2.

3. A system of monitoring and oversight, with data collection and monitoring of patient's long-term outcomes; and
4. A governance structure that ensures system oversight by experts in the field and an established deliberative forum through the Victorian State Trauma Committee that reports to and advises the appropriate Minister of required system changes.<sup>1197</sup>

In his presentation to the Committee, Professor Russell Gruen, Director of the National Trauma Research Institute at Alfred Health, advised of the VSTS' achievements:

*A key part of improving outcomes for Victorians after injury is to treat them well. To this end, Victoria has also led the world... After 10 years, the likelihood of dying after severe injury, all other things being equal, is less than half what it was in 2001, when the Victorian State Trauma System came into being. If you just think about that for a minute, it is virtually penicillinesque, I think. There is almost no other intervention in medicine or health care that has been as successful or effective as that.*<sup>1198</sup>

Throughout the Inquiry, the Committee heard from various participants about the role of the VSTS in reducing road trauma.<sup>1199</sup> In its submission, the DoH stated that the VSTS plays a major role in reducing the immediate impact of road and other trauma, particularly through significantly improving individuals' chances of successful rehabilitation. The DoH specifically acknowledged the VSTS' contribution to improved trauma outcomes and its ongoing role in tertiary prevention.<sup>1200</sup> Similarly, Mr Shelton of VicRoads noted that in regard to post-crash countermeasures, the VSTS has 'contributed significantly to reductions in trauma'.<sup>1201</sup>

The Committee also refers to the positive findings of the recently published study, *Reduced Population Burden of Road Transport-Related Major Trauma After Introduction of an Inclusive Trauma System*.<sup>1202</sup> The purpose of the study was to determine the burden of crash related serious injury in Victoria over a 10-year period after the introduction of the VSTS. It did this through examination of all crash related fatality and major trauma cases from the National Coroners Information System and the Victorian State Trauma Registry for the period of July 2001 to June 2011. The study concluded:

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<sup>1197</sup> Alfred Health, *Submission*, no. 20, 22 April 2013, p. 2.

<sup>1198</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 38.

<sup>1199</sup> Australasian College for Emergency Medicine, *Submission*, no. 22, 24 April 2013; David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013; Department of Health, *Submission*, no. 30, 14 May 2013; Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013.

<sup>1200</sup> Department of Health, *Submission*, no. 30, 14 May 2013.

<sup>1201</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013, p. 267.

<sup>1202</sup> B J Gabbe, et al., 'Reduced Population Burden of Road Transport-Related Major Trauma After Introduction of an Inclusive Trauma System', *Annals of Surgery*, 2014.

*Since the introduction of a regionalized, inclusive trauma system in Victoria, Australia, there has been a significant decline in the incidence of mortality, reduced risk-adjusted mortality for hospitalized road transport-related major trauma patients and an overall reduction in burden related to road transport-related injury as measured by DALYs...The results of this study contribute to a growing evidence base that implementation of inclusive trauma systems can play an important role in reducing the population burden of road traffic injury.*<sup>1203</sup>

Based on the evidence received, the Committee strongly endorses the work of the VSTS and believes it is important that it be acknowledged in the VRSS and accompanying action plans. Doing so will also publicly acknowledge the longstanding contribution of the medical fraternity to road safety in Victoria. Further, it will ensure consistency with the *UN Decade of Action on Road Safety* which, as noted earlier, identified post-crash responses as the fifth pillar of response to achieve and maintain a low road toll.<sup>1204</sup>

**Recommendation 35:** That the Victorian Government identify the Victorian State Trauma System as a countermeasure in the *Victorian Road Safety Strategy 2013-2022* and include it in accompanying, future, action plans. This is in recognition of its role in addressing road related trauma.

In its submission, Alfred Health raised a number of concerns with the VSTS. A key concern was the need to upgrade some of its core facilities, especially its operating theatres, to match modern best practice facilities common to many other trauma centres in Australia and overseas.<sup>1205</sup> Building on this point in the public hearing, Associate Professor Mark Fitzgerald, Director of the Trauma Service at Alfred Health, outlined some of the VSTS' current facility limitations:

*...the first thing is that when we set this up we were not too sure of what impact there would be. So for instance, at the Alfred there are four receiving trauma bays and at Royal Melbourne there are two. At Royal Melbourne the case load has doubled, and ours has gone up nearly 70 per cent. As far as the receiving facilities go it is quite common that we are full...There is often a juggling of facilities.*<sup>1206</sup>

Professor Gruen of Alfred Health explained further the need to update facilities:

*The seriously injured patient who is dying and in need of resuscitation has two points where their care is most dangerous. One is in the helicopter on the way to the helipad at the Alfred or Royal Melbourne. The second is between the emergency department and the operating theatre, which is where they are often highly unstable, bleeding and in need of urgent surgery. They go into a lift. Then they go 50 yards down a corridor, with patients and patients' families walking up and down the corridor, into*

<sup>1203</sup> B J Gabbe, et al., 'Reduced Population Burden of Road Transport-Related Major Trauma After Introduction of an Inclusive Trauma System', *Annals of Surgery*, 2014, p. 6.

<sup>1204</sup> Alfred Health, *Submission*, no. 20, 22 April 2013, p. 2.

<sup>1205</sup> Alfred Health, *Submission*, no. 20, 22 April 2013, p. 3.

<sup>1206</sup> Associate Professor Mark Fitzgerald, Director, Trauma Service, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 41.

*the intensive care unit, and have to enter in through some old doors, which sometimes you have to push open to get into the operating theatre. In a way I think that sums up the problem with an aged facility that is housing an ultramodern trauma service which has to provide modern, world-class critical care.*<sup>1207</sup>

The need to adequately resource the VSTS was also recommended by the Australasian College for Emergency Medicine in its submission. It proposed that all seriously injured patients receive definitive care in a major trauma service and that these hospitals be provided with adequately trained staff and resources.<sup>1208</sup> The Committee agrees with these calls to upgrade the VSTS in order for it to continue providing high levels of care to road trauma patients in Victoria.

**Recommendation 36:** That the Victorian Government work with the Victorian State Trauma Committee to undertake an audit of the Victorian State Trauma System with the aim of devising a schedule and funding plan to upgrade its equipment.

### 9.3 The Safe System approach

The Safe System approach to road safety is gradually being recognised around the world as the way forward to achieve road safety improvements and significant road trauma reductions. The Safe System approach aims to build safety into the road system before crashes occur and manage the combined effects of roads, vehicles, road users, and speed in a holistic manner. As noted in the NRSS:

*...Safe System principles demand a holistic approach to the safety of our road system. This means we must manage the combined effects of the speeds at which we travel, the safety of the vehicles we use, and the level of protection provided by our roads – not only to minimise the number of crashes, but to ensure that when crashes do occur they do not result in death or serious injury.*<sup>1209</sup>

A key feature of the Safe System approach is the understanding that road crashes are often the result of unintentional errors, and therefore the road environment needs to accommodate human error. This coincides with the earlier evidence presented in section 9.1 regarding the contribution of system failures to both fatal and non-fatal crashes.<sup>1210</sup> The approach reflects a shift away from focusing only on specific problems, but rather it has a greater focus on generic problems in recognition that 'road traffic is inherently

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<sup>1207</sup> Professor Russell Gruen, Director, National Trauma Research Institute, Alfred Health, *Transcript of evidence*, 22 July 2013, p. 41.

<sup>1208</sup> Australasian College for Emergency Medicine, *Submission*, no. 22, 24 April 2013, p. 2.

<sup>1209</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011-2020*, ATSB, Canberra, 2011, p. 31.

<sup>1210</sup> L N Wundersitz and M R J Baldock, *The relative contribution of system failures and extreme behaviour in South Australian crashes*, Centre for Automotive Safety Research, University of Adelaide, Adelaide, 2011.

unsafe: ordinary people are killed in crashes under normal circumstances'.<sup>1211</sup> On this basis, minimising the risk of crashes is no longer totally reliant on road user behaviours. Instead, the design of the road environment and vehicles requires consideration of the human body's tolerance to physical force and ensuring that road users are not exposed to crash forces likely to result in death or injury.<sup>1212</sup>

Shared responsibility is also a key feature of the Safe System approach, a point highlighted in the VRSS:

*Government taking action on its own is not enough. Government can make roads and roadsides safer, set safe speed limits, promote the development and purchase of safer vehicles as well as encourage people to behave more safely on the roads, but this will only get us so far. The community needs to be involved.*

*That's why this strategy takes a new collaborative approach. Government commits to making roads, vehicles and roadsides safer through engineering safer infrastructure, and creating a strong safety environment, but everybody needs to commit to making the right choices and doing the right thing to stay safe.<sup>1213</sup>*

The Safe System approach was formally adopted by the former Australian Transport Council in 2004. It is based on the road safety models of the Netherlands' *Sustainable Safety*, and Sweden's *Vision Zero*. Both of these countries are recognised as the original pioneers of the Safe System approach.

### 9.3.1 The Safe System approach in Victoria

In the evidence received in the submissions and public hearings, there was overwhelming support for the use of the Safe System approach to manage road safety in Victoria. The Committee is also highly supportive of this approach and is of the view that employing policy interventions and countermeasures consistent with its key principles is fundamental for Victoria achieving long-term serious injury reductions. Based on the VRSS, however, the Committee questions the extent to which the Victorian Government has fully embraced the Safe System approach, as it continues to rely on the traditional road safety approach of engineering, education and enforcement.<sup>1214</sup> Further, to fully comply with the Safe System approach, it is essential that the Government makes the important shift to integrate road safety policy into broader government objectives around health, justice, planning, transport and education. This will contribute to Victoria achieving long-term reductions in fatalities and serious injuries. This is discussed in further detail in section 9.3.2.

<sup>1211</sup> F Wegman, *Putting people at the centre: how to improve road safety in the 21st century?*, Parliamentary Advisory Council for Transport Safety, London, 2009, p. 10.

<sup>1212</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, p. 108.

<sup>1213</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2012, p. 6.

<sup>1214</sup> State Government of Victoria, *Victoria's Road Safety Strategy 2013-2022*, Melbourne, 2012, p. 6.

Outlined below is an overview of how the Safe System cornerstone areas of safe users, safe speeds, safe roads and safe vehicles have been implemented in Victoria based on the evidence received from submissions and Inquiry participants.

### 9.3.1.1 Safe road users

Prior to the adoption of the Safe System approach, road safety policy traditionally focused on behavioural change, through a combination of education and enforcement interventions to shift community attitudes around the need to safely use the roads. Arising from this approach, various road safety measures were introduced in Victoria, such as mandatory wearing of seat belts, mandatory wearing of motorcycle helmets and later bicycle helmets, and random breath testing (RBT), all of which have been proven to significantly reduce fatality rates.<sup>1215</sup>

Nowadays there is an understanding that most road users respect the law but can still make mistakes on the road that may lead to crashes. Hence the current focus within the Safe System approach on the interaction between infrastructure, speed and physical vulnerability, which is accompanied by the recognition that road users require assistance to avoid making mistakes in the first place. On the other hand, there still exists a minority of road users who continue to break the law and place themselves and other road users at risk of harm. These risky behaviours are reflected in Victorian crash statistics. The exact involvement of these contributing factors, especially speed, in crash related serious injuries is less clear. Based on the disparity between road users that typically comply with the law and those that do not, different approaches have been required under this cornerstone area to overcome system failures on the one hand and extreme behaviours on the other hand.

According to Victoria Police's submission:

*...the most effective operational countermeasures for reducing fatalities and serious injury levels have been initiatives specifically targeting driver behaviour including:*

- *Enforcement of Drug & Alcohol Impaired Drivers*
- *Speed Enforcement Campaigns*
- *Red Light Enforcement Campaigns.*<sup>1216</sup>

This enforcement approach, combined with public education campaigns typically run by the TAC, are the most common form of countermeasure to address behavioural change among road users. The Committee understands the difficulties in evaluating the impact of

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<sup>1215</sup> Bureau of Infrastructure Transport and Regional Economics, 'Effectiveness of measures to reduce road fatality rates', viewed February 2014, <[http://www.bitre.gov.au/publications/2010/files/is\\_039.pdf](http://www.bitre.gov.au/publications/2010/files/is_039.pdf)>, p. 1.

<sup>1216</sup> Victoria Police, *Submission*, no. 32, 21 June 2013, p. 6.

public education campaigns on reducing actual road trauma, and notes there are few studies that have done so. There is a general consensus, however, that public education campaigns are an important feature of managing a safe road system. Public education campaigns are particularly useful in supporting enforcement activities. According to *The Handbook of Road Safety Measures*, the overall cost-effectiveness of campaigns often depends on the cost of enforcement and its effect on reducing road crashes:

*Road user information and campaigns are relatively cheap measures. However, campaigns alone (without accompanying enforcement) were not found to reduce accidents and are therefore most likely not cost-effective. When combined with enforcement, the cost-effectiveness depends for the most part on costs of enforcement and the effects of the enforcement on accidents.*<sup>1217</sup>

In his presentation to the Committee, Associate Professor Stuart Newstead of MUARC advised of the importance of enforcement activities, indicating that a safe system is meaningless if people are not using it in the way it is designed to be used. He also referred to the example of RBT, stating that while the program is poor at intercepting motorists with a blood alcohol concentration (BAC) higher than 0.05, its greater purpose is to create the perception of potentially being caught at any time. Associate Professor Newstead advised that creating this strong perception within the community, whether it is for drink driving, speeding or mobile phone use, is where enforcement activities achieve the best return as they involve less input for a greater deterrent outcome.<sup>1218</sup>

Assistant Commissioner Robert Hill of the Road Policing Command at Victoria Police highlighted the impact of Victoria Police's drink driving enforcement activities on detection rates:

*Our drink driving model is working very well. It has been well established over a long period of time. Principally the basis for that is the strength in the legislative platform that it operates within. We have done internal analysis of our drink driving data...In 2009 we processed almost 19 000 people for drink driving. In 2012, it is 13 375, so there has been a significant drop in the number of people we have processed. One could argue that is perhaps because of the way we changed our enforcement, but the reality is that the enforcement has not changed, and a number of other indicators show that that is a legitimate change in driver behaviour.*<sup>1219</sup>

The Committee heard from some Inquiry participants of the need to continue policing and deterrence strategies to target high risk behaviours. In particular, Inspector Martin Boorman from the Road Policing Operations and Investigations Division of the Road Policing Command at Victoria Police advised the Committee of the increasing drugs

<sup>1217</sup> R Elvik, et al., *The Handbook of Road Safety Measures*, Emerald Group Publishing Limited, Bingley, 2009, p. 862.

<sup>1218</sup> Associate Professor Stuart Newstead, Associate Director, Injury Analysis and Data, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 103.

<sup>1219</sup> Inspector Inspector Martin Boorman, Road Policing Operations and Investigations Division, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 309.

presence in crash related fatalities and serious injuries. He stated that much of this is the result of the growing normalisation of illegal drugs for social purposes in the broader community.<sup>1220</sup> The Committee notes the intention within the *Victoria's Road Safety Action Plan 2013-2016* to 'create a new offence with a tough penalty for driving under the combined influence of alcohol (over legal Blood Alcohol Concentration) and illicit drugs'.<sup>1221</sup> The enforcement of drink driving offences has also been enhanced in the Action Plan, with intentions to require alcohol interlocks to apply to every convicted drink driver, including low-level and first offences, rather than only applying to drink drivers with a BAC of .15 or higher.<sup>1222</sup>

In terms of continuing to address road safety through the safe road users' area, the MUARC submission indicated that there would be less success compared to the savings likely to be achieved through the other cornerstones areas. That is, unless there is scope for the 'introduction of large-scale technological solutions to address the problems that currently rely on public campaigns, education and enforcement for compliance'.<sup>1223</sup> MUARC offered the examples of fitting of mandatory alcohol interlock to all new vehicles, seat belt interlocks, and Intelligent Speed Assist (ISA) to address speeding and low-level unintentional speeding.<sup>1224</sup> Similarly, VicRoads stated in its submission that 'the future landscape of road safety will require a heavy reliance on the introduction and uptake of existing and new technologies to modify driver behaviour and to deliver greater road user compliance'.<sup>1225</sup> Both submissions indicated the need for greater research into these technologies to determine their level of effectiveness, a point also shared by the Committee. The efficacy of these countermeasures is presently unknown and would be required to be subject to regulatory assessment processes before implementation in Victoria, and post-implementation review.

**Finding 43:** In future, there may be a growing reliance on new and existing vehicle technologies to modify road user behaviours and ensure compliance with the law.

The Committee also believes that further in-depth research is necessary to understand distraction and fatigue as contributing factors to serious injury crashes. The Committee commends the University of NSW's TARS Research's naturalist driving study, which includes Victoria. This study will continuously record data from approximately 400 cars in Sydney and Melbourne, from within and outside the vehicles, to examine driving

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<sup>1220</sup> Inspector Inspector Martin Boorman, Road Policing Operations and Investigations Division, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 308.

<sup>1221</sup> State Government of Victoria, *Victoria's Road Safety Action Plan 2013-2016*, Melbourne, 2013, p. 8.

<sup>1222</sup> State Government of Victoria, *Victoria's Road Safety Action Plan 2013-2016*, Melbourne, 2013, p. 7.

<sup>1223</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 32.

<sup>1224</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 32.

<sup>1225</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 66.



behaviour in normal and safety-critical situations.<sup>1226</sup> As mentioned previously, the findings of the ECIS will also be highly beneficial to understanding some of these key behavioural factors involved in serious injury crashes.

### *Vulnerable road users*

The Committee also received evidence that addressing road safety through the cornerstone area of safe users involves enhancing the safety of vulnerable and other road users, such as pedestrians, bicyclists, motorcyclists, younger drivers, older drivers, and country road users. The Committee notes that the VRSS has a distinct focus on each of these groups.

The Committee received extensive evidence about the role and value of safe walking and cycling, and the need to provide more protection to these travel modes on Victorian roads.<sup>1227</sup> In her submission, Dr Jan Garrard, a Senior Lecturer in Public Health at the School of Health and Social Development, Deakin University, provided an overview of road safety trauma experienced by bicyclists and pedestrians:

*In 2011, 49 pedestrians were killed on Victorian roads, comprising 17% of road fatalities (BITRE 2012). Over the past 10 years (2002 to 2011), pedestrian fatalities in Victoria have shown only a small decline relative to motor vehicle occupants, and also relative to the reduction in pedestrian fatalities in Australia as a whole. In addition, in Victoria in 2008-09, 722 pedestrians were seriously injured, 36% of which were classified as high threat to life injuries (AIHW 2012).*

*The number of hospitalisations for traffic crash injuries among cyclists in Victoria increased from 626 in 2004 to 959 in 2008, representing a yearly increase of 10.6% (Boufous et al 2010b). The rate per 100,000 population showed a similar yearly increase of 8.7%.*

*High threat to life road traffic injuries for cyclists comprise a relatively high and increasing proportion of total high threat to life traffic crash injuries. In 2000-01, cyclists comprised 7.8% of these injuries, while in 2008-09 this had increased to 11.3% (Henley and Harrison 2012).<sup>1228</sup>*

At the time of finalising this report, there was significant media attention surrounding a car ('dooring') incident in the City of Melbourne. The various and wide-ranging responses from individuals in the community and even some who work in the road safety area

<sup>1226</sup> UNSW Transport and Road Safety, 'Naturalistic Driving Study', viewed March 2014, <<http://www.tars.unsw.edu.au>>.

<sup>1227</sup> Janet Bolitho, President, Road Safety Action Group Inner Melbourne, *Transcript of evidence*, 22 July 2013; Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013; Dr Janet Garrard, *Submission*, no. 11, 9 April 2013; Julian Lyngcoln, Director Safer Roads, VicRoads, *Transcript of evidence*, 11 September 2013; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013; Royal Australasian College of Surgeons, *Submission*, no. 18, 22 April 2013; Transport Accident Commission, *Submission*, no. 35, 5 June 2013; VicRoads, *Submission*, no. 31, 17 May 2013; Victoria Police, *Submission*, no. 32, 21 June 2013.

<sup>1228</sup> Dr Janet Garrard, *Submission*, no. 11, 9 April 2013, p. 2.

signified the disparity in views about bicyclists, and the understanding of road laws as they relate to on-road cycling. Some of these issues are addressed in section 9.3.2. However, the Committee believes more effort is required on behalf of the Victorian Government to increase awareness of the rights and responsibilities of bicyclists and motorists in the context of on-road cycling. The Committee is also concerned with the increased risks and potential for trauma associated with cycling, as well as the potential benefits of cycling. On this basis, the challenges and opportunities associated with this mode of travel warrant extensive investigation, and in particular the type of inquiry that parliamentary committees are best placed to conduct.

**Recommendation 37:** That the Victorian Government develop terms of reference for an inquiry into bicycling, its challenges and opportunities, to be conducted by the Victorian Parliamentary Road Safety Committee.

In the context of young drivers, the Victorian Government has implemented the comprehensive Graduated Licensing Scheme (GLS) in stages since January 2007. Some of its key components include:

- A minimum of 120 hours of on-road supervised driving experience as a learner for those under 21 years;
- An increase in the probationary period from three to four years (Probationary 1 (P1) for one year and Probationary 2 (P2) for three years) for those under 21 years at the time of licensing;
- P1 drivers are only permitted to carry one peer passenger (16-21);
- P1 drivers are banned from any mobile phone use while driving; and
- Extension of the zero BAC requirement from three to four years to align with P1 and P2 licence phases.<sup>1229</sup>

According to VicRoads, the early evaluation of the GLS has indicated that ‘changes to the GLS have been accompanied by a significant reduction in the crash involvement of newly licensed probationary licence holders’.<sup>1230</sup>

Strategies to enhance safety among many of the road user groups can be achieved through all the Safe System cornerstone areas, which is evident in both the VRSS and accompanying action plan, and in the evidence received during the Inquiry. Professor Ivers of the George Institute for Global Health referred to country road users as an

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<sup>1229</sup> D Healy, J Catchpole and W Harrison, *Victoria's Graduated Licensing System evaluation interim report*, VicRoads, Kew, 2012, p. i.

<sup>1230</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 66.

example of where road safety policy is failing under some of the key Safe System cornerstone areas:

*Rural and remote safety is another issue. We have made great advances in safety in urban environments, but in rural and remote areas we have not had the same shifts, so we have not had the same improvements. The reason is basically that people are travelling at higher speeds on poorer quality roads in older quality cars with less police enforcement because we cannot put enforcement in place.<sup>1231</sup>*

Professor Ivers also raised the issue of there often being a socioeconomic aspect to increased crash related serious injury and fatality rates in rural areas, which again is reflected across the Safe System:

*There is a clear link across all types of injury with socioeconomic status. Basically if you are poor...[have] lower education levels, you are more likely to be living in an area that is not well serviced by public transport, where you may have less well-developed infrastructure because you have less public lobbying for better infrastructure than you have in more middle-class, highly educated areas, and you are more likely to be driving older cars.*

*Your response to social marketing campaigns may be different as well, because they tend to be targeted at mainstream populations... I think this is where we really struggle in Australia in all states.<sup>1232</sup>*

Importantly, this issue reinforces the need for road safety policy to be integrated into broader government policy to effectively respond to quite distinct but continuing problems within particular communities. This issue is discussed further in section 9.3.2.

**Finding 44:** It is essential that road safety policy be integrated into broader government policy to effectively respond to distinct but continuing problems within particular communities.

### 9.3.1.2 Safe speeds

Speed is widely recognised as a key risk factor in crash related fatalities and injuries, influencing both the risk of crashes and the severity of injuries resulting from crashes. Excessive or inappropriate speeding is recognised as a behavioural issue, with certain responses sitting under the safe users cornerstone area. However, under the Safe System approach, the issue of speed can also be addressed by setting appropriate speed limits that requires consideration of the interaction between infrastructure, speed and physical

<sup>1231</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 144.

<sup>1232</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 150.

vulnerability.<sup>1233</sup> Further, as mentioned earlier, future vehicle safety features could address speeding.

Speed as a risk factor was a matter raised by the majority of Inquiry participants.<sup>1234</sup> Many submissions and some witnesses referred to the Nilsson model to demonstrate the strong relationship between speed and serious injury.

Evidence to the Committee strongly supported the establishment of safe speeds in order to create an environment that is forgiving of human frailty. Ms Cockfield at the TAC advised the Committee that road safety in Victoria is now at the point where speed is the most important area to focus on.<sup>1235</sup> In its submission, VicRoads outlined the Victorian Government's integrated approach to addressing speed, which includes:

- Setting speed limits - safe speeds that consider road function, traffic composition, and road design characteristics, and which are also credible;
- Road engineering measures - setting low speed limits in areas where safety is crucial, such as near schools, pedestrian crossings, and at intersections. It also involves implementing physical speed reducing measures to assist cars maintain safe speeds, such as roundabouts or speed humps;
- Speed enforcement initiatives - use of speed cameras, mobile cameras and fines as a deterrent for speeding behaviour; and
- Information and education for drivers - all of the above components have been accompanied by information to road users, including the use of mass media campaigns, in order to inform the community about the measures being taken and also to deter the incidence of speeding.<sup>1236</sup>

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<sup>1233</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, p. 113.

<sup>1234</sup> David Shelton, Executive Director, Strategy Planning, Road Safety Co-ordinator, VicRoads, *Transcript of evidence*, 11 September 2013; Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013; Dr Janet Garrard, *Submission*, no. 11, 9 April 2013; Julian Lyngcoln, Director Safer Roads, VicRoads, *Transcript of evidence*, 11 September 2013; Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013; Office of Road Safety WA, *Submission*, no. 24, 30 April 2013; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013; Assistant Commissioner Robert Hill, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013; Royal Automobile Club of Victoria (RACV) Ltd, *Submission*, no. 10, 4 April 2013; Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013; SWOV Institute for Road Safety Research, *Submission*, no. 21, 23 April 2013; Transport Accident Commission, *Submission*, no. 35, 5 June 2013; VicRoads, *Submission*, no. 31, 17 May 2013; Victoria Police, *Submission*, no. 32, 20 September 2013.

<sup>1235</sup> Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 320.

<sup>1236</sup> VicRoads, *Submission*, no. 31, 17 May 2013, pp. 63-64.

The Committee heard from some Inquiry participants about the need to lower speed limits, particularly in order to increase the safety of vulnerable road user groups.<sup>1237</sup> In his presentation to the Committee, Mr Julian Lyngcoln, the Director of Safer Roads at VicRoads, advised of some of VicRoads work around lowering speed limits, particularly in areas of high vulnerable road user activity:

*A lot of work has been done in Victoria to lower speed limits, particularly in areas where there are lots of vulnerable road user activities — so 40 kilometre-an-hour speed limits around schools, through strip shopping centres and increasingly on residential streets as well. In the recent speed limit review we committed to changing our speed limit guidelines to make it easier for local governments to place 40 kilometre-an-hour limits on their local roads where they are not serving a through function, they basically have a local access function, they have lots of use by cyclists and pedestrians and they will not have much impact on the operation of the network but there are potential improvements for safety. That has been really effective.*<sup>1238</sup>

The Committee also heard from Inquiry participants that in many instances speed management can be a cost-effective way to reduce road related trauma. Professor Ivers at the George Institute for Global Health suggested that it is not always feasible to invest in high-quality roads for every Victorian rural road but speed limits on those roads can be addressed.<sup>1239</sup> In his presentation to the Committee, Dr Gary Dolman, Head of the Bureau of Infrastructure, Transport and Regional Economics (BITRE), referred to unpublished data that examined the effectiveness of a range of road safety measures for reducing fatalities and serious injuries, which showed that speed and alcohol measures have proven to be the most effective.<sup>1240</sup>

The Committee acknowledges that what is considered a safe speed is dependent on infrastructure and other factors, such as vehicle type and weather. The Committee notes the divergent views in the community on safe speeds and about their efficacy in reducing trauma as opposed to reducing risk. It is important that decision-makers balance risk-reduction efforts, such as safe speeds, with other considerations of functioning road networks.

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<sup>1237</sup> Chika Sakashita, Project Manager, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013; Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013; Dr Janet Garrard, *Submission*, no. 11, 9 April 2013; Julian Lyngcoln, Director Safer Roads, VicRoads, *Transcript of evidence*, 11 September 2013; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013; Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013; Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013; Transport Accident Commission, *Submission*, no. 35, 5 June 2013; VicRoads, *Submission*, no. 31, 17 May 2013.

<sup>1238</sup> Julian Lyngcoln, Director Safer Roads, VicRoads, *Transcript of evidence*, 11 September 2013, p. 281.

<sup>1239</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 144.

<sup>1240</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 166.

### 9.3.1.3 Safe roads

The Safe System approach places high emphasis on improving roads and roadsides as a way to prevent crashes and reduce the severity of crashes. Long before employing the Safe System approach, prevention through road safety has been a strong focus of the Victorian Government, reflected in its funding of blackspot programs since the early 1990s.<sup>1241</sup> Throughout the Inquiry, the Committee received evidence about two approaches to applying safety treatments to roads and roadsides: targeting and treating high crash location sites; and systematic road safety audits that identify sites requiring improvements for safety purposes. The Committee also notes the value in designing and upgrading roads with consideration of the safety needs of all road users.

Mr Chris Jurewicz, Senior Research Engineer of Road Safety at the Australian Road Research Board (ARRB), explained the two approaches:

*We can talk about two major approaches to improving road safety. One is a reactive approach, which basically deals with what is broken. We have crashes and we go to fix it. We spend money to reduce those crashes – from 10 to 5; it is an improvement, there is a benefit, there is a value. It is a squeaky wheel. If it stands out on the map, we have to deal with it and fix it.*

*We also have a proactive approach, which has been emerging over the last 10 or 15 years, which does not necessarily focus on crashes but focuses on finding where potential crashes may occur in the future. That is predominantly driven by the road infrastructure itself, how it operates and who is using it.<sup>1242</sup>*

In the context of the first approach, the Committee heard from VicRoads, the TAC and MUARC about the significant investment at the state level in a number of accident blackspot programs. The VicRoads' submission stated:

*The first of the TAC funded programs was implemented from 1992/93 and 1995/96 and had a budget of \$85 million. In total, 559 distinct sites were treated under these programs.*

*A subsequent blackspot program, with a budget of \$240 million was implemented from 2001/01 – 2003/04. This program, known as the Statewide Blackspot Program, had two distinct components; the accident blackspot program and the potential blackspot program. The 841 sites treated under the Blackspot program were selected based on their poor history of casualty crashes over a number of preceding years – similar to that used for the \$85 million program. However, the 285 sites treated under the Potential Black Spot component were identified using an alternative method that did not rely on crash histories of sites. Of the \$240 million allocated to the Statewide*

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<sup>1241</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 60.

<sup>1242</sup> Chris Jurewicz, Senior Research Engineer, Road Safety, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 67.

*Blackspot Program, approximately \$20 million was allocated to the Potential Blackspot component.*<sup>1243</sup>

Ms Samantha Cockfield, the Acting Senior Manager of Road Safety and Marketing at the TAC, also advised the Committee that the TAC's largest investment in its history has been in road and roadside treatments, through the blackspot programs outlined above and more recently through the Safer Roads Infrastructure Program (SRIP). The SRIP commenced in 2004 with the focus on treating the most common types of crashes in Victoria – run off road crashes and side impact crashes at intersections. To date, the SRIP has comprised three key stages (see Table 2). In 2013, the Victorian Government also announced it would significantly boost funding to the program by \$1 billion over the 10-year life of the VRSS.<sup>1244</sup>

**Table 2: Safer Roads Infrastructure Program highlights**<sup>1245</sup>

Infrastructure Program	SRIP1 \$130M (2006-2008)	SRIP2 \$110M (2007-2008)	SRIP3 \$722M (on going since 2008)
Program Focus	Serious casualty run off road crashes	Serious casualty intersection crashes	Serious casualty crashes Both intersection and run off road Mass action treatment and Innovative programs
Number of projects and Capital Cost	113 sites \$130M 42 intersections \$11M 68 run off road \$91M 3 duplication widening \$27.6M	252 sites \$110M 196 intersections \$57M 56 run off road \$53M	601 sites \$451M 255 intersection \$112M 140 run off road \$255M 148 Greyspots \$31M 25 40km/h Strip Shopping Centre (SSC) \$5 Edgeline C roads \$9.4M Tactile centreline A roads \$3.2M 17 Innovative \$8M

MUARC conducted an extensive evaluation of the SRIP using a quasi-experimental study design that included analysis of over 57,000 police-reported casualty crashes between the period from 1 January 2000 to 31 December 2009. Overall, the evaluation results showed that the SRIP produced significant crash reduction rates and 'would have contributed to

<sup>1243</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 60.

<sup>1244</sup> Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 321.

<sup>1245</sup> Peter Schofield, Manager, Road Safety Strategy and Community Programs, VicRoads, *Personal communication*, 13 March 2014.

the reduction of deaths and serious injuries on Victorian roads.<sup>1246</sup> The VicRoads submission provided the following table of results from the MUARC evaluation.

**Table 3: MUARC evaluation results of Safer Roads Infrastructure Program**<sup>1247</sup>

CRASH REDUCTIONS				
	SWBSP	SRIP 1	SRIP 2	SRIP 3*
	SERIOUS CASUALTY	SERIOUS CASUALTY	SERIOUS CASUALTY	ALL CASUALTY
<b>Metropolitan</b>	30%	36 %	47%	29%
<b>Rural</b>	44%	28%	38%	34%
<b>Intersection</b>	45%	48%	48%	29%
<b>Run-off-road</b>	29%	27%	36%	36%

As shown in Table 3, the SRIP2 was the most effective of the three programs, and also had the highest benefit–cost ratio of 3.6, which VicRoads explained was due in part to the strength of the intersection treatments compared to the run off road treatments.<sup>1248</sup> VicRoads also stated that of the treatments implemented as part of the SRIP2, the installation of roundabouts to replace conventional intersections was the most effective of all, with an estimated casualty crash reduction of 76%.<sup>1249</sup>

**Finding 45:** To date, the Safer Roads Infrastructure Program (SRIP) has contributed to significant reductions in road trauma in Victoria. The Committee believes that continued funding of the SRIP will assist Victoria to achieve the 30% reduction targets in both serious injuries and fatalities.

At a national level, representatives from BITRE advised the Committee on the success of the National Black Spot Programme, which began in 1990. BITRE has evaluated the program on three separate occasions. Dr Dolman, the Head of BITRE, referred to the key findings of the latest evaluation in his presentation to the Committee:

*That report found that fatality and casualty crashes at treated black spots were reduced by 30 per cent and property-damage-only crashes by 26-per cent. Over the*

<sup>1246</sup> Peter Schofield, Manager, Road Safety Strategy and Community Programs, VicRoads, *Personal communication*, 13 March 2014.

<sup>1247</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 62.

<sup>1248</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 62.

<sup>1249</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 61.



*six years that were studied there were 2027 black spots treated. That involved the saving on average of 24 lives a year.*<sup>1250</sup>

The Committee understands that Commonwealth funding of the National Black Spot Programme has been extended to 2018-19.<sup>1251</sup>

In regard to the second approach to applying safety treatments to roads and roadsides, the Committee received evidence from the ARRB about the value of road safety audits as a proactive approach to reducing crash and injury risks on roads. Mr Jurewicz of the ARRB explained to the Committee that it is becoming increasingly more difficult to find treatable black spots as more than half of fatal crash locations occur in locations with no prior crash history, and severe crashes are scattered 'almost semi-randomly'.<sup>1252</sup> Mr Jurewicz indicated that road safety audits, on the other hand, provide an expert subjective approach to determine where there are crash and injury risks on roads and propose recommendations for redress. Mr Jurewicz also advised that the ARRB Group has been working over the past 10 years to minimise subjectivity and make its approach to quantifying risk more methodical.<sup>1253</sup>

The ARRB Group created the Australian National Risk Assessment Model (ANRAM), a nationally agreed approach, funded and endorsed by road safety agencies through Austroads, to assist road agencies identify road sections that are associated with a high risk of severe crashes based on road features, traffic flow and speeds. The system allows decision-makers to estimate economic benefits of treatments, and to evaluate the effectiveness of interventions in reducing fatalities and serious injuries.<sup>1254</sup> Mr Jurewicz explained the ANRAM's proactive approach to the Committee:

*...it can tell you not how many crashes you are going to have in the next five years but on average how many you would expect for a location with these features and this traffic flow and speed. It is an indicator, but it uses the FSI – fatal and serious injury crashes – as currency. We have tested this, and it correlates pretty well to the real-world performance of roads.*<sup>1255</sup>

Another road auditing tool is the Australian Road Assessment Program (AusRAP), which Mr Jurewicz explained is similar to the ANRAM but is of more interest to agencies that lobby and deal with the public. ANRAM, on the other hand, is of more use to road safety agencies, such as VicRoads, that are responsible for road safety programs and

<sup>1250</sup> Dr Gary Dolman, Head of Bureau, The Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Transcript of evidence*, 6 August 2013, p. 167.

<sup>1251</sup> Department of Infrastructure and Regional Development, 'Black Spot Programme', viewed March 2014, <<http://investment.infrastructure.gov.au>>.

<sup>1252</sup> Chris Jurewicz, Senior Research Engineer, Road Safety, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 68.

<sup>1253</sup> Chris Jurewicz, Senior Research Engineer, Road Safety, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 68.

<sup>1254</sup> ARRB Group Ltd, *Submission*, no. 23, 26 April 2013, p. 5.

<sup>1255</sup> Chris Jurewicz, Senior Research Engineer, Road Safety, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 70.

infrastructure programs.<sup>1256</sup> According to Mr Dave Jones, Manager of Roads and Traffic at the Royal Automobile Club of Victoria (RACV), AusRAP is the partner program to the developing ANRAM program, both of which the ARRB Group has contributed to significantly. RACV is a partner in the AusRAP.<sup>1257</sup>

The AusRAP is an initiative of the Australian Automobile Association (AAA) and is part of the International Road Assessment Program (iRAP), of which many countries are members. According to Mr Jones of the RACV, the AusRAP aims to 'save lives by advocating for safer road infrastructure'.<sup>1258</sup> The key component of the AusRAP is its star rating program for highways, which rates them from one to five stars based on the roads' in-built safety features that include 'road and lane width, the presence of shoulders, whether they are sealed, if there are passing lanes and if there are barriers to prevent motorists who inadvertently leave the road from crashing into trees or other roadside objects'.<sup>1259</sup> At this stage, AusRAP only assesses rural highways with speed zones of 90 kilometres an hour or more.<sup>1260</sup>

According to the RACV, the benefits of the star rating system are:

- *Identifying the risk of crashes on particular lengths of road*
- *Determining investment plans to address the identified risks, at a network level (i.e. the quantum of investment required to lift the star rating by reducing one or more types of risk)*
- *Advising travellers of the relative safety of particular routes, or lengths of road*
- *Tracking investment in roads over time, to show whether the investments have increased safety*
- *Enabling roads to be 'star rated' at the design stage, to reduce the opportunity for risks to be 'built into' roads when they are constructed. International best practice is for organisations funding roads to specify that the funding is conditional on the road being constructed to a particular star rating.*<sup>1261</sup>

Mr Jones stated that AusRAP has assessed 2363 kilometres of nationally funded highway in Victoria, of which the Commonwealth Government committed 50% of funding to assist with that work.<sup>1262</sup> The RACV indicated in its submission that while the Commonwealth

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<sup>1256</sup> Chris Jurewicz, Senior Research Engineer, Road Safety, ARRB Group Ltd, *Transcript of evidence*, 23 July 2013, p. 69.

<sup>1257</sup> Royal Automobile Club of Victoria (RACV) Ltd, *Submission*, no. 10, 4 April 2013, p. 4.

<sup>1258</sup> Dave Jones, Manager, Roads and Traffic, Royal Automobile Club of Victoria (RACV), *Transcript of evidence*, 10 September 2013, p. 217.

<sup>1259</sup> Royal Automobile Club of Victoria (RACV) Ltd, *Submission*, no. 10, 4 April 2013, p. 4.

<sup>1260</sup> Dave Jones, Manager, Roads and Traffic, Royal Automobile Club of Victoria (RACV), *Transcript of evidence*, 10 September 2013, p. 217.

<sup>1261</sup> Royal Automobile Club of Victoria (RACV) Ltd, *Submission*, no. 10, 4 April 2013, p. 5.

<sup>1262</sup> Dave Jones, Manager, Roads and Traffic, Royal Automobile Club of Victoria (RACV), *Transcript of evidence*, 10 September 2013, p. 218.

Government contributed significant funding to the collection and analysis of star rating data in 2013, there has not been a commitment to continue this funding. The RACV also noted that in most developed countries, the Road Assessment Projects are funded by governments, whereas in Australia the AAA provides the majority of funding.<sup>1263</sup>

The Committee understands that the potential of the ANRAM and the AusRAP as road safety audit tools is yet to be fully realised in Victoria. Mr Jones proposed to the Committee that the AusRAP be incorporated into standard project implementation processes. For example, when VicRoads undertakes safety-related road projects, it could also determine an AusRAP rating for that length of road and update the data so there is a common map of the Australian highway network.<sup>1264</sup>

The Committee is of the view that there is scope for VicRoads to investigate the feasibility of incorporating these audit tools into its decision-making processes regarding future road projects and upgrades.

**Finding 46:** There is scope for VicRoads to investigate the feasibility of incorporating the Australian National Risk Assessment Model and the Australian Road Assessment Program into its decision-making processes regarding future road projects and upgrades.

#### 9.3.1.4 Safe vehicles

The fourth cornerstone area in the Safe System approach is safe vehicles. The Committee chose to discuss this area last due to the growing capacity of emerging vehicle technologies to address issues in each of the other three cornerstone areas. The Committee heard from Inquiry participants that over the last four decades there have been important improvements to vehicle safety that either assist vehicles to avoid crashes, or to improve injury outcomes when crashes occur. Mr Nicholas Clarke, the Chief Executive Officer of the Australasian New Car Assessment Program (ANCAP) advised the Committee of the various safety assist technologies being introduced into modern vehicles:

*...there are technologies that will help the driver as they are driving along. There are technologies that will recognise an imminent risk; there are technologies that will take over the emergency response of the vehicle; there are technologies that will stop a driver leaving a lane or be alert to the fact that a driver is fatigued and is perhaps going to sleep, and the list goes on and on.*<sup>1265</sup>

In his presentation to the Committee, Dr Peter Cairney, the Principal Behavioural Scientist at the ARRB, referred to the key vehicle safety features of roadway departure warnings,

<sup>1263</sup> Royal Automobile Club of Victoria (RACV) Ltd, *Submission*, no. 10, 4 April 2013, p. 4.

<sup>1264</sup> Royal Automobile Club of Victoria (RACV) Ltd, *Submission*, no. 10, 4 April 2013, p. 4.

<sup>1265</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, pp. 182-183.

collision avoidance warnings, ISA, and seat belt reminders. Dr Cairney advised the Committee that while the costs of these safety features are high, they are 'actually coming down dramatically so the future of it all looks very good'.<sup>1266</sup>

An active safety feature now required by law to be in all new Australian vehicles is Electronic Stability Control (ESC), which helps drivers to avoid crashes by making it easier to regain control of a vehicle if it runs off-road. ESC is claimed to reduce the incidence of single crashes by 29%.<sup>1267</sup> Airbags were another safety feature commonly referred to by Inquiry participants, along with MUARC research that demonstrated the significant safety benefits of side airbags, particularly in preventing death and serious injury in side impact crashes.<sup>1268</sup>

The Committee also notes the VicRoads trial of ISA with recidivist speed drivers, of which the MUARC evaluation determined was effective in reducing speeding among the sample group through tactical and operational speed support. The evaluation noted, however, that ISA did not influence behavioural change in drivers, nor was behavioural change sustained after the technology was removed. On this basis, it was advised that ISA needs to remain active to ensure safety benefits.<sup>1269</sup> Further, Ms Cockfield of the TAC advised that the TAC is intending to conduct ISA trials within the government fleet in order to show the simplicity of using the technology.<sup>1270</sup> The application of ISA to address recidivist offending was an issue identified by the Committee, which has broader justice implications. The Committee believes that the Department of Justice, in collaboration with road safety agencies, should be the responsible agency for determining how ISA is applied for this purpose.

The Committee is aware that the safety benefits of these technologies can only be realised through vehicle replacement. The VicRoads submission stated that:

*...modern vehicles [are]...three times less likely to result in serious injury to their occupants in the event of a crash than those manufactured in the early 1970s. However, improved vehicle safety generally only occurs through vehicle replacement. In Victoria, the average vehicle age is 10 years (ABS, 2012) and annual replacement rates are around 5 per cent, meaning that a significant proportion of the vehicle fleet is without many advanced vehicle safety features and full turnover of the fleet takes around 20 years.*<sup>1271</sup>

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<sup>1266</sup> Dr Peter Cairney, Principal Behavioural Scientist, ARRB Group Ltd, *Transcript of evidence*, 11 September 2013, p. 337.

<sup>1267</sup> State Government of Victoria, *Victoria's Road Safety Action Plan 2013-2016*, Melbourne, 2013, p. 31.

<sup>1268</sup> A D'Elia, J Scully and S Newstead, *Evaluation of Vehicle Side Airbag System Effectiveness*, Monash University Accident Research Centre, Clayton, 2012.

<sup>1269</sup> K Young, et al., *Repeat speeders trial*, 2013, p. 107.

<sup>1270</sup> Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 320.

<sup>1271</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 65.

The ANCAP is a key Australian initiative promoting the safety features of modern vehicles. Mr Clarke of the ANCAP, explained to the Committee that it is a not-for-profit company that provides consumers with information on the crashworthiness of vehicles through crash-test ratings on the relative safety of vehicles. A five star vehicle is considered to have high safety, having achieved the highest international standards in all test categories. Vehicles rated one star are considered to have poor safety. Mr Clarke indicated that ANCAP runs extensive campaigns to encourage consumers to purchase five star rated vehicles. In 2012, 73% of 1.1 million vehicles sold into the Australian market were five star rated.<sup>1272</sup>

According to VicRoads, improving vehicle safety in Victoria has been achieved through a consumer-driven approach that promotes and advocates for higher vehicle safety standards through various tools and media, as well as support for the ANCAP. It also noted the Victorian Government's recent policy decision to require all new light passenger government fleet vehicles to have a five star ANCAP rating.<sup>1273</sup> Mr Clarke also indicated his support for a consumer driven approach to promoting the adoption of new safety technologies in vehicles.<sup>1274</sup> Mr Clarke expressed particular interest in the autonomous braking system technology, which has emerged in the last five years and is showing strong potential in reducing crashes. He described it as follows:

*Autonomous emergency braking systems rely on a combination or mix of radar; lidar, which is light detection and ranging; and perhaps stereo video cameras or single video cameras. It is a mix or combination of any or all of those things. That technology scans the road ahead, looking for possible hazards. Those hazards can be vehicles, animals, cyclists, motorcyclists, pedestrians and so forth. The technology will identify the hazard in front generally before the driver will recognise the hazard, and it will start to arm itself, ready for an emergency situation.*

*If the driver continues on his or her way without actually taking any action for the potential hazard, the risk profile raises for the system and the system will then intervene to alert the driver that there is an imminent risk. That intervention might be a buzzer, a 'dab on the brakes' or some sort of rattling of the steering wheel — some sort of tactile thing — to say that there is an issue here. If the driver then does not respond and the risk has elevated to very serious, then the car will brake autonomously. It will provide maximum braking power to avoid the collision.<sup>1275</sup>*

Mr Clarke indicated that while the ANCAP was working with industry to encourage them to include the technology in new vehicles made or imported into Australia, it was also

<sup>1272</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, p. 183.

<sup>1273</sup> VicRoads, *Submission*, no. 31, 17 May 2013, p. 66.

<sup>1274</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, p. 184.

<sup>1275</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, p. 183.

working within the broader community and with the media to create the necessary demand among consumers for such technology.<sup>1276</sup>

Mr Clarke also raised with the Committee the need to provide more encouragement and possibly incentives for people to buy safer vehicles. He advised that while many in the community are highly aware of vehicle safety, it is proving more difficult to change driver behaviours. There is also the issue of people who cannot afford later models of vehicles.<sup>1277</sup> The Committee strongly agrees with the need to reduce the average fleet age in Victoria, noting evidence that estimated if everyone drove the safety vehicle in its category, road trauma involving light passenger vehicles could be reduced by 26%.<sup>1278</sup> The Committee notes the role of the Australian Design Rules in enhancing the safety of vehicles, but it does not believe this is a feasible and efficient option in today's local manufacturing environment. On this basis, the Committee agrees with the consumer-driven approach already employed by the Victorian Government and promoted by ANCAP. The Victorian Government should consider how it can effectively and efficiently encourage people to purchase safer vehicles.

**Recommendation 38:** That the Victorian Government continue its policy decision to require all new light passenger government fleet vehicles to be five star rated, and encourage the purchase of five star rated vehicles among the community, and vehicles equipped with proven technologies not yet mandated.

The Committee received evidence from various Inquiry participants about emerging Intelligent Transport System (ITS) technologies and their potential role in future road safety policy. According to the MUARC submission, these safety features are considered likely to produce the 'biggest gains in reducing serious injury in the future'.<sup>1279</sup> It cited research that 'conservatively' estimated a reduction of 25-35% in serious injuries if there was a full take-up of such technologies.<sup>1280</sup> Similarly, Mr Clarke advised the Committee of the potential significant impact that investing in vehicles could have in reducing road trauma:

*Just in terms of priorities, we do spend a lot of money on roads, and we have to spend a lot; roads are very important. If we are looking for rapid change and rapid reduction in the road toll in terms of deaths and serious injuries, then that is a good part of it, but I think safer cars are a better part. I think with a very small or modest investment in safer cars you can travel a lot of territory very quickly, and I think you can make a*

<sup>1276</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, p. 186.

<sup>1277</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, p. 188.

<sup>1278</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. 75.

<sup>1279</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 31.

<sup>1280</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 31.

*bigger impact on the road toll more quickly than you can with developing roads, just by virtue of the fact that roads take forever to build.*<sup>1281</sup>

Further, in his presentation to the Committee, Dr Cairney at the ARRB referred to the role of ITS in supporting the Safe System approach:

*The conclusion for ITS is we have some market-ready and emerging ITS systems that appear to offer considerable crash reductions. If they are not already available as nomadic devices, it is possible they will be available soon. This may be the only way in which conditions that approximate the safe system can be made available on the less well travelled parts of the road network.*<sup>1282</sup>

The key emerging ITS technologies are vehicle to vehicle (V2V), vehicle to infrastructure technologies (V2I), and vehicle to nomadic device (V2N). In their submissions, MUARC, the TAC and VicRoads outlined how these technologies operate:

*...these comprise location awareness (through GPS and other similar systems) and short range, low latency radio communication to relay vehicle locations or hazards to surrounding road users. Vehicles can then become aware of impending conflict situations independent of visual detection ability and either provide warnings to the driver or take control of the vehicles to prevent a crash.*<sup>1283</sup>

MUARC also stated in its submission that it is important to commence real-world implementation trials soon to facilitate long-term integration into the transport system.<sup>1284</sup> The Committee understands that as part of these trials, there are a number of regulatory and legal matters that require consideration and resolution to ensure these technologies can operate seamlessly in the road environment. Professor Mark Stevenson, Director of MUARC, indicated in his presentation that these issues are far from being addressed:

*It is a continuum in terms of where we are at with the systems, from where we are now to totally autonomous. The time period for us going from A to B is not clear, but what is clear is that we are moving in that direction and we are behind in terms of regulatory issues around litigation and everything else. We are not preparing ourselves for that, because the move into the ITS where the vehicles are communicating with each other, even if it is warning systems and so on, potentially could be just a few years off in terms of citywide deployment. A whole city has to be on top of that. We have to know what the regulatory requirements are for that. What if the warning system did fail and it did not alert them that a car is flying through that*

<sup>1281</sup> Nicholas Clarke, Chief Executive Officer, Australasian New Car Assessment Program (ANCAP), *Transcript of evidence*, 6 August 2013, p. 186.

<sup>1282</sup> Dr Peter Cairney, Principal Behavioural Scientist, ARRB Group Ltd, *Transcript of evidence*, 11 September 2013, p. 338.

<sup>1283</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 31; Transport Accident Commission, *Submission*, no. 35, 5 June 2013, p. 63; VicRoads, *Submission*, no. 31, 17 May 2013, p. 66.

<sup>1284</sup> Monash University Accident Research Centre (MUARC), *Submission*, no. 28, 8 May 2013, p. 31.

*intersection and did not alert them to brake sooner than they did — all those sorts of issues. We have not done any work in that area whatsoever.*<sup>1285</sup>

The Committee understands that a number of trials of these technologies have been conducted in the United States of America and Europe, and much can be learned from these experiences. Ms Margaret Prendergast, the General Manager of Policy and Regulation at the Centre for Road Safety, Transport for NSW, spoke of a trial to be conducted between Port Kembla and south-western Sydney of 60 heavy vehicle. She indicated that as part of the trial the heavy vehicles will talk to each other and the traffic lights, although the drivers will be unaware of this until something happens and a warning is set off.<sup>1286</sup>

Based on the potential safety benefits of these technologies, the Committee believes it is essential that relevant stakeholders work together to advance the use of ITS in Australia. Of particular importance is anticipating current and future regulatory and non-regulatory implications and processes at both state and national levels, and achieving harmony on these matters across all jurisdictions. The Committee notes that in November 2011 the Standing Council on Transport and Infrastructure (SCOTI) endorsed the *Policy Framework for Intelligent Transport Systems in Australia*, which aims to achieve national coordination based on clear principles to ensure ITS benefits are optimised, as well as facilitate the involvement of Australian industry and researchers in the market for ITS.<sup>1287</sup> The Committee commends this important national initiative.

At the state level, the Committee believes it is important that key representatives of the Victorian Government, road safety agencies, research institutions, as well as industry stakeholders, hold regular discussions around vehicle safety and emerging ITS technologies. Matters for potential discussion include: latest local and international research and developments; progress among manufacturers to harmonise ITS in vehicles; current and future policy and legislative implications surrounding ITS, particularly those relating to enforcement activities and community acceptance; and potential research projects and local trials of ITS technologies. The outcomes of these discussions should feed into the SCOTI initiative.

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<sup>1285</sup> Professor Mark Stevenson, Director, Monash University Accident Research Centre (MUARC), *Transcript of evidence*, 23 July 2013, p. 106.

<sup>1286</sup> Margaret Prendergast, General Manager, Policy Regulation, Centre for Road Safety, Transport for NSW, *Transcript of evidence*, 5 August 2013, p. 137.

<sup>1287</sup> Standing Council on Transport and Infrastructure, *Policy Framework for Intelligent Transport Systems in Australia*, Commonwealth of Australia, Canberra, 2012.



**Recommendation 39:** That the Victorian Government take a leading role in convening a regular forum for government agencies (including Federal), industry, academics and other key stakeholders to facilitate discussion around existing and emerging Intelligent Transport System technologies and vehicle safety. The forum should be convened within 12 months of this report being tabled and meet on a bi-annual basis thereafter.

### 9.3.2 An integrated approach to road safety

As mentioned previously, a key characteristic of the Safe System approach is the integration of road safety into other policy areas, and particularly alignment with broader government transport and planning decisions. This not only reinforces the Safe System principle of shared responsibility but it also reflects a shift away from the traditional approach to road safety of engineering, enforcement and education to more innovative and holistic solutions.

The current NRSS places a large emphasis on an integrated approach to road safety, reinforcing that road safety is closely linked to various policy areas, including the typical areas of transport, infrastructure, police, health, education and emergency services, and the non-typical road safety areas of energy, environment, employment, youth, research, innovation and technology, justice, insurance, trade and foreign affairs.<sup>1288</sup> It states that based on the Safe System approach, road safety activities can be a means to support:

- *a more sustainable and active lifestyle*
- *improved environmental outcomes, which will reduce energy consumption and reduce greenhouse gas emissions*
- *reduced pressure on health and hospital systems from trauma and substance abuse*
- *improved workplace safety*
- *improved land use planning and urban amenity*
- *productive economic activity resulting from fewer crashes, reliable travel times associated effects.*<sup>1289</sup>

The Committee agrees with this approach and believes that to continue making significant progress in reducing road trauma, exploration of a wider range of coordinated responses with other policy areas is required. For example, in reference to emerging ITS technologies, the Committee is aware that to accommodate and fully realise the potential of particular technologies in the broader community, would require consideration of land use and urban design. It is also important to note that the likely benefits arising from ITS

<sup>1288</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. 98.

<sup>1289</sup> Australian Transport Council (ATC), *National Road Safety Strategy 2011–2020*, ATSB, Canberra, 2011, p. 98.

technologies will be felt across various social, economic and environmental policy areas, not just road safety.

The Committee also received evidence about efforts to address road safety issues through greater linkages with health and alcohol policy. In his presentation to the Committee, Mr Schofield of VicRoads referred to the role of the medical fraternity in road safety and advised that the DoH had recently been included in the Road Safety Management Group in acknowledgement of the important link between health and road safety. He also stated that the VRSS includes a reference to the Victorian drug and alcohol strategy, and the VRSS is also referenced in the drug and alcohol strategy.<sup>1290</sup> Further, Inspector Boorman advised of work that Victoria Police had undertaken with VicRoads, the Department of Justice and the DoH to examine how to appropriately deal with recidivist drink drivers, many of whom have alcohol dependency issues.<sup>1291</sup>

Similarly, Professor Ivers of the George Institute for Global Health referred to the need for road safety agencies to work outside of their existing 'silos' and engage with health and other agencies to effectively tackle the issue of alcohol and its contribution to road trauma:

*...we do need to broaden the dialogue around alcohol because again in road safety traditionally we have focused on road safety-related measures to address alcohol to stop people drink driving, but we will not reduce drink driving on the roads. Alcohol interlocks are an option, and we have random breath testing, but it is not until we actually look at alcohol advertising, binge drinking in young people and the pervasive culture of heavy drinking across Australian society that we are going to really shift that beyond what we are able to do.*

*We are only just fiddling at the margins now. There is not going to be a significant shift unless we start tackling alcohol, and that actually requires road safety policy-makers to actually engage in dialogue with health and other agencies. We are not very good at that in road safety; we tend to operate within a sort of little silo. We have our health silo over here — they treat the outcomes of injury, including road injury — and then we have the road authorities over here, and they very rarely talk to each other.<sup>1292</sup>*

**Finding 47:** To continue making significant progress in reducing road trauma, the Victorian Government needs to explore a wider range of opportunities to integrate road safety objectives into other policy areas, such as health, transport, justice, environment, education and planning.

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<sup>1290</sup> Peter Schofield, Manager, Road Safety Strategy and Partnerships, VicRoads, *Transcript of evidence*, 11 September 2013, p. 281.

<sup>1291</sup> Inspector Martin Boorman, Road Policing Operations and Investigations Division, Road Policing Command, Victoria Police, *Transcript of evidence*, 11 September 2013, p. 307.

<sup>1292</sup> Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 151.

### 9.3.2.1 Integrating safe mobility goals into urban design

There were calls from various Inquiry participants to integrate road safety policy into broader transport and planning decisions, including integrating 'safe mobility' goals into urban design in order to protect pedestrians and cyclists.<sup>1293</sup> The Road Safety Action Group Inner Melbourne (RSAGIM) submission proposed designing streets that prioritise people over motorised traffic. It referred to the models of shared space and naked streets, which are based on the principle that by 'increasing the ambiguity of the operation of the street forces road users, especially motorists, to drive with greater levels of care and consideration for vulnerable road users'.<sup>1294</sup> Dr Garrard from Deakin University advised the Committee that in the long-term, integrating safer mobility for pedestrians and cyclists into urban design would contribute to reducing crash-related serious injuries in Victoria. She also advised that in the short-term, some areas could be retrofitted to make them more pedestrian and bicyclist friendly.<sup>1295</sup>

Similarly, among some Inquiry participants there was a push for greater promotion of active transport, through urban design and other means, as a way to reduce the dominant impact of the road transport system on land use. This also aligns with public health objectives, such as overcoming obesity with safe walking and cycling, as well as accommodating the ageing population within the road transport system.<sup>1296</sup> Dr Garrard commented on some of the public benefits of promoting active transport:

*...walking tends to be a more socially inclusive way of getting around, which means that it is not dependent on socioeconomic status. In a way, that is good from a public health point of view of people getting exercise. We know from sport and recreation that it is usually people in higher socioeconomic groups who get more exercise through sport, leisure, gyms and all that. If we can encourage walking and cycling in the community, it is a bit more socially inclusive because it is done by people across the spectrum demographically.*<sup>1297</sup>

Opportunities for policy integration were also recognised in the health policy area by the Victorian Parliament's Environment and Planning References Committee (EPR Committee) in its final report for the *Inquiry into Environmental Design and Public Health*

<sup>1293</sup> James Cleaver, Policy Adviser, Transport and Infrastructure Committee, Municipal Association of Victoria, *Transcript of evidence*, 22 July 2013, p. 34; Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 11; Professor Rebecca Ivers, Director of the Injury Division, The George Institute for Global Health, *Transcript of evidence*, 5 August 2013, p. 144; Samantha Cockfield, Acting Senior Manager, Road Safety and Marketing, Transport Accident Commission (TAC), *Transcript of evidence*, 11 September 2013, p. 321.

<sup>1294</sup> Road Safety Action Group Inner Melbourne, *Submission*, no. 8, 22 March 2013, pp. 13-14.

<sup>1295</sup> Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 15.

<sup>1296</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, pp. 125-126.

<sup>1297</sup> Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 16.

*in Victoria*. This report, tabled in May 2012, explored the links between health challenges in planning and designing urban environments. The EPR Committee noted there were ‘a range of health benefits from designing environments that encouraged physical activity through walking, cycling and using public transport’.<sup>1298</sup> It emphasised the importance of considering health when designing communities, such as creating environments that promote physical exercise and social interaction. It found that ‘such health-promoting elements could be purposely designed into the built environment, or, as was too often the case, designed out’.<sup>1299</sup> A key focus of the Committee’s recommendations was to embed health and wellbeing objectives throughout the Victorian planning system’s legislative and policy framework.<sup>1300</sup> In many respects, the ethos underpinning this approach is one that this Committee believes can be applied in road safety.

According to the OECD, improvements in road safety are essentially linked to better organised urban environments where there is a clear road hierarchy that ‘facilitates inter-urban traffic flow and meets intra-urban social and environmental needs’.<sup>1301</sup> Under the Safe System approach, this involves catering for the needs of different road user groups, and potentially dividing the road hierarchy into single purpose functions. This functionality is a key principle of the Netherlands’ *Sustainable Safety*, which promotes a safe mix of traffic comprising road users that are similar in mass, speed and direction of travel.<sup>1302</sup>

Creating a clear and viable road user hierarchy can be effectively achieved through innovative urban design, and better planning and coordination of appropriate infrastructure, such as building cycling and pedestrian networks into the designs of towns and cities. Such a hierarchy can assist to reduce delays on roads and traffic congestion, and reduce conflicts on the roads between different road user groups, particularly bicyclists and motorists. Further, it may contribute to a greater recognition of the legitimacy and cost-effectiveness of certain road users and modes of transport. In reference to international evidence, Dr Garrard indicated that there is a correlation between levels of walking and cycling and overall road fatality data, inferring that ‘if you

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<sup>1298</sup> Parliament of Victoria, *Inquiry into Environmental Design and Public Health in Victoria*, Report No. 1, Legislative Council Environment and Planning References Committee, May 2012, p. v.

<sup>1299</sup> Parliament of Victoria, *Inquiry into Environmental Design and Public Health in Victoria*, Report No. 1, Legislative Council Environment and Planning References Committee, May 2012, p. v.

<sup>1300</sup> Parliament of Victoria, *Inquiry into Environmental Design and Public Health in Victoria*, Report No. 1, Legislative Council Environment and Planning References Committee, May 2012, p. v.

<sup>1301</sup> OECD and International Transport Forum, *Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*, Organisation for Economic Co-operation and Development, 2008, p. 125.

<sup>1302</sup> L Mooren, R Grzebieta and S Job, ‘Can Australia be a global leader in road safety?’, Paper presented at the *Australasian Road Safety Research, Policing and Education Conference*, Brisbane, 2013.

make the road system safe for pedestrians and cyclists, you make it safe for everybody'.<sup>1303</sup>

Within some of the Victorian Government's current planning documents there is an acknowledgement of the need to accommodate alternative modes of transport, in addition to motorised vehicles, into urban networks. The Government's key planning document is *Plan Melbourne*, the purpose of which is to guide the city's growth to 2050 through an integrated approach to planning and development that includes land use, transport, and social and community infrastructure.<sup>1304</sup> As part of the Plan, there are directions for local travel options, by: improving pedestrian environments by creating quality pedestrian links and short cuts; establishing a network of high-quality cycling links, which include routes targeted for greater separation from other vehicles; and considering lowering speed limits in mixed-use and residential neighbourhoods in accordance with 40 km/h pedestrian zones.<sup>1305</sup> The Committee notes there is no reference to road safety in this section of the report, despite the strong links between the two areas.

Other key Victorian Government documents that acknowledge the need to accommodate the needs of bicyclists and pedestrians in urban design are *Cycling into the future 2013-2023*<sup>1306</sup> and the Principal Pedestrian Network (PPN).<sup>1307</sup> The cycling strategy identifies six directions to support and enhance cycling in Victoria, with one relating to reducing safety risks and another relating to planning urban cycling networks to improve connectivity. As part of the latter direction, the Government states that cycling will be part of the blueprint for the State's growth and development, which will bring together transport and land use.<sup>1308</sup> The PPN is 'a designated network of routes in a given area which support walking trips into and around key destinations such as activity centres, schools and transport nodes'.<sup>1309</sup> The PPN was established in recognition that walking has a valuable role in creating a more effective transport system.

The Committee notes that despite the cycling strategy and PPN initiative being developed before the release of the VRSS, there is no mention of these documents in the VRSS or accompanying action plan. While the VRSS and action plan have a distinct focus on these two road user groups, it is only in the context of road safety and not in the broader policy context of urban design, planning or transport. The Committee is of the view that substantial road safety benefits could arise from enhanced cycling and pedestrian

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<sup>1303</sup> Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 17.

<sup>1304</sup> Victorian Government, *Plan Melbourne*, Melbourne, 2013.

<sup>1305</sup> Victorian Government, *Plan Melbourne*, Melbourne, 2013, p. 87.

<sup>1306</sup> Victorian Government, *Cycling into the Future 2013-23*, Melbourne, 2012.

<sup>1307</sup> Department of Transport Planning and Local Infrastructure, 'Principal Pedestrian Network Factsheet', viewed November 2013 <<http://www.transport.vic.gov.au>>.

<sup>1308</sup> Victorian Government, *Cycling into the Future 2013-23*, Melbourne, 2012, p. 3.

<sup>1309</sup> Department of Transport Planning and Local Infrastructure, 'Principal Pedestrian Network Factsheet', viewed November 2013 <<http://www.transport.vic.gov.au>>.

infrastructure that is to be achieved through the cycling strategy and the PPN. The Victorian Government should explore these benefits further.

**Recommendation 40:** That *Victoria's Road Safety Strategy 2013-2022* and accompanying action plans should acknowledge the objectives of *Cycling into the future 2013-2023* and the Principal Pedestrian Network to create pedestrian and cycling friendly infrastructure. In this context, the Victorian Government should explore ways to contribute to reduced safety risks on the roads.

While government agencies actively promote cycling and walking as legitimate modes of travel, more effort is required to promote and encourage these travel modes from a road safety perspective. An initiative in the Action Plan 2013-2016 is the implementation of a grants program for local government to provide safer walking and cycling infrastructure. The Committee commends this initiative and is of the view that it should be expanded to include a supporting document, such as a handbook, that examines the cost-effectiveness of various infrastructure-based measures that aim to provide greater separation between pedestrians, bicyclists and motorists. This could be partly informed by the Principal Bicycle Network (PBN) and the Bicycle Priority Routes, which have been developed in partnership with local governments and are a network of cycling routes. According to VicRoads, the PBN is a 'bicycle infrastructure planning tool' to guide investment in the development of the State's bicycle network.<sup>1310</sup>

The handbook should identify best practice examples from within local municipalities, other jurisdictions and overseas of where the physical environment supports bicyclists, such as providing partially and fully separated bicycle lanes on popular cycling routes, innovative measures to address car dooring, and design options to accommodate the future demand of on-road cycling. This should be developed for the purpose of guiding local government in their land use planning processes and provision of local transport infrastructure. This will be an important resource not only for local government surrounding Melbourne but also for those in the outer suburbs, a point reinforced by Dr Garrard in her presentation to the Committee:

*A lot of our cycling infrastructure tends to be radial and into the city, to cater for the commute into the city. I think we have to go more neighbourhood oriented. We are now having higher density development in some of the middle and outer suburbs and traffic congestion is increasing in those areas, and I think we need to do more about helping people to get around for those short household trips by bicycle and by walking. We could do a lot more for the infrastructure.*<sup>1311</sup>

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<sup>1310</sup> VicRoads, 'Principal Bicycle Network (PBN)', viewed March 2014, <<http://www.vicroads.vic.gov.au>>.

<sup>1311</sup> Dr Janet Garrard, Senior Lecturer in Public Health, School of Health and Social Development, Deakin University, *Transcript of evidence*, 22 July 2013, p. 15.

**Recommendation 41:** That the Victorian Government develop an online e-book for local government that investigates the feasibility and cost-effectiveness of various infrastructure-based measures that provide greater separation between bicyclists, pedestrians and motorists. The handbook should identify best practice examples within Victorian local municipalities, other jurisdictions and overseas.

### 9.3.2.2 Integrating road safety objectives into planning and transportation policies

At a broader planning level, the Committee recognises that there are great opportunities to explicitly incorporate road safety objectives into land use planning and transportation policies. According to the Conference of European Directors of Roads, land use planning can be considered a road safety measure in certain cases, particularly in the context of planning for future traffic volumes and the distribution of traffic in the development of new areas and road networks.<sup>1312</sup>

The Committee is aware of the VicRoads' integrated tool, *SmartRoads*, which 'aims to better manage the use of our roads and better link transport to adjacent land use'.<sup>1313</sup> It provides a long-term approach to operating Victoria's road network, with the aim of enhancing its efficiency and safety through identifying the best way to use the network by assigning priority to different modes of transport at particular times of the day. As part of this, *SmartRoads* promotes active transport:

*SmartRoads sets out an approach for managing the many competing demands for limited road space. Depending on the time of day, some roads will be given bus or tram priority, while other roads provide an alternative route for through traffic. Under the SmartRoads plan, people will be encouraged to walk and cycle by making places more pedestrian-friendly and ensuring cyclists have improved access to activity centres and public transport services.*<sup>1314</sup>

In a practical sense, *SmartRoads* is intended to inform consideration of all new road proposals, from major infrastructure projects to minor works, as well as land use developments with implications to the road network.

In April 2013, the Victorian Auditor-General's Office (VAGO) released its final report into *Managing Traffic Congestion*, which considered the role of *SmartRoads* as a demand management initiative for traffic management. It found the initiative has considerable potential to influence demand for road space but it lacked a comprehensive implementation strategy to fully leverage its potential to better manage congestion across the road network.<sup>1315</sup> Aside from addressing traffic congestion, the Committee

<sup>1312</sup> G Yannis, P Evgenikos and E Papadimitriou, *Best Practice for Cost-Effective Road Safety Infrastructure Investments*, Conference of European Directors of Roads, Paris, 2008, p. 62.

<sup>1313</sup> VicRoads, *SmartRoads Connecting Communities*, Melbourne, 2011, p. 3.

<sup>1314</sup> VicRoads, *SmartRoads Connecting Communities*, Melbourne, 2011, p. 4.

<sup>1315</sup> Victorian Auditor General's Office, *Managing Traffic Congestion*, Melbourne, 2013, p. xi.

believes the *SmartRoads* tool provides a valuable opportunity to raise the profile of road safety objectives and the benefits of incorporating these objectives into Victoria's land use planning and development system.

**Recommendation 42:** That VicRoads increase *SmartRoads*' focus on road safety objectives in order to increase the integration and consideration of road safety in planning and transportation policies.

The Committee understands that the Government's key planning policy, the *State Planning Policy Framework*, is currently under review to ensure all policy matters align and integrate with the key strategic directions of *Plan Melbourne*.<sup>1316</sup> This review provides a timely opportunity to enhance the focus of road safety in the Government's planning documents and processes. In particular, there is merit in requiring that road safety impacts be considered as part of all land use developments and transport projects, similar to the assessment of environmental impacts. The Committee understands the challenges in bringing about such changes to planning policies, especially when road safety is not the key objective of such policies and might be in conflict with other core objectives. However, the Committee strongly believes that future road trauma reductions will not be achieved unless road safety objectives and pedestrian, bicyclist, motorcyclist and public transport users are integrated in Victorian planning frameworks. Planning for road safety is more economical and effective than trying to retrofit the road network for safety.

**Recommendation 43:** That the Victorian Government integrate road safety objectives into the assessment of Victorian Government major transport and infrastructure projects, as well as land use and urban planning projects.

## 9.4 A final reflection

During this Parliamentary term, the Road Safety Committee has had the opportunity to reflect on broader issues surrounding road safety in the 21<sup>st</sup> century, arising from this inquiry, and its previous one. Up to this point, Victorian road safety agencies have traditionally grappled with and overcome the challenges of reducing trauma, predominantly, on their own. However, as identified in the previous section, it has become clear to the Committee, that if Victoria is to address existing and new road safety challenges, road safety must be integrated within other policy areas. Often referred to as a 'whole of government' approach, integrated policy making is the most effective way to achieve success in any given area. Departments covering health, justice, planning and

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<sup>1316</sup> Department of Transport Planning and Local Infrastructure, 'State Planning Policy Framework Review Advisory Committee', viewed April 2014, <<http://www.dpcd.vic.gov.au>>.



transport are some of the key areas that the Committee believes should be intrinsically involved in developing road safety policy.

The Committee is also of the view that the opportunity to create a paradigm shift exists now, against the background of new road safety challenges. Such challenges include the changing patterns of road use and the growing number of motorcyclists and bicyclists, demographic changes (e.g. older road users), and increased urban density. There is also an increasing recognition of the need to transform the way people and goods are transported in the safest and most efficient manner.

As these matters were not central to the current Inquiry's terms of reference, the Committee did not pursue these in its investigations. However, they remained foremost in the Committee's considerations and it believes these matters should be reviewed by the Road Safety Committee in the next Parliamentary term. The Victorian Government needs to consider the question of how to further develop integrated policy-making as the means to achieve the ultimate goal of road safety to achieve the safest roads possible.



## APPENDIX A: LIST OF SUBMISSIONS

Actuaries Institute

Alfred Health

Andatech Corporation Pty Ltd

ARRB Group Ltd

Dr David Andreassen

Australasian College for Emergency Medicine

Australian Physiotherapy Association

CARRS-Q

Mr Colin Clarke

Department of Health

DriveSchool Enterprises Pty Ltd

Dr Janet Garrard

Mr Harry Gill

Jaguar Consulting

Law Institute of Victoria

Maurice Blackburn Lawyers

Mr John McMahon

Monash University Accident Research Centre

Municipal Association of Victoria

Office of Road Safety WA

Road Safety Action Group Inner Melbourne Inc.

Robert Bosch (Australia) Pty Ltd

Royal Australasian College of Surgeons

Royal Automobile Club of Victoria (RACV) Ltd

Safe Work Australia

Mr Lex Stewart

SWOV Institute for Road Safety Research

Transport Accident Commission

Transport and Road Safety (TARS) Research

VicRoads

Victoria Police

Victorian Auditor-General's Office

Victorian Automobile Chamber of Commerce

Mr Asko Vilenius

## APPENDIX B: LIST OF WITNESSES

### Public Hearings

22 July 2013

Ms Janet Bolitho	President <b>Road Safety Action Group Inner Melbourne</b>
Dr Janet Garrard	Senior Lecturer in Public Health School of Health and Social Development <b>Deakin University</b>
Mr Rex Deighton-Smith	Director and Principal <b>Jaguar Consulting</b>
Mr James Cleaver	Policy Adviser, Transport and Infrastructure Committee
Mr Ben Morris	Manager, Environment <b>Municipal Association of Victoria</b>
Associate Professor Mark Fitzgerald	Director, Trauma Service
Professor Russell Gruen	Director, National Trauma Research Institute <b>Alfred Health</b>
Mr Bruce Prosser	Director, Information and Funding Systems
Mr Peter Carver	Project Director, Health Strategy
Dr Martin Lum	Medical Director, Hospital and Health Service Performance <b>Department of Health</b>

23 July 2013

Dr Cliff Naude	Senior Economist
Mr Chris Jurewicz	Senior Research Engineer, Road Safety
Ms Van Hoang	Rating Supervisor
Mr Gerard Waldron	Managing Director <b>ARRB Group</b>
Professor Mark Stevenson	Director
Associate Professor Stuart Newstead	Associate Director, Injury Analysis and Data <b>Monash University Accident Research Centre</b>

5 August 2013

Dr Liz de Rome

Senior Research Officer  
**Neuroscience Research Australia**

Dr Rebecca Mitchell

Senior Research Fellow

Dr Mike Bambach

Senior Research Fellow  
Transport and Road Safety (TARS) Research  
**The University of New South Wales**

Ms Margaret Prendergast

General Manager, Policy and Regulation

Mr Hassan Raisianzadeh

Principal Manager, Information  
Centre for Road Safety  
**Transport for NSW**

Professor Rebecca Ivers

Director, Injury Division

Ms Chika Sakashita

Project Manager  
**The George Institute for Global Health**

Dr Richard Tooth

Director  
**Sapere Consulting**

Mr Aaron Cutter

Fellow  
**Actuaries Institute**

6 August 2013

Dr Gary Dolman

Head of Bureau

Mr Tim Risbey

Research Manager, Safety and Maritime Analysis

Dr Mark Harvey

Research Manager, Regulatory Reform and  
Investment Analysis  
**The Bureau of Infrastructure, Transport and  
Regional Economics (BITRE)**

Mr Nicholas Clarke

Chief Executive Officer

Ms Rhianne Robson

Communications Manager  
**Australasian New Car Assessment Program  
(ANCAP)**

Dr Fleur de Crespigny

Director, Data Analysis, Policies and Services Branch

Mr Richard Webster

Assistant Director, Data Analysis, Policies and  
Services Branch

Ms Ivanka Debevec

Director, Legal Branch, Work Health and Safety and  
Corporate Governance Branch  
**Safe Work Australia**

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## 10 September 2013

Professor Belinda Gabbe <sup>1317</sup>	Head, Victorian State Trauma Registry
Associate Professor Rodney Judson	Chair, Steering Committee
	<b>Victorian State Trauma Outcomes Registry and Monitoring Group (VSTORM)</b>
Mr Dave Jones	Manager, Roads and Traffic
	<b>Royal Automobile Club of Victoria (RACV)</b>
Professor Philip Clarke	Professor of Health Economics
Dr Dennis Petrie	Senior Research Fellow
	Centre for Health Policy, Programs and Economics
	Melbourne School of Population and Global Health
	<b>University of Melbourne</b>
Adjunct Professor Diana Rosman	Program Manager, Data Linking Branch
	<b>Department of Health, Western Australia</b>
Mr Malcolm Cumming	Principal
Mr Adam Kostick	National Business Development Manager
	<b>Maurice Blackburn Lawyers</b>
Ms Claire Thompson	Acting Principal Policy Officer
Dr Matthew Legge	Road Safety Data Analyst
	Office of Road Safety
	<b>Government of Western Australia</b>

## 11 September 2013

Mr David Shelton	Executive Director, Strategy Planning, Road Safety Co-ordinator
Mr Peter Schofield	Manager, Road Safety Strategy and Partnerships
Mr Julian Lyngcoln	Director, Safer Roads
	<b>VicRoads</b>
Mr Brian Savage	General Manager, Policy and Government Relations
Mr David Russell	Senior Manager, Government and Public Affairs
Mr Martin Oakley	Consultant

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<sup>1317</sup> During the course of the Inquiry, Belinda Gabbe's position at Monash University changed from an Associate Professorship to a Professorship. For the purpose of consistency, she is referred to as Professor throughout the report.

**Victorian Automobile Chamber of Commerce (VACC)**

Assistant Commissioner Robert Hill  
Superintendent Philip Green  
Inspector Martin Boorman  
Senior Sergeant Michael Batten

Road Policing Command  
Operational Systems Support Division, Intelligence and Covert Support Command  
Road Policing Operations and Investigations Division, Road Policing Command  
Road Policing Strategy Division, Road Policing Command

**Victoria Police**

Ms Samantha Cockfield  
Mr Michael Nieuwesteeg  
Mr Hafez Alavi  
Mr Alan Woodroffe

Acting Senior Manager, Road Safety and Marketing  
Research Manager, Road Safety and Marketing  
Senior Data Analyst  
Senior Manager Policy, Service and Review

**Transport Accident Commission (TAC)**

Dr Peter Cairney

Principal Behavioural Scientist

**ARRB Group Ltd**

28 October 2013

Professor Anthony Harris

Director  
Centre for Health Economics  
**Monash University**

Professor Luke Connelly

Professor of Health Economics, Director of ACERH, Associate Director of CONROD  
School of Economics  
**University of Queensland**

Mr David Watts

Acting Privacy Commissioner and Victorian Commissioner for Law Enforcement Data Security  
**Privacy Victoria**

Professor James Harrison

Director, Research Centre for Injury Studies, and Program Manager, National Injury Surveillance Unit  
**Flinders University**

Professor Jeffrey Richardson

Foundation Director  
Centre for Health Economics  
**Monash University**



# APPENDIX C: ACCESS POLICY, DEPARTMENT OF HEALTH WA



Government of **Western Australia**  
Department of **Health**

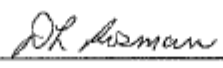
## **DATA LINKGE BRANCH**

**Public Health Division**

## **ACCESS POLICY**

## 1 DOCUMENT CONTROL

### 1.1 Approved by

Name	Signature	Date	Version
Diana Rosman Program Manager Data Linkage Branch		20/11/2010	1.00

### 1.2 Reviewers

Name	Role
Alex Godfrey	Project Manager

### 1.3 Distribution List

Name	Role
Carol Garfield	Manager, Data Linkage Systems
Geoff Davis	Senior Data Linkage Consultant

### 1.4 Documentation Identification and Location

Master Location	H:/ADMINISTRATION/ Policies
File Name	DLB_Access_Policy_FINAL

### 1.5 Change History

Release Date	Version	Summary of Changes	Author
15/02/2010	0.1 Draft	Initial document.	Ted Bennett
17/02/2010	0.2 Draft	Incorporating Review Comments	Ted Bennett
30/03/2010	0.3	Major Revision – pricing and text	Diana Rosman
28/06/2010	0.4	Separated Access and Pricing into 2 documents	Diana Rosman
25/10/2010	0.8	Include comments from DLAB	David Preen, Merran Smith

<b>1</b>	<b>DOCUMENT CONTROL</b>	<b>2</b>
1.1	Approved by	2
1.2	Reviewers	2
1.3	Distribution List	2
1.4	Documentation Identification and Location	2
1.5	Change History	2
<b>2</b>	<b>INTRODUCTION</b>	<b>4</b>
<b>3</b>	<b>SCOPE</b>	<b>4</b>
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4.1	Access to Linked Data	5
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4.4	Terms and Conditions for Data Release	6

## 2 INTRODUCTION

A centralised data linkage facility was established within the Department of Health, WA in 1995, as a collaborative venture with the assistance of a grant from the WA Lotteries Commission.

The enhanced data linkage infrastructure is now managed by the Data Linkage Branch (DLB) of the Department of Health, WA. The Department of Health collaborates with the Centre for Health Services Research at The University of Western Australia, the Health Innovation Research Institute at Curtin University of Technology and the Telethon Institute for Child Health Research to provide information for research seeking to understand and improve the health and wellbeing of the people of Western Australia (WA).

In WA, data linkage arrangements follow the separation principle, where personal or demographic information is separated from the service or content data prior to linkage. Data custodians (or stewards) remain in control of their service data and approve and prepare each research extract as required.

The WA Data Linkage System (WADLS) is an electronic system for connecting data from a range of sources for statistical purposes. The system is readily extensible and now enables information from most of WA's population data collections to be joined for approved applications.

The WADLS is maintained using rigorous, internationally recognised privacy preserving protocols, probabilistic matching and extensive clerical review. Regular updates of core linkages are undertaken according to availability of personal or "demographic" information from data providers. The core "linkage keys" are retained and managed by the Data Linkage Unit (DLU) within the DLB. It may also be possible to link external datasets to the WADLS for approved projects, with approval from relevant ethics committees and data providers.

The detailed process to be undertaken for access to these data linkage resources is described in [www.data-linkage-wa.org.au](http://www.data-linkage-wa.org.au)

## 3 SCOPE

This document describes the policy for access to WA's data linkage resources and the associated services provided by DLB's data linkage, systems and client services teams.

## 4 ACCESS TO DATA HOLDINGS

Information can be requested through the Department of Health data services email portal, for research, planning, evaluation and monitoring projects that aim to improve the health of Western Australians.

The WA Data Linkage Access Policy and associated Pricing Policy apply to applicants who wish to access or use resources available through the Data Linkage Branch.

Access to data linkage services and resources is to be consistent with the following principles:

- investment in research activities and infrastructure is planned, developed and maintained with the aim of maximising the contributions of the research to improved health outcomes and social wellbeing;
- linkage activities and supporting infrastructure is developed on a collaborative, non-exclusive basis;
- access is a critical issue in the drive to optimise Australia's research activities. There will be as few barriers as possible to accessing linked data for those undertaking meritorious research;

- access will be open to those whose projects comply with the following principles:
  - They are projects conducted in accordance with the relevant legislation, regulations and guidelines.
  - They are ethically approved human research projects of scientific merit.
  - They have the support and approval of the relevant data custodians.
  - They are aimed at understanding and improving the health and wellbeing of West Australians.
  - They are projects whose results will be available in the public domain within a specified timeframe.
  - Resources are available to undertake the project through to publication.

#### **4.1 Access to Linked Data**

The purposes for which access to linked data will be provided are:

- To facilitate research which may contribute to the promotion, protection and maintenance of the health and wellbeing of the people of WA;
- To facilitate the planning, evaluation and delivery of health and social services;
- To contribute to improvement in research methodologies, data collection, quality assessment, linkage and development and use of advanced statistical techniques.

Linked data will be provided to:

- Researchers with the appropriate experience, qualifications, facilities and funding to conduct the proposed research.
- Postgraduate students and early career researchers who are part of a research team with appropriate experience and resourcing.

Linked data will not usually be provided for clinical governance or auditing purposes, but potential applicants will be referred to original data providers.

Applications supported by private funding will only be accepted if there is no conflict of interest or inappropriate involvement and an undertaking is made to publish results of the research, regardless of research findings, in publicly available media within a specified timeframe.

#### **4.2 Prioritisation of Researcher Access**

Access by researchers for meritorious research will generally be provided on a 'first come first served' basis. However, the following factors may be taken into consideration when prioritising access:

- Data availability;
- Complexity of project/ technical feasibility;
- Public interest;
- Resources; e.g. funding
- National Health Priority Areas determined by the Australian Health Ministers' Conference;
- Strategic priorities (as determined by the members of the Data Linkage Advisory Board)..

### **4.3 Application Process**

A standard application process is advertised on the DLB website. The standard application form will be consistent with the National Ethics Application Form.

The DLB client services unit will coordinate approval and access arrangements. The Program Manager provides advice on access and use of DLB services and the exercising of Access and Pricing Policy controls.

### **4.4 Terms and Conditions for Data Release**

Data will not be released to researchers until:

- The team of investigators includes a senior researcher based in Western Australia;
- The project is approved by a recognised human research ethics committee (including Department of Health HREC if applicable);
- All the relevant Data Custodians have approved the use of data under their supervision
- The Delegate of the Director General has approved the release of Department of Health data;
- Other requirements are met (e.g. approval from Chief Executives of Area Health Services)

### **4.5 Researcher Obligations**

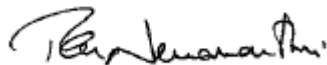
- To adhere to the Department of Health Code of Practice for information management, confidentiality and security.
- To provide a copy of any reports, journal articles or presentations to the DLB and Department of Health Data Custodians for review and comment within 30 days prior to distribution or publication.
- To provide a copy of any final reports or journal articles to the DLB for its research outputs collection.
- To submit a plain language summary of research results to the DLB for its website.
- To apply for approval for any changes to security arrangements outlined in the application, including changes in the location of research data.
- To apply for approval for any changes to the Research Protocol;
- To apply for approval for any changes to Research Personnel;
- To apply for approval for any changes to Termination Plan.

## 5 Policy approval

This Policy has been approved for release via web and other media by the Executive Director, Public Health Division, Department of Health WA .

The Policy has been endorsed by the WA Data Linkage Advisory Board and is consistent with policies being developed through the National Collaborative Research Infrastructure Strategy funded Population Health Research Network (PHRN).

Signed by



.....  
TARUN WEERAMANATHIRI 26/11/2010

Executive Director

Public Health Division

Department of Health





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