



Recent developments in willingness-to-pay methods for estimating the social cost of crashes

Dr Cliff Naude

Overview

- Methods
- Current practice in Australia
- Current estimates
- Scoping a national WTP study for Australia
- Interim values
- Conclusions

Methods

- **Human capital** (Hybrid HC in Australia) - loss of output to households & workplace due to death, injury (later incl. human costs)
- **Willingness-to-pay** – respondents' WTP to reduce risk of death or injury
- **Revealed preference**
 - inferred WTP based on actual data of purchases in related markets (hedonic)
 - e.g. safety attributes of cars
- **Stated preference**
 - survey of respondents to determine WTP (WTA)
 - contingent valuation or more recently choice modelling (choice experiment)
- Other – **life satisfaction** approach

Assessment of preferences (additional)

- **Revealed preference**
 - Estimates based on real economic choices
 - Cost effective
 - Causal relationships need to be correctly understood
 - Link between the real dependent & inferred variables
 - Functional form specification (missing variables)
 - Data must be of high quality
- **Stated preference**
 - Widely applied (CV & more recently choice modelling)
 - Can explore reasons behind preferences
 - Ex ante application
 - WTP vs WTA disparity
 - Costly
 - Time-consuming
 - Survey bias

Current practice in Australia

- Described in detail in Austroads reports & VicRoads submission
- **Human Capital** (2000) approach (BITRE) – loss of output to households & workplace due to death, injury
- **Hybrid (modified) Human Capital** (2006) approach (BITRE) – HC plus ‘pain & suffering’, additional costs of crashes, e.g. Emergency services, cleanup costs
- **NSW RTA study** (2007) – SP (WTP), value of risk reduction, choice experiment
- **Austroads updating** (bi-annual) – HC approach (BITRE) & NSW RTA values

NSW RTA study (additional)

- Car users – 10 games (situations) of choice between two hypothetical alternative routes which differ in characteristics, i.e. traffic conditions, speed, travel time, number of lanes, risk of fatality and injury
- Pedestrians - choose between two routes differing in terms of number of lanes, speed limit, crossing type, walking time, council rate/housing rent increase to cover road safety improvements, number of fatalities and injuries
- Sample sought 210 respondents, 213 interviews conducted (142 urban/Sydney trips, 71 non-urban/Bathurst trips)
- Interviews took 15-45 mins

Current estimates

Method	Cost per fatality (June 2010) (AU\$m)	Cost per serious injury (June 2010) (AU\$m)	Cost per other injury (June 2010) (AU\$m)
HC (BITRE)	1.84	0.44	0.017
WTP - NSW RTA (urban)	6.92	0.34	0.018
WTP - NSW (rural)	6.84	0.21	0.022
WTP – NZ (urban)	3.19	0.58	0.070
WTP - Singapore	1.50	0.20	0.014

Scoping a national WTP study for Australia

- Objective: scoping study for Austroads
- National Road Safety Strategy recommendation for action:
‘Develop a nationally agreed approach to applying the willingness-to-pay methodology to value safety’
- ARRB project team, Austroads Project Manager: Dr Mark Harvey (BITRE)
- Review of local & international case studies
- Interviews with identified experts
- Scoping a national WTP study
- Interim values

Review of local & international experience

Study	Key components
NSW RTA (2007)	<ul style="list-style-type: none"> • SP (WTP) / 'Stated Choice' • VRR, WTP to reduce risk of death & injury • Choice experiment with interview survey
New Zealand (1991, 1996)	<ul style="list-style-type: none"> • SP (WTP plus willingness to accept WTA) • Linked to household travel survey
Norway (2009)	<ul style="list-style-type: none"> • SP (choice experiment compared with CV) • Internet-based questionnaire (repeated)
Sweden (2004)	<ul style="list-style-type: none"> • Revealed preference (hedonic pricing) • Vehicle safety attributes
UK (1997)	<ul style="list-style-type: none"> • SP (chained approach), CV questions used for valuing non-fatal injuries, SG compares with risk of death • VPF (1987), VPI (1991)
Singapore (2008)	<ul style="list-style-type: none"> • SP (choice experiment & CV compared)

Interviews

- Aim to get behind published material & get input
- Australian experience:
 - Prof. David Hensher & Prof. John Rose (Institute of Transport and Logistics Studies, ITLS, University of Sydney)
 - Vartguess Markarian (Pricewaterhousecoopers, PwC)
 - Frank Perry (Transport for NSW, formerly RTA)
 - Prof. Jordan Louviere & Prof. Joffre Swait (Centre for the Study of Choice (CenSoC), University of Technology Sydney) (discrete choice modelling expertise)
 - BITRE (crash data consistency)
- New Zealand experience:
 - Dr Jagadish Guria (formerly of LTSA)

Scoping a national WTP study for Australia

- Stated preference with choice experiment
- Experiment design & survey / interview component critical
- Estimated cost (2012): \$1m
- Timeframe: 3-4 years overall
- Range of expertise required & identified
- Life of 8-10 years for results
- Funding availability a key issue
- Value of statistical life, serious injury, etc
- Interim values: Updated by CPI or indexed by per capita GDP & adjusted by income elasticity (ATC National Guidelines)
- Importance of crash risk & exposure data – consistency of definitions & recording of crash data across jurisdictions

Scoping a national WTP study for Australia (additional)

- Data collection through choice experiment
- Experiment design crucial
- Survey component (market research expertise)
- Interview technique
- Preparation of respondents
- Online vs personal interviews
- Pilot study (approx 1,500) to test interview technique, software, etc
- Sample size of 6,000-8,000
- Sample segmentation:
 - urban and non-urban respondents (given variations in routes, trip lengths, speed limits, travel time, running costs, crash rates & severities)
 - crash types (e.g. fatal, serious injury & minor injury)
 - range of road users (e.g. car drivers & passengers, trucks, public transport commuters, pedestrians)
 - as wide an age group as possible, e.g. 18–75 years

Scoping a national WTP study for Australia (additional)

- Expertise required:
 - Technical experts
 - Survey / market research firm
 - Project management
 - Client project management
 - Peer review

Conclusions

- SP technique recommended in absence of RP
- Recent developments in this direction taken into account
- Cost, complexity & time as major considerations
- Need to estimate values for fatalities & injuries across modes
- Comparison of methods
- National WTP study as a way forward
- Additional costs, e.g. Emergency services
- Interim values
- Implications for economic evaluation

Key references

- Austroads 2013. Social cost of road crashes in Australia: The case for willingness-to-pay values for road safety, Report AP-R438-13, Sydney.
- Austroads 2012. Guide to Project Evaluation – Part 4: Project evaluation data, Report AGPE04-12, Sydney.
- Austroads 2011. Updating Austroads RUE unit values and related methodologies, Report AP-R373-11, Sydney.