

Institution: Durham University
Unit of Assessment: Psychology
Title of case study: Valuing health and safety benefits
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Dr Covey's research has focused on understanding the public perception of hazards and how this might feed through into their preferences for safety prioritisation. Her work at Durham has changed Government policies and has had significant impacts on how UK-wide investment decisions are made. It has saved the railway industry millions of pounds in unnecessary upgrade costs and placed a monetary value on the impact of air pollution on health for the first time. Her work has allowed the views of the public to be fed into decisions that could affect their own safety and has provided more accurate and robust figures for the valuation of safety.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>This case study draws upon a body of research conducted by Dr Judith Covey since her appointment to the psychology department of Durham University in 1999. Three interdisciplinary projects were undertaken using stated preference methods to elicit the public's perceptions of hazards and estimate how much they are willing to pay for small reductions in the risks of death or injury. Two of the projects focussed on investigating whether members of the general public apply the same value of preventing a fatality (VPF) used for appraising the benefits of road safety improvements to saving lives from a range of different types of railway accidents (1,2). The other project was concerned with estimating how much people are willing to pay to avoid the consequences that air pollution could have on their health and life expectancy (3).</p> <p>As a psychologist Dr Covey's contribution to the research was distinct from the economists that she collaborated with on these projects. The economists (partners at the Universities of Newcastle, Queen Mary, and East Anglia) were responsible for ensuring that the stated preference methods used were theoretically appropriate and modelling how the data should be analysed to produce values that can subsequently inform policy making. However, stated preference methods are notoriously difficult to design and people's responses have been found to be subject to a range of decision biases and anomalies. For example, apparently irrelevant features of survey instruments, such as the way that information is presented (framing effects) or scales used to elicit responses (response effects) can have unwanted influences on the values obtained.</p> <p>Dr Covey's role as a psychologist was to understand and identify the ways in which responses to the questions used in these projects might be unduly influenced by chosen elicitation methods used and to ensure that the surveys were designed to minimize sources of bias. Techniques employed by Dr Covey included the use of cognitive interviewing to identify sources of response error. Experiments were also designed and conducted to test the robustness of different variants of the survey instruments. This research ensured that the surveys ultimately used in these projects to elicit values from large samples of the general public were designed to be as valid and reliable as possible. This research was essential to instil confidence in the results obtained, giving policy-makers confidence that the values can be used in assessing multi-million pound investment decisions.</p> <p>Key findings from the general public surveys that have subsequently had an impact on policy include:</p> <ul style="list-style-type: none"> • The Department for Transport VPF figure should be applied across all rail fatality cases, regardless of whether an accident involves single or multiple fatalities (Projects 1 and 2) • Monetisation of the impacts of air quality on people's health, for example an extra year of life in normal health £27,630; avoiding a respiratory hospital admission between £7,289 - £14,280; avoiding a day of discomfort due to breathing difficulties between £7 - £30 (Project3).

3. References to the research (indicative maximum of six references)

1) Burton T, Chilton S, **Covey J**, Gilbert H, Pidgeon NF, Jones-Lee M, Loomes G, Robinson A, Twist J; Spencer A (2001) *Valuation of benefits of health and safety control: Follow-up study*. HSE Contract Research Report (315). Project funded by a consortium including the Health and Safety Executive, Department for Transport, Home Office and HM Treasury.
http://www.hse.gov.uk/research/crr_pdf/2001/crr01315.pdf

2) **Covey J**, Robinson A, Jones-Lee M, Loomes G (2008) *Assessment of the Value of preventing a fatality*. Rail Safety and Standards Board, RSSB T616, Oxford Risk. Project funded by the Rail Safety and Standards Board (RSSB).
http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/research/T616_rpt_final.pdf

3) Chilton S, **Covey J.**, Jones-Lee M, Loomes G, Metcalf H (2004): *Valuation of Health Benefits Associated with Reductions in Air Pollution*. DEFRA, UK. Project funded by the Department of Environment, Food and Rural Affairs (DEFRA).
http://archive.defra.gov.uk/environment/quality/air/airquality/publications/healthbenefits/airpollution_reduction.pdf

This research is recognised internationally by the academic community. It has been presented by Dr Covey and her colleagues at several academic conferences and workshops both nationally (e.g., University of Kent, 2005; British Academy, 2013) and internationally (e.g., University of Alicante, 2003). It has been published in one of the highest ranked international peer-reviewed journals for research in decision analysis, economics, and psychology (*Journal of Risk and Uncertainty*).

4) Chilton S, **Covey J**, Hopkins L, Jones-Lee M, Loomes G, Pidgeon N, Spencer A (2002): *Public perceptions of risk and preference-based values of safety*. *Journal of Risk and Uncertainty* 25:211—32. Journal published by Springer. Editor in Chief W Kip Viscusi (Vanderbilt Law School USA). Journal ranked 306th out of all 11,171 journals and 26th out of all 319 economics journals on journal-ranking.com (04/13); IF 1.529; 35 citations, 70 downloads and 162 abstract views between 03/04 and 03/13. DOI: 10.1007/s11166-009-9082-0

5) **Covey J**, Robinson A, Jones-Lee M, Loomes G (2010). *Responsibility, scale and the valuation of rail safety*. *Journal of Risk and Uncertainty*, 40, 85-108. Journal published by Springer. Editor in Chief W Kip Viscusi (Vanderbilt Law School USA). Journal ranked 306th out of all 11,171 journals and 26th out of all 319 economics journals on journal-ranking.com (04/13); IF 1.529; 7 citations, 16 downloads and 83 abstract views between 03/10 and 03/13. DOI: 10.1023/A:1020962104810

4. Details of the impact (indicative maximum 750 words)

Value of preventing rail fatalities (Projects 1 and 2)

Dr Covey’s research at Durham provided robust evidence that a single value of preventing a fatality (VPF) should be applied across all rail fatality cases, regardless of whether an accident involves single or multiple fatalities. This valuation has been used to inform decisions not only about investing in specific safety improvements but also in the deployment of engineering solutions and the operational management of the railways.

Previous rail policy had used two VPF figures, placing a premium on incidents with multiple fatalities. In 2002/3 the VPF for preventing a single fatality was £1.25million and £3.46million per equivalent fatality for prevention of multiple fatalities. (<http://www.rssb.co.uk/SiteCollectionDocuments/pdf/SafetyPlanFullReport.pdf>). The research that Dr Covey conducted contributed to the decision to abandon the use of a higher value as noted by Deloitte in their 2009 review of value of life estimates for the National Audit Office “*Following the outputs of the research commissioned by the Rail Standards and Safety Board (Covey et al., 2008) and resulting industry discussion and agreement, the same fatality value is applied to each fatality*”

Impact case study (REF3b)

prevented whether the accident relates to a single or multiple-fatality accident” (1).

The concept of a single VPF figure continues to be fully adopted by the Rail Safety and Standards Board (RSSB). Their latest policy document *Taking Safe Decisions* (2009) – recognised as the authoritative guidance on how the rail industry takes decisions that affect safety – uses a single VPF for all rail cases (2).

The VPF that is used in cost-benefit analysis is also used in the RSSB’s Safety Risk Model. This model is used by the rail industry and its partners to quantify the consequences of hazardous events thereby allowing them to prioritise their investment in safety and make optimal decisions about engineering solutions and operational management.

Specific examples of how the VPF derived from Dr Covey’s research has affected decision making include:

- A key recommendation following the Ladbroke Grove rail accident in October 1999 involved the fitting of ‘burst panels’ on new-built trains to prevent fuel tank rupture. However a follow-up analysis in November 2008 using Dr Covey’s updated VPF research demonstrated the costs far outweighed the benefits and significantly weakened the case for upgrades, saving the industry an estimated £3.3 million in unnecessary costs (3)
- Network Rail used the updated VPF figures in a decision to introduce “another train coming” warning at 63 level crossings in the UK in 2012. The upgraded audible warnings use a warble and spoken alarm when a second train is detected, and were installed at crossings on the London to North East England route (4).

Impacts of air pollution on health (Project 3)

Dr Covey’s research directly contributed to the monetary valuation of the impact of air pollution on health for the first time. The findings of this DEFRA-funded project have informed recommendations put forward by the Interdepartmental Group on Costs and Benefits (IGCB) on the values that should be assigned to a range of health endpoints when using the impact pathway approach for valuing changes in air quality (full details of how the study informed the recommendations can be found in Annex 2 in (5)).

The strong impact of the research on IGCB’s recommendations is illustrated by the following quote *“Following the publication of this report, an expert workshop on the Valuation of Health Benefits of Reductions in Air Pollution and Use of Values in Appraisal was held in June 2004. The recommendations of this workshop informed an IGCB paper that sought to agree the valuation of health benefits in policy appraisal. These recommendations were agreed interdepartmentally and therefore form the basis of the valuation of health benefits within the current analysis. The monetary valuation of health benefits represents a major development in the IGCB methodology”* (5).

The impact pathway approach is the central methodology currently recommended by DEFRA (6), the Department for Transport (7), and HM Treasury (8) for appraising proposals that lead to changes in air pollution. Supplementary Green Book guidance provided by HM Treasury in May 2013 notes how the values used to monetise health impacts have been derived from this DEFRA-funded study (8).

Examples of how the impact pathway approach and monetised values of health impact have been used include:

- Transport for London used the impact pathway approach when developing a Low Emission Zone, which aims to improve health by reducing exhaust emissions from heavy-polluting road vehicles. The values recommended by IGCB were used to forecast the monetised health benefits of the scheme (estimated benefit £140m-£210m) (9).

Impact case study (REF3b)

- In December 2012 DEFRA awarded £2 million in grants to develop 42 similar low emission zones across England (www.defra.gov.uk/news/2012/12/31/2-million-air-pollution/). The projects were expected to demonstrate value for money and where possible a quantitative evaluation of the health benefits of the air quality strategies proposed (10).

5. Sources to corroborate the impact (indicative maximum of 10 references)

- (1) Deloitte (2009). Review of the Highways Agency Value of Life Estimates for the Purposes of Project Appraisal: A report to the National Audit Office. Deloitte LLP. See page 51.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/35209/review-value-life-estimates.pdf
- (2) RSSB (2009). Taking safe decisions
www.rssb.co.uk/SiteCollectionDocuments/pdf/vtsic_presentations/Taking%20safe%20decisions%20-%20Part1.pdf; RSSB (2007). Safety decisions programme. The route to 'Taking safe decisions'. See pages 3, 17, 22 and 24.
http://www.rssb.co.uk/SiteCollectionDocuments/pdf/vtsic_presentations/RouteToTakingSafeDecisions.pdf
- (3) RSSB (2008). Turning Potential Fuel Tank Solutions into Practice. See section 4.4.1.
http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/Research/T634_rpt_final.pdf
- (4) RSSB (2008). Examining the Benefits of "Another Train Coming" Warnings at Level Crossings. See page 81, tables 15 and 16.
http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/research/T652_rpt_final.pdf; Network Rail press release (2012). We're Installing Voice Warnings to Improve Safety at Level Crossings, <http://www.networkrail.co.uk/news/2012/july/We-are-installing-voice-warnings-to-improve-safety-at-level-crossings/>
- (5) IGC B (2007). An economic analysis to inform the Air Quality Strategy. Updated third report of the Interdepartmental Group on Costs and Benefits. The Stationery Office. PB12637. See page 5.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221088/pb12637-icgb.pdf
- (6) DEFRA (2013). Impact pathway guidance for valuing changes in air quality. Crown Copyright 2013. PB13913. See pages 16-17.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197900/pb13913-impact-pathway-guidance.pdf
- (7) Department for Transport (2012). The Air quality sub-objective. See page 15.
http://www.dft.gov.uk/webtag/documents/expert/pdf/U3_3_3-air-quality-120723.pdf
- (8) HM Treasury (2013). Valuing impacts on air quality. Supplementary Green Book guidance. Crown Copyright 2013. ISBN 978-1-909096-99-8. See pages 21-22.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197893/pu1500-air-quality-greenbook-supp2013.pdf
- (9) Transport for London (2008). London Low Emission Zone: Impacts Monitoring. Baseline report, July 2008. Transport for London 2008. See page 163.
<http://www.tfl.gov.uk/assets/downloads/roadusers/lez/lez-impacts-monitoring-baseline-report-2008-07.pdf>
- (10) DEFRA (2012). Annex A: Eligibility and criteria for assessment of applications for Defra's local authority air quality grant programme 2012/13. See pages 2-3.
<http://archive.defra.gov.uk/environment/quality/air/airquality/local/documents/aqgp-annexa-eligibility-2012-13.pdf>