NZIER INSIGHT
107-2023

NZIER PUBLIC GOOD PROGRAMME
THINKING ABOUT AOTEAROA NEW ZEALAND'S FUTURE

The value of safety improvements

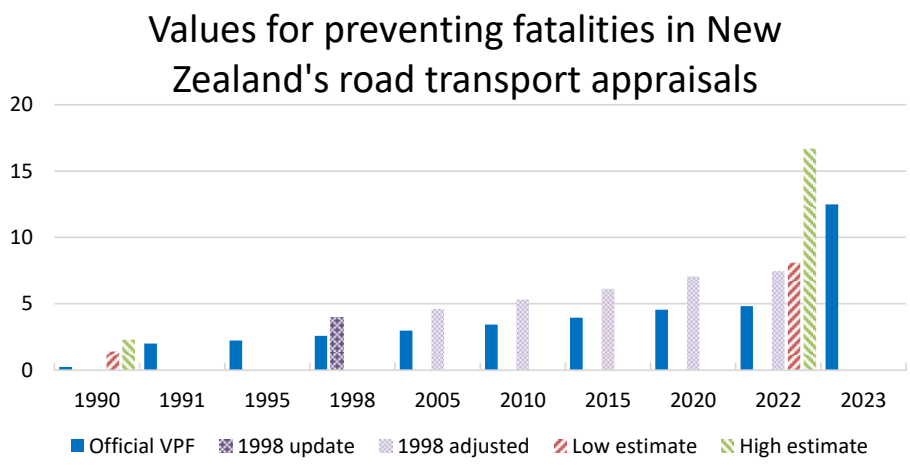
In April, Waka Kotahi/NZTA released its latest update of the *Monetised Cost and Benefit Manual (MCMB)*, which provides the input values for economic appraisal of public investments in roads and other land transport. This update includes revisions of the values of preventing fatalities, serious injuries and minor injuries, which mark significant increases over the previous values for these different types of injury. The latest figures are many times larger than the real value of expected lifetime earnings of the average Kiwi. What is behind this big change, and what are its implications for public investment in transport and other areas?

How has the value of safety improvements in transport changed?

The principal safety value used in transport analyses, the value of preventing fatalities (VPF), has changed since 1989, as shown (in blue) in Figure 1. The new VPF in 2023 is a significant increase from that used previously – at $12.5 million, about two and half times larger than the 2022 VPF of about $4.9 million. The last time there was a significant increase in VPF was in 1991. Since then, that value has been adjusted by price index and increased at an annual average of about 2.8 percent.

Figure 1 shows low and high estimates around the values chosen for VPF in 1991 and 2023, in the latter case between $8.1 million and $16.9 million per fatality prevented. In 1998 an update of the VPF was estimated at about $4 million, a little over 50 percent larger than the index-adjusted 1991 VPF figure at that date. But this was not adopted by officials because of unresolved policy issues, including concern that an increase of such scale would change the relativity between values of safety and travel time and distort the resulting investment appraisals.

Figure 1 Evolution of New Zealand's value for preventing fatalities since 1989



Source: NZIER

Economic valuation of life may be unpalatable, but it is unavoidable

While valuing a life in monetary terms may seem presumptuous, even morally offensive, people always do so when choosing between actions with different cost and safety records. Whenever someone crosses the road, they are implicitly, if not explicitly, weighing up the benefits of getting to the other side against the risks of being involved in an accident. And intoxicated people who drive themselves home place a lower value on their own and others' lives than those who pay for a taxi.

Most roads in New Zealand are provided as if they are public goods, collective facilities open to access by all. As some road users behave erratically, posing risks to their own safety and that of others, roads are designed with certain features and rules of use to lower the risk of accidents and their severity when they occur. But safety features come at a cost, so it is necessary to weigh up those costs against the value of benefits obtained.

Safety features are not always as successful as expected, affecting the probability of injuries rather than avoiding them. So, when analysing the costs and benefits of transport projects, the safety benefits are expressed as a change in the risk of accidental injury.

What is required for highway project appraisals is some indicator of the government's preparedness to incur costs to make transport safer. This is the purpose of the VPF, a before-the-event valuation of anonymous lives saved through a reduction in the level of risk. And as road users pay for roads through their fuel taxes, road user charges, vehicle registrations and local authority rates, there is logic in public investments in safety being guided by how travellers themselves view the risks of their travel.

Economic analysis does not attempt to place a value on known individuals or to assess the value of their avoiding certain death at a given time. Rather it focuses on the value of reducing the probability of fatal accidents shared by the population as a whole. A reduction in risk of death of 10 in 10,000 is equivalent to saying that of the next 1,000 people who would die from such accidents, one death will be prevented. In that sense, only the figure is used as an expression of a life's value – the value of statistical life saved (VOSL), a fatality prevented.

One reason to be explicit about the value attached to preventing fatalities is that implicit valuation in the past has displayed wide variability. It can be inefficient to have values attached to life-saving that vary markedly across situations because it means more lives could be saved by diverting resources from the higher cost to the lower cost options.

Leaving aside property damage, the principal social costs of a fatal road accident arise from three sources: opportunity costs of diverting resources from more productive use to accident attendance, clean-up and remediation; productivity losses from workplace disruption and the waste of the victim's education, skills and unfulfilled potential; and psychological costs of pain, grief and suffering for victims and their surviving loved ones.

New Zealand has been an innovator in this matter

In the 1970s and 1980s, New Zealand had a poor record on road safety compared to the other OECD countries it liked to compare itself with. To the confusion of visiting foreigners, the "road toll" that often made news headlines had nothing to do with turnpikes and road charging but referred to the annual tally of fatalities on the roads, which peaked in 1977 with 889 deaths and in 1987 with 835 deaths.

At the time, most of New Zealand's motorways did not have crash barriers on the median strips between carriageways because their installation cost per kilometre was high,

and the probability of safety gain in any kilometre stretch was very small.

Barriers tended to be confined to stretches where potential damage was highest because of high traffic numbers or road characteristics, like deceptive bends.

In the late 1980s, several highly publicised head-on crashes occurred on motorways where a vehicle crossed the median strip into on-coming traffic – resulting in serious injuries and deaths, with vehicles in the correct carriageway often faring worst. The level of accidents was putting pressure on the government to intervene, but politicians were reluctant to interfere with processes in place to oversee investment in road safety.

Necessity prompts innovation

After its cost-benefit analysis failed to endorse the public clamour for median barriers on Auckland's motorways, the then National Roads Board reviewed its valuation procedures. It valued fatalities at $235,000, the discounted sum of the average victim's foregone lifetime earnings. This so-called 'human capital' approach enables apparently precise valuations of a premature fatality's forgone life's 'worth', but it ignores the psychological component of the value of being alive and gives no guide to the worth of individuals identified as 'non-productive' in the national accounts, such as children and retirees.

In 1989, the Board commissioned NZIER to prepare a report on the current theory and practice in the valuation of life for policy and investment appraisal. This reviewed both the human capital approach and an alternative of directly estimating aggregate willingness to pay (WTP) for a reduction in risk. The WTP approach estimates a low average willingness to pay for a small reduction in risk which, scaled across the population, indicates an aggregate value for risk reductions that avert the loss of anonymous lives. That can result in a value per life saved far exceeding the average wage of individual respondents.

In the USA, researchers analyse wages of occupations differentiated by risk to identify a premium on accepting risks (although not specific to transport). Researchers in Europe often use stated preference surveys to ask direct questions about WTP for reduced transport risks.

New Zealand learned from the experience of the UK, which until the 1980s, had an official VPF for transport of £252,000 ($685,000). When economists at the University of Newcastle conducted a nationwide survey of people's willingness to pay for risk reduction and estimated a VOSL in the range of £750,000 to £1.4 million (Jones-Lee, Hammerton, and Philips 1985), officials initially rejected the results, claiming "severe methodological problems." But in a rare show of solidarity the academic community defended the work as intrinsically sound, so the government raised its value to £500,000 as an interim measure, pending more work on refining risk valuation in its processes. Completion of a similar survey in Sweden confirmed that willingness to pay-based values can far exceed the human capital-based values commonly used at that time (Persson and Cedervall 1991).

NZIER's review concluded that although human capital is more readily quantified, willingness to pay for risk reduction is more theoretically correct and consistent with other values used in cost-benefit analysis. These findings were presented at a workshop, where there was some pushback against relying on "hypothetical" survey-based WTP values and broader discussion about whether it was better to use a figure that was roughly right or one that was precise but wrong. NZIER then prepared a second paper addressing some outstanding points raised and outlining an approach to designing and conducting a WTP questionnaire survey (Clough and Meister 1990).

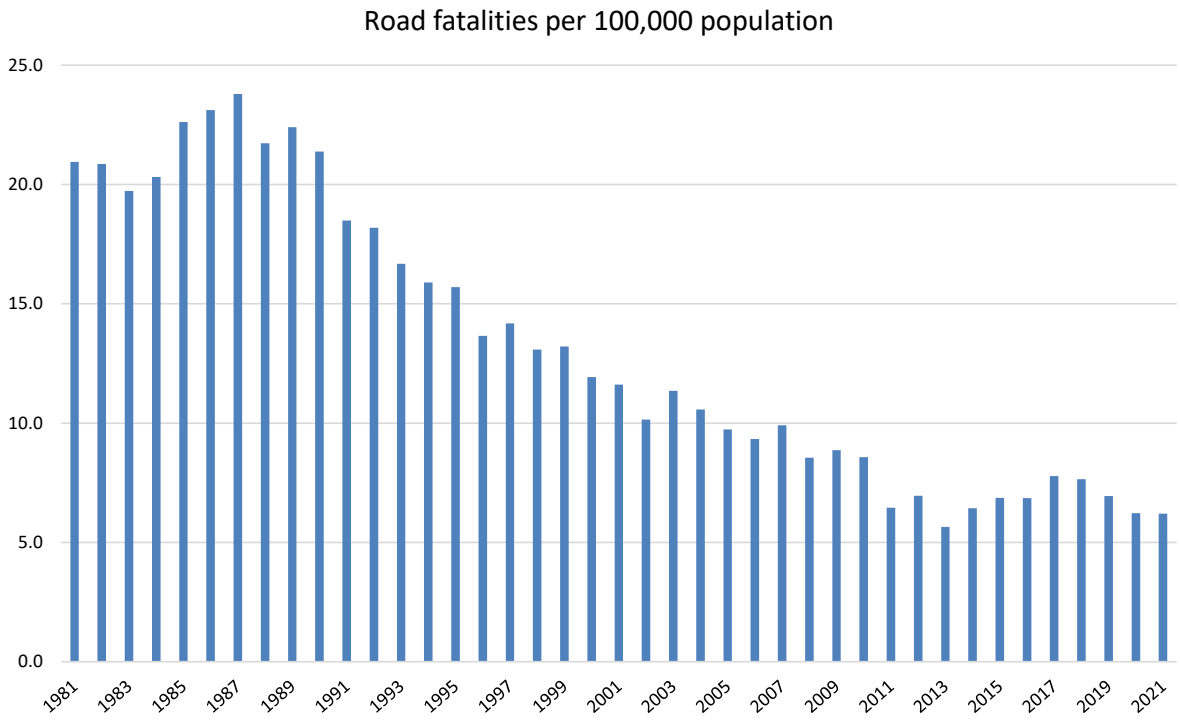
From theory into practice

Following this, the Ministry of Transport commissioned an Australian market research

firm and a US researcher to conduct a stated preference survey as an adjunct to the national travel survey. They prepared a questionnaire that asked willingness to pay to reduce risk in transport in five different ways, and obtained five different answers, implying a value of statistical life in the range of $1.4 million to $2.3 million, with a mean around $1.9 million (Guria and Millar 1991). Despite the wide range, the results consistently suggested the public's willingness to pay for reductions in risk implied a VPF far higher than $235,000. Officials subsequently adopted a mid-range figure of $2 million for use as VPF from 1991.

That figure was subsequently adjusted by annual changes in wage or labour cost indexes to reflect how rising income might affect willingness to pay for risk reduction. Coinciding with this change in the VPF, the road toll fell consistently in successive years to 282 in 2013 but then rose to 419 in 2018 before declining again to 318 in both 2020 and 2021.

Figure 2 Rate of road fatalities has been declining since the 1980s



Source: NZIER

Figure 2 shows the annual road fatalities rate per population has trended down since the late 1980s. A similar pattern emerges when computing rate per billion vehicle kilometres travelled, which fell from 31 in 1987 to between 6 and 8 in the ten years to 2021.

Many factors contributed to this reduction in road fatalities, including changes in car import regulations that enabled increased used car imports from other countries, which lowered the average age and improved the average safety rating of the New Zealand vehicle fleet. These changes also made cars more affordable and allowed some motorbike users to switch to the greater safety of cars. New car design and safety ratings also improved

over that period. But the technical adjustment in the VPF made it easier to justify investing in road safety features, such as deploying median barriers more widely across motorways.

The 1989–1990 estimate is an average across 568 responses, but about half of the total responses were discarded because answers were inconsistent with an understanding of risk. In 1997–1998 another survey was commissioned that used refined surveying methods to improve reliability across responses. This suggested a new VOSL of $4 million, but that result was not adopted by officials, so the 1990 VOSL continued to be used, index-adjusted each year (Guria et al. 2003).

In 2015 NZTA commissioned NZIER to review approaches for valuing injury and mortality risk in transport, which drew on a large meta-analysis of safety valuation studies conducted by the OECD between 2010 and 2012. This found New Zealand had been among the early users of stated preference approaches to willingness to pay for risk reduction. Still, by 2015 most other OECD countries had adopted the approach, either conducting their own surveys or adapting those of their neighbours. The review concluded that after 25 years, it was time for the VPF to be updated, to account for the changes in risk and incomes that affect willingness to pay (Clough, Guria, and Bealing 2015).

The declining road toll coincided with a period of increasing population and vehicle kilometres travelled, indicating average risks had come down. However, an increase in incomes may have increased the public's risk aversion and WTP for more safety, as is suggested by the growth in popularity of sport utility vehicles in New Zealand, whose larger size is perceived as making them safer in accidents, at least for their occupants if not for other road users.

The implications of VPF going up as objective risks are coming down have attracted scrutiny. For instance, Douglas (2021) compared the evolution of VPF and fatality rates across seven national jurisdictions, noting that improvements in fatality rates had come down the most in Germany, which uses a relatively low VPF based on human-capital estimates. In contrast, while the USA had the largest rise in VPF, it still had the worst road fatality rate per vehicle kilometre travelled.

Douglas suggested reverting to human capital-based VPF because the number of WTP survey responses that get discarded for giving answers that suggest a poor understanding of risk indicates that people cannot be relied upon to indicate the social value of risk reduction. However, if risk reduction is the appropriate way to conceptualise safety, resorting to a method that does not measure social attitudes to risk is hardly a solution.

The latest valuation changes more than just the values

In 2017 NZTA commissioned a pilot study from consultants to produce new values for non-market parameters relating to safety, travel time and reliability (Denne et al. 2018). This included trialling a new stated preference survey using an approach to Discrete Choice modelling widely used in Australia to ascertain values of transport time and reliability.

The results of this pilot suggested a VPF of around $8.3 million. The same consultants were commissioned to undertake a full-scale survey, resulting in a research report released in February 2023 (Denne et al. 2023). That recommended a significant increase in VPF to between $8.1 million and $16.9 million. It also estimated the value of preventing serious injury is between $429,458 and $890,681 and of preventing minor injury between $44,458 and $91,707. By comparison, the Ministry of Transport's 2022 figure for average social cost was $4.9 million per fatality, $516,300 per serious injury, and $27,700 per minor injury (Te Manatū Waka Ministry of Transport 2022). These are summarised in Table 1, which also includes the averages of lower and upper

estimates as the source of the new parameter values in the Waka Kotahi *Monetised Costs and Benefits Manual* (Waka Kotahi NZ Transport Agency 2023).

Table 1 shows the *MCBM*'s values applying to fatalities and minor injuries increase by around one and half times the previous figures. The value of severe injuries increases by 28 percent, an average of a range that is 20 percent less than the current figure at the lower end and over 60 percent greater at the upper end.

These results raise some perplexing questions about the scale of the VPF adjustment since 1991. As shown in Figure 1 above, the index-adjusted VPF reached around $5 million by 2022, while the 1998 updated but not adopted VPF, index adjusted at the same rate as the established VPF, would have reached about $8 million by 2022, similar to the lower end of the new estimates range but less than half the upper end of that range.

Table 1 Recent changes in values attached to injuries

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Zone	Fatality	Serious Injury	Minor Injury
Previous values Ministry of Transport (2022)	4,934,900	516,300	27,700
New values T. Denne et al. (2023) Low estimate	8,100,000	429,458	44,458
New values T. Denne et al. (2023) High estimate	16,900,000	890,681	91,707
Average of new value high and low estimates	12,500,000	660,070	68,083
Waka Kotahi NZ Transport Agency (2023)	12,500,000	660,100	68,000
% increase of new values over previous values	**153%**	**28%**	**145%**

Source: NZIER, drawing on Ministry of Transport, NZTA

Lifting the lid

One reason is that the valuation methodology has changed. The 2023 research report deemed the methodology trialled in the pilot study in 2017 not suitable for assessing WTP to avoid risks because the size of current risks and potential changes is incomprehensibly small for the individual routes on which its survey questions are framed. Instead, the survey adopted a community or citizen value-based approach to questions relating to safety. Rather than asking survey respondents about route choices with risks that affected them directly, questionnaires sought respondents' willingness to pay into a government programme to avert one annual occurrence of a given event (fatality, serious injury, minor injury).

This new survey does not explicitly ask about WTP for changes in individual risk but about paying towards a programme to reduce road accidents' annual body count. This citizen value-based approach is similar to surveys commonly used in environmental settings. Such surveys can give values for hitherto unknown environmental features that are disproportionately high compared to identifiable actual WTP for environmental improvement, due to 'warm glow' effects (respondents feeling good about contributing to a worthy cause) and also 'focus illusion' (respondents losing sight of their income constraints and trade-offs with other things their stated spending could be used for).

The Miller and Guria 1991 report, from which the previous VOSL was derived, was based on assessing people's willingness to pay to reduce

risk to them, and it tested respondents' understanding of risks so it could exclude unreliable responses. The new survey does not identify private individuals' risk tolerance, as the researchers have concluded that respondents cannot be relied on to answer questions on individual risk.

The new results pull New Zealand out of the company of other countries with relatively low VPFs less than around $10 million (e.g. Australian Commonwealth, Germany, Netherlands, Sweden and the UK), and into a smaller group of jurisdictions with VPFs greater than $10 million (e.g. USA, Canada and New South Wales). The Waka Kotahi *MCBM* does not explain why the VPF should rise so much, other than that it is based on the new research of Denne et al. (2023), who note their results are in the range of other countries' values, but that comparisons are not informative as the approaches they developed differ from those adopted in other countries.

Denne et al. explain that a standard approach to the valuation of government policies in cost-benefit analysis is to aggregate individual WTP values across the number of individuals in the relevant population, but they also cite numerous researchers who suggest that households may be a more appropriate unit for aggregating values.

Because the survey cannot tell whether respondents are answering as individuals paying out of their own income, or as householders paying out of a household budget, results are presented as a range. The higher value represents average payments by individuals, and the lower value represents average payments by households.[1]

Denne et al. recommend using aggregation across households (*c*.$8.1 million) as a minimum estimate of VPF but suggest the value is likely to be higher, allowing for some respondents who may not have pooled their individual incomes into a household total. The figure in the new *MBCM* assumes a 50:50 split between household and individual behaviour by averaging the low and high estimates.

None of this explains why the VPF should have increased by over two and a half times between 2022 and 2023 or why method change is appropriate at this time. A new VPF at the lower end of the range around $8 million, would be more consistent with the 1998 value update had it been accepted and index-adjusted over time.

Consequences of raising VPF

In 2019, the government launched Vision Zero, aimed at reducing road fatalities to zero by 2050. It follows a Swedish approach to improving safety by making transport systems more forgiving of mistakes people inevitably make. A higher VPF might suit a government's push for a progressive reduction in fatalities, but as Douglas (2021) points out, countries with higher VPF do not necessarily have lower fatality rates. Shifting the basis of valuation away from an expression of public value in reducing risks faced on the roads to paying towards a more generalised programme intended to save lives begs the question, does this public WTP for safety only apply to roads or transport?

Previous concerns about increasing VPF distorting relative values are not apparent in the new *MBCM,* where the proportionate change in VPF is more than twice that in the basic values for travel time. Also, concerns about larger VPF diverting funds away from speed and productivity improvements into safety may in any case, be unfounded. After reviewing and standardising values across appraisals of 24 New Zealand transport projects, Wignall (Wignall 2017) concluded the share of total benefit attributable to safety was about 2 percent, to time-saving about 80

[1] I.e. the resulting survey average per respondent is multiplied by the national adult population or the national number of households.

percent and 18 percent to remaining measured items like savings in vehicle operating costs, greenhouse gas emissions, and positive benefits to health. Travel time dominates because it affects every trip on the roads, whereas only some trips have accidents.

Beyond the road edge

There may be bigger changes in relativity with values used elsewhere in government for safety assessment. Government agencies other than transport also make decisions that affect public safety and health and seek to obtain value for money to ensure resources are used efficiently for the benefit of societal wellbeing. But if differing values of life and health are used by departments seeking a common outcome, there may be inconsistencies and inefficiencies in spending across a broader societal perspective.

A survey of the values of health and safety used by different departments in seven OECD countries (including New Zealand) found the use of differing values was widespread (Cubi-Molla et al. 2021). Moreover, in all the countries surveyed, health agencies used lower values for life and health than agencies for transport and the environment.

Estimating a public WTP for a government programme to reduce deaths in transport raises the question of whether respondents would also be WTP the same towards reducing premature deaths in other areas, where perhaps the cost-effectiveness of funds used may be even greater. If not, how large a variation in WTP between contexts is reasonable? And should agencies, when changing the values they use, have regard to the effect on relativity with other values used in other agencies of government?

Public land transport investments are funded through hypothecated revenues from fuel taxes and road user charges, so a higher transport VPF need not draw funding from other areas of government spending. But it may influence safety assessments in other areas, and there is scope for confusion and gaming in appraising government expenditures and policies when there is a wide range of estimates of the value of expected health and safety outcomes.

In the past, the VPF derived for road transport has been used by agencies such as the Civil Aviation Authority as 'indicative' of the sort of social value that might be gained by investing in new safety measures around airports, even though in principle, the public may have a different aversion to the risks of potential multiple-death incidents in aircraft than in self-driven vehicles. The VPF has also been used in connection with some environmental policies, where chronic exposure to an environmental risk can impact people's health and shorten their years of life expectancy and/or raise their risk of earlier death in the distant future.

The value of a life year some years in the future could be valued in the same way as the VPF through an explicit stated preference survey. But customised surveys are expensive, and agencies may prefer to use existing benefit estimates from transport rather than pay for their own bespoke estimates.

A common approach is to treat the WTP-based VPF as if it were a capitalisation of a stream of annual values, which can be extracted as values of life years discounted by how far in the future longevity change occurs. The annualised values of life years vary with the life years forgone through premature fatality and the discount rate chosen: over 40 years at 5 percent discount rate, the annualised value of the 2022 VPF Is about $42,000, and of the new 2023 VPF, about $103,000.

Health agencies such as Pharmac and ACC have their own approaches to weighing up health outcomes of different courses of treatment, in which outcomes can vary by longevity gained and residual impairment in the quality of life. These may also influence other agencies through the Treasury's CBAx model of public spending assessment (The

Treasury 2022). The CBAx values database includes the transport VPF and also values for quality-adjusted life years based on Pharmac's valuations and life expectancy tables. These range from about $40,000 to $60,000, which are more consistent with the annualised value of the 2022 VPF than with the new 2023 VPF.

How much variation in VPF is justified?

Risk-based valuations vary with the type of risk and will not be the same in all areas of life, but wide discrepancy in values attached to safety outcomes can lead to inefficiency in the selection of public safety initiatives, particularly where the link to individual risk is weak. If land transport has a VPF much higher than other safety areas, it will allow the selection of safety features on roads to creep up the supply cost curve to accept measures where the cost-effectiveness of avoiding fatalities is less than in other areas of government activity with more constrained budgets and lower effective VPF.

There is justification for some variation in VPF applied because some risks are more abhorrent than others. For instance the fencing regulations for backyard swimming pools reflect social preferences for elevated protection of young children. But across central government agencies and between central and local government, there is a wide range of VPF applied, more often implied in decisions than explicitly tied to a reference number like the transport VPF.

Lally (2023) identifies how a council declining to install low cost fencing along a waterfront where there have been several recent drownings implies a low VPF, whereas regulations requiring private property owners to incur costs in strengthening their buildings against earthquakes implies an even higher VPF than the new transport figure. Having one agency provide guidance and coordination on the VPF appropriate to different situations would improve efficiency and consistency in values attached to publicly funded safety improvements (Lally 2023).

An update of the old VPF in transport was long overdue, and the new VPF reflects new methods and a larger sample size than the one it replaced. It is an official value in that it has been chosen by Waka Kotahi New Zealand Transport Agency for use in its appraisals, in consultation with other Ministries. The changes in values for travel safety brought in with the new Waka Kotahi monetised cost and benefits manual are substantial, both in the size of the value changes proposed and in shifting the basis of valuation.

But those changes have led to a widening gap between the values attached to safety in transport and in other publicly mandated safety programmes. The shift in valuation basis away from explicit consideration of individual risk faced by the travelling public to a more general valuation of the public good of safety improvements is not justification for values attached to safety improvements diverging across public sector agencies and their programmes.

It remains to be seen what effect the new VPF will have on road fatalities, and more research is needed on what determines the fall in injuries:

- Is it better cars, better roads, better driver behaviour, better regulation and enforcement?
- Is it public attitudes towards safety, perceived risk, income and ability to pay?
- What other circumstances affect people's willingness to pay, and what differences is it reasonable to expect in the VPF applied in transport, accident compensation, pharmaceuticals and other areas of safety regulation, such as bringing old buildings up to modern earthquake safety codes?

References

Clough, P., J. Guria, and M. Bealing. 2015. 'Approaches to Valuing Injury and Mortality Risk in Transport Assessments August 2015'. NZ Transport Agency research report 571. Wellington, N.Z.: NZ Transport Agency.

Clough, P., and A. Meister. 1990. 'Reports on the Economic Evaluation of Life'. Bulletin 86. Road Research Unit, Transit New Zealand.

Cubi-Molla, Patricia, David Mott, Nadine Henderson, Martina Garau, Bernarda Zamora, and Mendel Grobler. 2021. 'Resource Allocation in Public Sector Programmes: Does the Value of a Life Differ Between Governmental Departments?' Office of Health Economics.

Denne, T., G. N. Kerr, D. Glover, M. Winder, and L. Wright. 2018. 'A Pilot Study to Determine the Relative Value of Non-Market Transport Impacts of Investment'. NZ Transport Agency research report 648. NZ Transport Agency.

Denne, T., G. Kerr, A. Stroombergen, M. Winder, B. Gribben, and N. Tee. 2023. 'Monetised Benefits and Costs Manual (MBCM) Parameter Values: Results of a Survey to Derive Values for Road Safety, Travel Time and Reliability'. Research report 698. Waka Kotahi NZ Transport Agency. https://www.nzta.govt.nz/assets/resources/research/reports/698/698-monetised-benefits-and-costs-manual-mbcm-parameter-values.pdf.

Douglas, Neil. 2021. 'Valuing Life When Roads Are Increasingly Safe'. In Australasian Transport Research Forum 2021 Proceedings.

Guria, J., W. Jones, M. W. Jones-Lee, M. Keall, J. Leung, and G. Loomes. 2003. 'The New Zealand Values of Statistical Life and of the Prevention of Injuries'. Land Transport Safety Authority.

Guria, J., and T. Millar. 1991. 'The Value of Statistical Life in New Zealand; Market Research on Road Safety'. Wellington, N.Z.: Ministry of Transport. https://www.researchgate.net/publication/308395966_The_value_of_statistical_life_in_New_Zealand_Market_research_on_road_safety.

Jones-Lee, Michael W., Max Hammerton, and Peter R. Philips. 1985. 'The Value of Safety: Results of a National Sample Survey'. The Economic Journal 95 (377): 49–72.

Lally, Martin. 2023. 'Waterfront Deaths and Cost Effectiveness'. Substack newsletter. Asymmetric Information (blog). 7 May 2023. https://nzae.substack.com/p/waterfront-deaths-cost-effectiveness-lally.

Persson, U., and M. Cedervall. 1991. 'The Value of Risk Reduction: Results of a Swedish Sample Survey. The Swedish Institute for Health Economics, Lund'. IHE Working Paper 1991: 6, Lund, Sweden.

Te Manatū Waka Ministry of Transport. 2022. 'Social Cost of Road Crashes and Injuries: June 2021 Update'. Wellington: Te Manatū Waka Ministry of Transport.

The Treasury. 2022. 'The Treasury's CBAx Tool'. 7 October 2022. https://www.treasury.govt.nz/information-and-services/state-sector-leadership/investment-management/plan-investment-choices/cost-benefit-analysis-including-public-sector-discount-rates/treasurys-cbax-tool.

Waka Kotahi NZ Transport Agency. 2023. 'Monetised Benefits and Costs Manual'. https://www.nzta.govt.nz/resources/monetised-benefits-and-costs-manual/.

Wignall, Don. 2017. 'Economic Re-Evaluation of New Zealand Transport Investments'. In Australasian Transport Research Forum (ATRF), 39th, 2017, Auckland, New Zealand. https://www.australasiantransportresearchforum.org.au/sites/default/files/ATRF2017_031.pdf.

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Further comments by John Yeabsley, Michael Bealing and assistance of Sarah Spring in preparing this Insight are gratefully acknowledged.

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How to cite this document:

Clough, P. 2023. The value of safety improvements". NZIER Insight 107. Available at https://www.nzier.org.nz/publications/the-value-of-safety-improvements-nzier-insight-107

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