FORECASTING ROAD SAFETY PERFORMANCE IN AUSTRALIA AND NEW ZEALAND

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1. A BRIEF STATEMENT OF THE ISSUE

In every area of societal concern, government seeks to:

- identify the emerging issues
- forecast their short and longer term impacts
- make plans to deal with those impacts
- implement, then monitor the effectiveness of, those plans
- continuously modify the forecasting/planning/action/evaluation process.

This paper explores the key issues involved in road safety forecasting.

2. MEASURING ROAD SAFETY PERFORMANCE

Road crashes for the most part result only in property damage, sometimes in personal injury and, least frequently, in death. However the community, and through it government, focuses predominantly on death, despite the fact that persons admitted to hospital as a result of road crashes outnumber those killed by a factor of around 15. This focus is, in part, because deaths represent the most severe crash outcomes. In part, it is also because serious injury data lag well behind real time and, thus, are of reduced current public interest. And, in part, it is because differences in crash reporting procedures make it difficult to compare performance across the different jurisdictions in Australasia – and on occasions across time within the same jurisdiction, following changes in definitions.

In a perfect world a greater focus would be given to the total road toll. However, for the reasons noted, it remains more practical to focus on deaths as a measure of performance.

However, it should be stressed that current strategies and countermeasure programs have been more successful in reducing death than they have in reducing serious injury. It can be anticipated that the ratio of death to serious casualty will fall further and, increasingly, governments will have to address more systematically the serious casualty issue. There does not appear, as yet, to be a consideration of this impending development in road safety forecasts.

In addition to looking at the absolute numbers of deaths and (less frequently) serious injuries, there are two commonly used rate measures. The first – the **transport** measure – reflects the level of safety with which the road transport system operates. It is most commonly expressed as deaths per 10,000 registered vehicles, with registration data being used as a substitute for the more preferred exposure measure of kilometres driven, ridden and walked. The second – the **public health** measure – is deaths per 100,000 head of population. This measure reflects the risk to an individual of being killed in a road crash. It is increasingly becoming the primary performance measure since a high level of safety in an extensively used road transport system may still result in an unacceptably high risk to an individual.

3. PAST AND CURRENT TRENDS

Figure 1 presents Australian and New Zealand road safety outcomes over the 40 years 1961-2000, expressed as annual averages over consecutive five-year periods. The averaging process removes short-term fluctuations and enables trends to be more easily discerned.

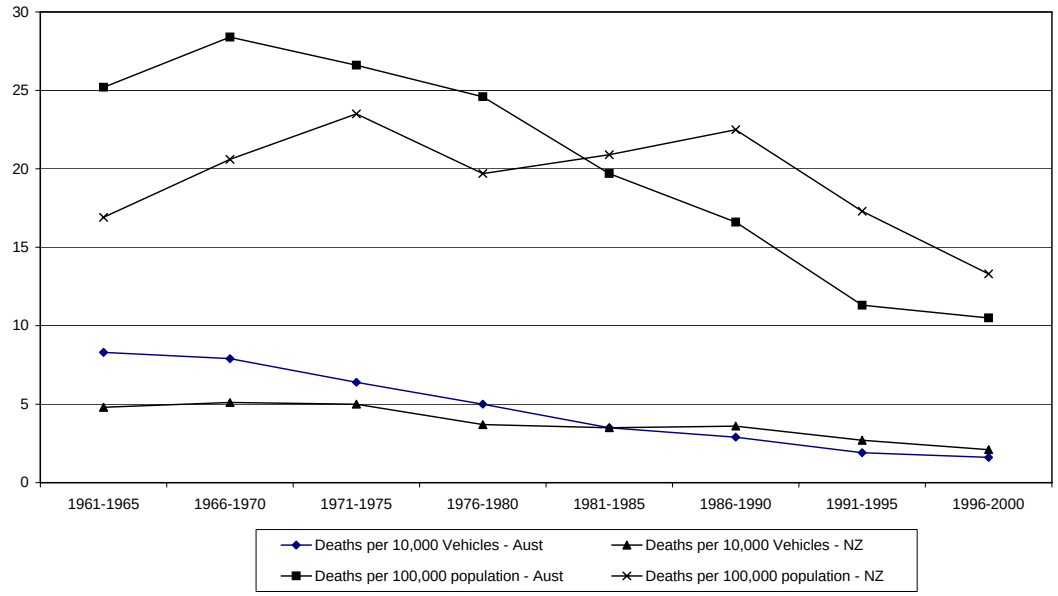

Figure 1: Average annual road death outcomes, Australia and New Zealand, 1961-65 to 1996-2000.

Several things should be noted:

- On the one hand, the transport measure of deaths per 10,000 vehicles fell throughout the 40-year period (though less consistently so in New Zealand), even when the absolute number of deaths was increasing. This is a common finding observed in every country as it motorises. It reflects the fact that as more (safer) vehicles come on to the road, governments are required to build more infrastructures and to improve the traffic management and enforcement systems through which the operations of road transport are controlled. It reflects progress but is a very gross measure of road safety performance. The level of transport safety is closely correlated with the level of motorisation, as well as with other key factors
- On the other hand, the public health measure of deaths per 100,000 population illustrates that the risk of an individual dying from a road crash increased until the 1970s in Australia and the 1980's in New Zealand

- Safety performance shows something of a cyclical pattern – occasional, quite dramatic falls in deaths followed by a relatively stable period at the lower level, then a new downturn, and so on. This common pattern probably reflects the periodic imperative for government action following either a 'bad' year or a prolonged plateau.

Because of these and other factors, forecasting based on attempts to fit linear trends to past data is certain to lead to invalid results.

4. FORECASTING AND TARGET SETTING

There are two primary purposes in forecasting road safety performance.

4.1 To choose realistic performance targets

Targets often appear to have been set primarily by a flawed process of international 'benchmarking'. Valid benchmarking requires that comparisons be made only against those countries with similar levels of motorisation and similar road transport systems. We tend, at present, to use the entire western, motorised world as the benchmark. However, there are immense differences across individual countries. For example, the U.K. and Sweden, which are held up as having the world's best safety performance, have far lower levels of motorisation than Australia or New Zealand. In addition, the U.K. in particular has relatively little high speed rural travel, has a very dense urban system and has a pedestrian safety problem quite different to that in Australasia. It is like benchmarking the Northern Territory against the ACT – the two statistical outliers among Australasian jurisdictions.

4.2 To foresee factors that need to be taken into account in future planning

To date, forecasting in Australasia has largely ignored this aspect. Yet the following matters[1] [2] will have profound influences over the next two decades:

- increasing vehicle mass incompatibility – the greater the disparity in mass between colliding vehicles the greater the probability of serious injury to the occupants of the vehicle of the lesser mass. Truck registrations in Australia, for example, are continuing to grow at almost twice the rate of passenger vehicle registrations, reflecting particularly a growth in intra urban freight movements. At the same time, within the passenger vehicle fleet, there is a rapid shift in disparity of mass with the medium mass group dropping as a proportion;
- changing political saliency (accessibility, equity and the environment) – like most western, motorised nations, Australia and New Zealand are seeking to grapple with all of the adverse impacts of their road transport systems, such as noise and gaseous emissions, urban amenity and 'social justice'. The political decision-making process of the next decade will require many more trade-offs in decision-making than in past decades when the number of deaths and serious casualties was so high that safety dominated the agenda;
- the ageing population – the number of older road users will grow rapidly with the attendant safety issues of lowered skills and greater frailty.

5. FORECASTING TRAPS FOR THE UNWARY

5.1 Assuming simple linear trends

Forecasts are frequently made by assuming a linear trend in historical crash data, or at least in recent crash data, then simply projecting that trend into the future. This method is defensible only in those rare circumstances where it is known that the underlying causal factors continue to operate in the same consistent way. The key drivers of road safety performance are changes in exposure to risk and the effectiveness of countermeasure strategies and programs. Vulcan and Corben[3], for example, provide estimates of the likely effects of a wide variety of measures ranging from vehicle design changes through general road improvements to black spot and enforcement programs at different levels of resource. The package of measures selected and the level of resource applied will profoundly influence the safety outcome.

5.2 Choosing a single year as a baseline

Within general trends, there is always some variation year to year. Renewed countermeasure effort in road safety may often – although not always - begin following a 'bad' year. Using that 'bad' year as the baseline for performance measurement will almost certainly overstate progress. As in Figure 1, it is better to take the average of several recent years as a baseline.

5.3 Being consumed by year-to-year comparisons

Given the degree of yearly variation, the least valid performance measure is the apparently simple year-to-year comparison. Far better is the selection of specific problems within the road safety total to be addressed, for example, collisions at intersections, run-off rural road crashes, pedestrian casualties, etc.

5.4 Unrealistic expectations concerning countermeasure implementation

Calculating the potential benefits of particular countermeasure programs from the literature (eg Vulcan and Corben, 1998[3]; Elvik and Amundsen, 2000[4]) is always problematic. However, even when accurate estimates can be derived, it is still necessary to correct for the various political difficulties in achieving implementation.

6. THE FORECAST OR, MORE STRICTLY, THE PROBABLE PRACTICAL POTENTIAL

It is virtually impossible to predict changes in the level of resource applied to road safety or in the specific mix of measures applied. Yet these are critical to accurate forecasting. The fallback position is to assume that neither will change dramatically in the short-term and to base the projection on past rates of gain.

Tables 1 and 2 present the average annual road safety performance gains achieved in Australia and New Zealand, respectively, over the last 40 years, again expressed in consecutive five-year periods.

Table 1: Average Annual Change in Rates (Australia)

	% change* in Deaths/10,000 Vehicles	% change* in Deaths/100,000 Population
1961-1965	0.6	(3.0)
1966-1970	1.1	(1.9)
1971-1975	4.8	2.5
1976-1980	5.8	3.4
1981-1985	5.3	3.3
1986-1990	2.4	5.7
1991-1995	4.7	3.8
1996-2000	3.4	3.2

* parentheses signify increase

Table 2: Average Annual Change in Rates (New Zealand)

	% change* in Deaths/10,000 Vehicles	% change* in Deaths/100,000 Population
1961-1965	(2.9)	(6.7)
1966-1970	0.1	(2.2)
1971-1975	9.5	1.9
1976-1980	3.1	0.6
1981-1985	(2.5)	(3.9)
1986-1990	2.1	1.0
1991-1995	5.3	4.6
1996-2000	6.2	5.2

* parentheses signify increase

If we take the preferred (public health) performance measure of deaths per 100,000 population, we can assume (from Tables 1 and 2) that a reasonable expectation for the next decade would be an annual average reduction of around 4% per annum in this rate. In four consecutive 5-year periods, Australia reduced the population death rate in the range 3.2% to 5.7% per annum. The New Zealand performance was far more variable but closer to 5% per annum in the 1990's. Note that we are not projecting from past trends here but rather, forecasting the likely returns if resources and countermeasure mixes do not change dramatically.

By applying the Australian Bureau of Statistics population growth forecast under the most 'adverse' (to safety) assumptions of maximum fertility rate and maximum net immigration, Australia's population in 2010 is expected to be around 21.5 million persons. With a 4% per annum average reduction in the death rate per 100,000 persons, the rate in 2010 would then be around 6.3 deaths per 100,000 persons, or an annual toll of around 1,350. Similar calculations for New Zealand suggest a population-based rate of around 8.8 with an annual toll around 360. In both cases, the reductions in the absolute number of deaths over the 2000 toll are of the order of 30 percent.

Vulcan and Corben's[3] analysis concludes that reductions in excess of 50 percent are possible with an aggressive program to implement all known effective measures, but the issue is whether such a program is likely to be implemented and sustained.

The forecast made here estimates what might be achievable if we continue to take the present scientific approach to planning and implementing our strategies and countermeasures, and if we assume that the level of resource devoted to road safety will not decline. It assumes further that systematic attention will be given to the factors likely to change the nature of the road toll over the next decade (such as the ageing population of road users, the increasing vehicle mass incompatibility, etc).

As an aside, it is interesting to note that the forecast rate of around six deaths per 100,000 persons for Australia implies that by 2010, Australia will reach the levels currently achieved in places such as the U.K. and Sweden. The forecast for New Zealand is of the order of 8.8, which may be conservative given that New Zealand has had stronger safety gains than Australia over the last decade. Nevertheless, this point reinforces the need for appropriate choices of targets and benchmarks, as discussed earlier.

Note also the rate of around six deaths per 100,000 persons is, in effect, the target that both Australia and New Zealand have selected in their current national road safety strategies. However, Sweden and the U.K. will not, of course, be content to remain at the levels that they currently have. Indeed, both countries have set targets for the same time period which are likely to see them remain well ahead of Australasia.

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