WHY WE CONTINUE TO UNDER-COUNT THE ROAD TOLL

Prepared by: Jim Langford, Monash University Accident Research Centre

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1. A BRIEF STATEMENT OF THE ISSUE

All Australasian jurisdictions maintain mass crash databases containing information collected predominantly via police reports. On the one hand, the databases are used widely in setting road safety intervention priorities, in designing countermeasures and in evaluating countermeasure effectiveness. On the other hand, they are known to substantially under-count the level of road crash casualties (as well as having a range of data quality limitations).

This paper aims to assess the extent to which police crash reports under-count road casualties and to identify possible means of improvement.

2. AN ASSESSMENT OF THE ROAD SAFETY ISSUE

Although there are differences in the variables collected, in underlying definitions and coding procedures, and in the use of supplementary information, the traffic accident reports used in Australasian jurisdictions are basically similar in structure and in collection method. Common features include:

- reports need to be completed for any crash occurring on a public road which results in at least one person being killed or injured. In some jurisdictions, reports also have to be completed for non-injury road crashes
- reports provide structured information relating to the circumstances of the crash, including its location, the vehicles and road users involved, the type of manoeuvre attempted, any injury outcomes and selected features of the road
- in most instances, reports are completed by police either at the scene of the crash, or soon thereafter, and thus represent an immediate perception of the event
- in most instances, the data provided by police represent the entirety of the data contained in the mass crash databases. The main exception relates to fatal crashes where additional information may be later entered.

Traffic accident reports from the different Australian jurisdictions have previously been judged sufficiently similar to allow their compilation into national fatality and serious injury collections, the need for some preliminary data manipulation notwithstanding. It also needs to be noted that the national serious injury collection has been suspended for the past few years (see below).

Arguably, the most important difference in police data collection and processing across the jurisdictions relates to determining injury outcomes. In the best of all possible worlds, the police officer attending the crash scene accompanies each injury victim to hospital and determines the level of treatment received, and later contacts the hospital for confirmatory or additional information. The injury outcome for each participant is then used to determine the overall crash severity (based on the most severe injury outcome).

In practice, this rarely happens. Police do not attend all crashes, in which case, they are largely reliant upon participants' reports of injury outcomes. Further, a recent report of the issues associated with the collection of non-fatal serious injury data in Australia[i] highlighted the following issues:

- although all jurisdictions use 'admitted to hospital' as the definition of non-fatal serious injury, the default procedure is often to count all victims transported from the crash scene by ambulance
- some jurisdictions, to some extent, follow up with hospital officials to determine whether an individual was admitted or treated only as an outpatient. Other jurisdictions report only what was apparent to police at the time of the crash.

Jurisdictions vary considerably in injury definitions, data collection, coding procedures, data ascertainment and accuracy of information. For example, since 1989 Victoria has had its own procedure for tallying non-fatal serious injury levels, based on two measurements: each person's injury level as recorded by police ('killed', 'major injuries – admitted', 'serious injuries – requiring medical treatment' and 'minor injuries'), and whether the person was also coded as later admitted to the hospital. These two variables are then combined to produce a serious injury count that is about twice the number based exclusively upon the 'major injuries - admitted' code. While the count based on both variables may have moved substantially closer to the real-world count of serious injuries[ii], it also means that Victorian statistics are likely to appear inflated relative to most other jurisdictions.

As a further example of jurisdictional differences[iii], prior to 1999 the Roads and Traffic Authority in NSW classified non-fatal injury data into either serious injury or other injury. A seriously injured person was defined as a person who was injured and admitted to hospital as a result of an accident, and who did not die as a result of those injuries within 30 days of the accident. However, following changes to the crash reporting system in July 1997, it became apparent that there were inconsistencies in the latest reported levels of hospital admissions. A subsequent investigation revealed a number of concerns, including the finding that police officers often did not know whether a person had been admitted to hospital following a crash. Consequently, "admitted to hospital" as a measure of serious injury in NSW is not considered reliable, and the publication of serious injury statistics for that jurisdiction has been discontinued since 1997.

As an alternative, measures of serious injury from the NSW Hospital Inpatient Statistics have been obtained from the Australian Institute of Health and Welfare, based on a patient's length of stay in hospital of two days or more. Trend data for NSW were published for the financial years 1993/94 to 1997/98. However, the introduction of a new classification system for External Cause of Injury or Poisoning (ICD10AM) by the NSW Health Department on 1 July, 1998 has prevented the continued delivery of trend data, thereby limiting the usefulness of this alternative approach for the immediate future.

For these, and other reasons, and as detailed in the Section 3 of this paper, the conventional traffic accident report falls well short of providing an accurate count of the road toll, specifically by under-counting. Persevering with a system that is known to under-count the true road toll has several limitations:

- road safety is diminished as a public health issue and, amongst other outcomes, is less likely to attract funding for countermeasure development
- individual projects find it more difficult to show suitable benefit-cost ratios and, hence, are less likely to be funded
- road safety priorities based upon crash data may well be distorted because under-counting is not consistent across all crash categories and variables

- implemented countermeasures cannot be confidently evaluated in terms of 'before' and 'after' crash reductions because under-counting cannot be assumed to be consistent over time.

On the other hand, this list of limitations notwithstanding, crash data in their current form can still fulfil a number of functions. For example, the collection of somewhere between one-half and two-thirds of all serious casualty crashes occurring in a given jurisdiction can serve as an adequate sample, especially for site-specific investigations. If it can be demonstrated that reported crashes are representative of all crash categories, and that data ascertainment rates are reasonably stable over time, the current crash data can be used for many evaluation purposes. If the extent of undercounting can be established, then current crash levels can be weighted to reflect the 'true' crash levels, as per the practice currently undertaken in New Zealand.

3. A REVIEW OF THE RESEARCH

> ' ... we road safety researchers do not know the size of our own field of study. We do not even know the number of injury accidents or the number of those injured.'[iv]

In Australia, the most comprehensive – but by no means only – investigations of crash under-counting have been conducted by the Road Accident Prevention Research Unit in Western Australia. Since 1987, the Unit has linked police and hospital data in Western Australia. When hospital inpatient records for the period October 1987-December 1988 were compared to police casualty crash participants' records for the same period[v], only 64% of hospital admissions could be linked to police records of any injury severity. The researchers recognised that failure to establish a linkage could be partly due to missing or incorrect data, to restrictions in the two original data sets, or to problems with the linkage process itself. However, after conducting quality checks, they concluded that only 4% of unlinked cases could be attributed to these factors, and deduced that the remaining 30+% of unlinked cases had not been reported to police.

Reporting (linkage) rates varied considerably across road users and other factors:

- 79.4% of vehicle drivers were reported, compared to 66.0% of passengers
- motorcyclists were the least reported of all road users (51.8%)
- participants in single-vehicle crashes were less likely to be reported than multi-vehicle crashes (75.7% v 66.5%)
- rates varied for hospital types (31% for private hospitals, 57% for country hospitals, 62% for public non-teaching hospitals in metropolitan areas, and 72% for teaching hospitals)
- the more severe the injury, as reflected in length of stay, the greater the reporting rates (from 58.3% for 1 day to 77.1% for more than 30 days).

The same database, expanded to cover the period 1987-1996, has been used to further explore the nature of the discrepancies between police and hospital data[vi]. After linkage and some pruning of out-of-scope cases it was found that, out of 31,539 hospital admission records, only 19,632 (62%) had a matching police crash report. Once again, the extent of linkage varied across crash types, road user groups, and injury severity in particular.

Using the hospital admission and hospital emergency attendance records, police reports and ambulance trip records, the researchers were able to construct an injury pyramid for all road injury levels for Western Australia, 1987-1996. Then also showed the extent to which injury severity level linked to police records. The results in brief were:

Severity of injury	'True' no. of injuries, 1987-1996	Linkage rate to police records (%)
Deaths	1,892	97
Hospital admissions	22,196	60
Emergency attendances	92,040	47
Other injuries	274,710	31

The same database has also been analysed to show that, in addition to totally missing approximately 40% of seriously-injured crash participants, police crash reports also mis-categorised the injury severity of many participants. Of all hospital inpatient records which were linked with police records, 24.3% were classified as outpatients by police, with a further 1.9% shown as uninjured[vii].

The problems with police data under-counting the road toll are not restricted to Australian jurisdictions. A recent study from New Zealand[viii] confirmed earlier research that police data substantially under-counted road casualty numbers. Police records were used to identify all participants (whether injured or not) in injury crashes in 1995. Hospital in-patient records across the country were then examined to identify admissions arising from road crashes. When the 5003 hospital admission records were compared to police records, 3145 were successfully linked – representing 62.8% of all hospital records.

The overall reporting (linkage) rates differed considerably across variables. As examples:

- 41% of motorcyclists in single-vehicle crashes were reported, compared to 75% of motorcyclists in multi-vehicle crashes
- drivers were more likely to be reported than passengers (70% and 55% respectively);
- road users aged less than 15 years were less likely to be reported (49% compared to 61-67% for other ages)
- the more severe the injury, reflected by days in hospital, the higher the reporting rates (from 56% for less than one day's admission to 68% for 15 days or more)
- the greater the delay in being admitted following the crash, the lower the reporting rates (65% for less than a day to 38% when the delay was 29+ days).

The New Zealand analyses were also based on linkage with police records, regardless of whether the police injury codes denoted serious injury.

Indeed, under-counting seems to be common to this data collection method. For example, the issue prompted a special OECD-sponsored report in 1994, looking at issues associated with under-reporting. It was found that, despite similar definitions, reporting requirements and collection methodologies, under-reporting was considerable and varied across both crash aspects and different countries[ix]. More recently, a meta-analysis involving forty-nine crash data ascertainment studies from thirteen countries[x] (including from Australia[xi]) found that the official counts of road injury undercounted at all levels of injury severity. The mean reporting levels were:

- fatalities (crash reports compared to official mortality statistics) – 95%
- serious injuries (requiring admission to a hospital) – 69%
- slight injuries (requiring outpatient treatment) – 27%
- very slight injuries (requiring treatment other than at hospitals) – 11%

- property damage only (no-one injured) – 25%.

Within this general framework, there was variation across both countries and road user groups:

- police-based fatality counts, when compared to official mortality data, ranged from 87% (Norway) to 106% (Netherlands) – with Australia being 92%
- hospital-treated injuries (both serious and slight) ranged from 21% (Denmark) to 88% (Canada) – with Australia being 64%
- for injuries of all severity levels, driver injuries had the highest police-based reporting rates (44-78%, Australia 73%), lower rates were usually found for pedestrians (38-83%, Australia 69%), with even lower rates for motorcyclists (22-81%, Australia 53%), and cyclists had the lowest rates (7-66%, Australia 7%).

4. POLITICAL, SOCIAL AND OTHER FACTORS

There is general agreement that police cannot be expected to substantially improve their count of road casualties[xii]. For those crashes that they do attend, police are often required to undertake more urgent duties at the scene, and are not specially trained to determine injury outcomes. While more systematic follow-up with hospitals might improve the quality of police injury information, resource issues frequently prevent this from occurring. While improvements in data definitions and coding procedures might increase the accuracy of police counts, the benefits are likely to be modest. In addition to these considerations, there are many instances when injuries become apparent only an appreciable time after the crash, and these may well result in formal medical treatment other than at hospitals. Further, there are the many crashes not reported to police and/or not attended by police, where injury outcome information (if any) is necessarily of questionable quality.

Two other collections of casualty data exist which could be valuable in conjunction with police data. First, hospital admission records can supply a more complete count of serious injury outcomes based on hospital admissions (and at least some hospitals and health systems could also provide useable accident and emergency attendance records). Secondly, in those jurisdictions where arising medical costs are covered by no-fault third party insurance schemes, this source can supply a more complete count of injury outcomes across all major treatment modes.

In this context, work is currently underway in a number of different jurisdictions: either to assess the feasibility of linking road crash data from a number of different agencies, especially police and hospital data, to provide a more complete count; or to periodically complement police data with data from other sources.

As indicated by the longstanding and widespread nature of the problem, the way forward is not simple. If it were decided to follow the Western Australia and New Zealand examples and link police data with a more complete injury-outcome collection (or set of collections), the difficulties would include:

- jurisdictions' current databases rarely contain the names of those involved in crashes. Efficient linkage with other databases requires names and possibly other personal identifiers to be entered which, resource issues aside, may well invoke other ethical and privacy considerations
- hospital and insurance databases have been designed to meet their respective business needs. If they are also to serve a research purpose, there will inevitably be the need for some re-design of the database and/or extensive data manipulations

- crash data need to be timely – and hospital data in particular have a history of tardy release. Deferring the release of casualty counts for several years would be an unacceptable outcome for those road safety practitioners required to make prompt responses to emerging data trends
- a new system that involved a linked database would require sizeable resources, particularly during the early years, and on-going commitment
- the development of casualty counts based on linked data in only a handful of Australasian jurisdictions would be of minimal value at a national level and would further reduce the possibility of cross-jurisdictional comparisons.

5. CONCLUSIONS

It is likely that, for a number of reasons – and national and international commitments figure amongst these – police crash reports will continue to be the basis of road casualty counts in most Australasian jurisdictions. In the absence of any extra efforts, this scenario necessarily means that we will continue to under-count the road toll.

One solution to this dilemma may be to calibrate police statistics at regular intervals against a more comprehensive collection of road casualties, to allow estimates of a full casualty count. This calibration, which could occur without the need for linking individual crash records, would most probably be against either hospital records or the databases held by no-fault insurance companies, if equivalent bodies can be found in each jurisdiction. While this approach will not solve all the difficulties associated with under-counting, it does have at least some advantages over the current situation.

Further, at least for fatal crashes, police reporting could be enhanced through cross-referencing with the Registers of Births, Deaths and Marriages and with coronial data to produce a greater insight into crash causation. Given the small numbers involved, this exercise would require relatively few resources.

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