MONASH
UNIVERSITY

ACCIDENT RESEARCH CENTRE

**BASELINE RESEARCH PROJECT**

# EVALUATION OF 50 km/h SPEED LIMITS IN VICTORIA

## SUMMARY OF INTERIM ANALYSIS OF ALL CRASHES AND CRASHES INVOLVING PEDESTRIANS

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***March 2002***

## EXECUTIVE SUMMARY

A 50 km/h default speed limit in built-up areas (except where otherwise signed at a different limit) was introduced in Victoria on 22 January 2001. This report presents interim results of analysis of the effects of the introduction of 50 km/h speed limits on casualty crash frequency.

Considering crashes of all types, analysis has shown a statistically reliable reduction in casualty crash frequency on roads with the new default limit of 13.3 percent relative to roads that have remained 60 km/h and 12.3 percent relative to all roads not affected by the change. When considering crashes involving pedestrians, analysis has shown a statistically reliable reduction in crash frequency for all casualty crashes on roads with the new default limit of 22.2 percent relative to roads that have remained 60 km/h and 19.4 percent relative to all roads not affected by the change. When considering fatal and serious injury (those involving a reported hospital admission) crashes involving pedestrians, statistically reliable reductions of 46.1 percent relative to roads that have remained 60 km/h and 40.2 percent relative to all roads not affected by the change were estimated.

The interim results presented are part of an ongoing project and estimate the effect of the 50 km/h default limit in the first five months after its introduction. Analysis will be updated following further post implementation crash history becoming available. Results are also subject to a number of noted assumptions and qualifications.

## 1.0 PROJECT BACKGROUND

A 50 km/h default speed limit in built-up areas was introduced in Victoria on 22 January 2001. This limit applies to all roads in built-up areas, on which signs do not indicate a higher (or lower) speed limit. This resulted in the speed limit on many roads reducing from 60 km/h to 50 km/h. The introduction of the new speed limit was accompanied by widespread media publicity campaigns and some police speed enforcement.

Analysis by VicRoads has shown that over 2400 people are injured or killed on local streets each year and that many of these crashes involve excessive or inappropriate speeds. Furthermore, research has also shown clear links between both crash risk and crash severity and travel speed. Studies also indicate strong links between risk of pedestrian death and vehicle travel speed in a collision between a vehicle and pedestrian. If hit by a vehicle at 50 km/h, a pedestrian has less than a 40 per cent chance of being killed. At 60 km/h a pedestrian has a 70 per cent chance of being killed. On the basis of these facts, together with identified crash reductions associated with the introduction of 50 km/h speed limits in other Australian states, it was estimated that a reduction of at least 10 per cent in the number of casualty crashes on those roads to which the reduced limit applied could be expected in Victoria each year.

The Monash University Accident Research Centre (MUARC) is currently carrying out a research project as part of its Baseline Research Program to evaluate the effects of the introduction of 50 km/h speed limits on casualty crash frequency. Analysis to date has examined the effects of the reduced limit on all crash types as well as on crashes involving pedestrians, crashes involving older drivers and crashes involving young drivers. This

document summarises key results from interim analysis of all crash types as well as crashes involving pedestrians.

The interim results presented in this summary are part of an ongoing project to assess the crash effects of the introduction of the 50 km/h default speed limit in Victoria. Results presented here estimate the effect of the change in the first five months after its introduction. The study will be updated at 6 monthly intervals, as additional crash data becomes available.

## 2.0 DATA AND METHODS

The study has analysed data on casualty crashes reported to police and occurring in metropolitan Melbourne over the period January 1996 to June 2001. A casualty crash is one where at least one person involved in the crash is injured or killed. Data was not complete for the six-month period beyond June 2001 for use in the analysis. Each crash analysed in the study was labelled according to the speed zoning that existed at the crash site after the introduction of the 50 km/h default speed limit, regardless of whether the crash occurred before or after the change. This labelling identified crashes that occurred in the current 50 km/h zones before they were re-zoned to 50 km/h, as well as identifying those crashes that occurred on roads where there had been no change in speed zoning, for comparative purposes. VicRoads supplied information on current speed limits of roads in Metropolitan Melbourne for use in labelling the analysed crashes using speed limit coverage mapping data generated for use on the Transport Accident Commission Safe Car project.

Trend adjusted average monthly crash frequency in the current 50 km/h areas before and after the introduction of the 50 km/h default speed limit on January 22$^{nd}$ 2001 have been compared with changes in average crash frequencies over the same period in other speed zones in Metropolitan Melbourne. Comparisons have been made with crashes occurring on roads that have remained zoned at 60 km/h after the introduction of the 50 km/h default speed limit. These roads are most likely to have similar characteristics to the roads that were re-zoned 50 km/h. Comparison has also been made with crashes in all speed zones of 60 km/h or above. This analysis incorporates the most crash data and hence offers the highest statistical precision.

As well as examining crashes of all types, pedestrian involved crashes were also considered. Pedestrian involved crashes were defined as those where at least one road user in the crash is coded as being a pedestrian.

Poisson regression models have been used to assess statistical significance of the change in crash frequency in 50 km/h zones after the introduction of the 50 km/h default speed limit relative to changes in crash frequency in other speed zones. A time trend has been included in the models to reflect differences in long term crash trends in each speed zone.

## 3.0 SUMMARY OF RESULTS

### *3.1 ALL CRASH TYPES*

Table 1 shows the total number of crashes of all types occurring in current 50 km/h zones and on the two comparison sets of roads, currently 60 km/h only and 60 km/h and above, in the periods before (61 months) and after (5 months) introduction of the 50 km/h default speed limit. It also shows the corresponding average monthly crash rates for each region and period. Numbers are given for crashes of each severity level as well as for all casualty crashes combined. Fatal crashes are defined as those where at least one person involved was killed whilst serious injury crashes are defined as those where at least one person involved was reported as being admitted to hospital. Other injury crashes involve injury to at least one person in the crash but with no one being killed or reported as admitted to hospital.

**Table 1:** *Total and average monthly crash numbers by current speed zone before and after introduction of the 50 km/h default speed limit - all crash types*

| | **Total Crash Numbers Before and After Introduction of the 50 km/h Default Limit** | | **Average Monthly Crash Numbers Before and After Introduction of the 50 km/h Default Limit** | |
|---|---|---|---|---|
| **Crash Severity And Current Speed Zone** | **61 Months Before (January 1996 – January 2001)** | **5 Months After (February 2001 – June 2001** | **61 Months Before (January 1996 – January 2001)** | **5 Months After (February 2001 – June 2001** |
| Fatal Crashes | | | | |
| 50 km/h | 137 | 6 | 2.54 | 1.50 |
| 60 km/h | 337 | 30 | 5.62 | 6.00 |
| All Zones > 50 km/h | 853 | 79 | 13.98 | 15.8 |
| Serious Injury Crashes | | | | |
| 50 km/h | 3699 | 277 | 60.64 | 55.40 |
| 60 km/h | 7948 | 674 | 130.30 | 134.80 |
| All Zones > 50 km/h | 14475 | 1208 | 237.30 | 241.60 |
| Other Injury Crashes | | | | |
| 50 km/h | 9209 | 645 | 150.97 | 129.00 |
| 60 km/h | 21421 | 1670 | 351.16 | 334.00 |
| All Zones > 50 km/h | 39193 | 3109 | 642.51 | 621.80 |
| All Casualty Crashes | | | | |
| 50 km/h | 13045 | 928 | 213.85 | 185.60 |
| 60 km/h | 29706 | 2374 | 486.98 | 474.80 |
| All Zones > 50 km/h | 54521 | 4396 | 893.79 | 879.20 |

Estimates of the net percentage change in crash rates in 50 km/h zones relative to each comparison area obtained using Poisson regression analysis are given in Table 2. Results are given by each crash severity as well as for all casualty crashes. Also given in Table 2 are the

statistical significance values of each result. Statistical significance values give the probability of obtaining the estimated crash reduction by chance given the real crash reduction is actually zero. Low significance probabilities indicate a likely real crash reduction. Statistically significant results less than 0.05, a point commonly considered to represent a reliable finding, are shaded in Table 2. Results presented in Table 2 cannot be directly derived from Table 1 as the analysis compensates for different long term time trends in the crashes in 50 km/h zones relative to the comparison group being considered.

**Table 2:** *Estimated crash reduction in 50 km/h zones relative to both 60 km/h zones and to all other speed zones following the introduction of the 50 km/h default speed limit – All Crash Types*

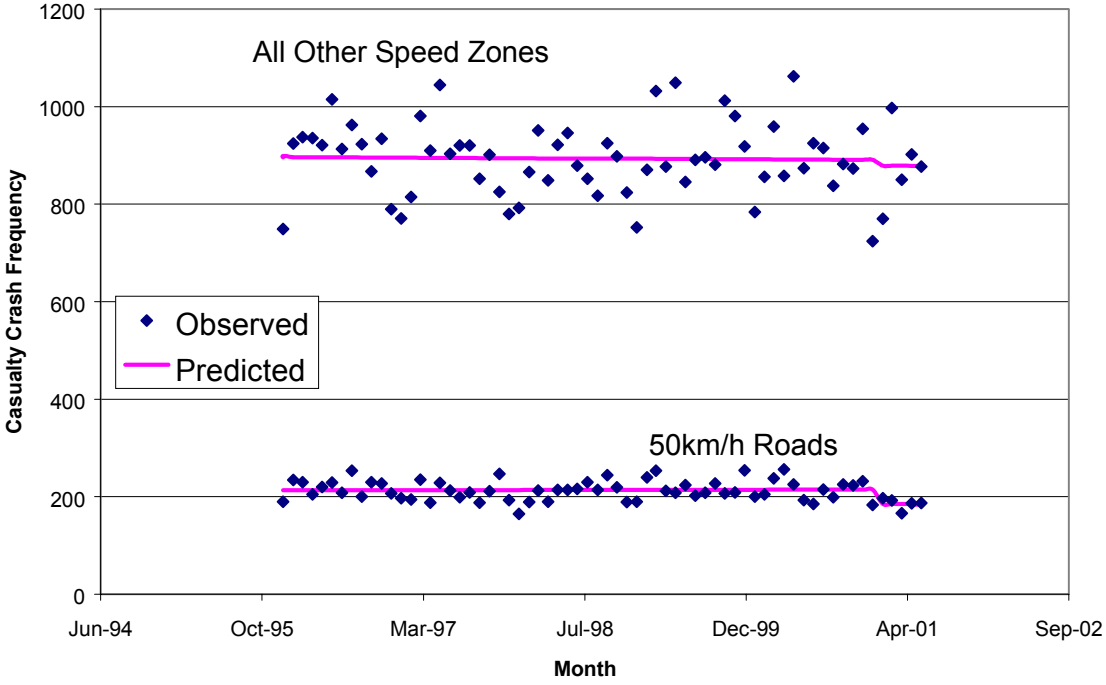
| | **50 km/h Zones relative to 60 km/h Zones** | | **50 km/h Zones relative to All Other Speed Zones** | |
|---|---|---|---|---|
| **Crash Severity** | **Crash Reduction Estimate** | **Statistical Significance** | **Crash Reduction Estimate** | **Statistical Significance** |
| Fatal Crashes | 52.89% | 0.1276 | 58.70% | 0.0569 |
| Serious Injury Crashes | 12.64% | 0.1036 | 11.46% | 0.1154 |
| Other Injury Crashes | 12.97% | 0.0093 | 11.84% | 0.0113 |
| All Casualty Crashes | 13.27% | 0.0014 | 12.32% | 0.0016 |

Results in Table 2 show a statistically reliable net reduction in all casualty crashes of 12% to 13%, depending on comparison area, associated with the introduction of the 50 km/h default speed limit. The estimated net reduction is the change in the crashes in the current 50 km/h zones after implementation of the change, relative to the change in the comparison group over the same period. This is illustrated in Figure 1.

Similar reductions as were observed for all casualty crashes were observed for serious and other injury crashes, although the result for serious injury crashes was not statistically reliable. Fatal crash reduction associated with the 50 km/h introduction was estimated to be 53% in comparison to crashes in 60 km/h zones and 59% in comparison to all speed zones above 50 km/h. Neither of these results are statistically reliable although the latter is approaching statistical reliability.

Figure 1 shows the monthly time series data for all casualty crashes of all types in both 50 km/h zones and in all other speed zones. To illustrate the model fitted to the data, Figure 1 also shows the estimated Poisson regression model predicted values. The estimated step change in the monthly level of crash in both the 50 km/h and other speed zones at the time of introduction of the50 km/h default speed limit is visible in the fitted model. The difference in the two step changes represents the net crash effect of the 50 km/h change (ie. 12.3% reduction, from Table 2).

**Figure 1:** *Observed and modelled (predicted) monthly casualty crash frequency in 50 km/h zones and all other speed zones – all crash types.*



### *3.2 CRASHES INVOLVING PEDESTRIANS*

Table 3 presents summary information, analogous to Table 1, for crashes involving pedestrians. Comparison of Tables 1 and 3 shows pedestrian involved crashes represent some 18% of all casualty crashes in 50 km/h zones compared to around 10% in all other speed zones. Unprotected road users like pedestrians are also likely to benefit significantly in terms of injury risk in a crash from speed reduction measures.

**Table 3:** *Total and average monthly crash numbers by current speed zone before and after introduction of the 50 km/h default speed limit – pedestrian involved crashes*

| | **Total Crash Numbers Before and After Introduction of the 50 km/h Default Limit** | | **Average Monthly Crash Numbers Before and After Introduction of the 50 km/h Default Limit** | |
|---|---|---|---|---|
| **Crash Severity And Current Speed Zone** | **61 Months Before (January 1996 – January 2001)** | **5 Months After (February 2001 – June 2001** | **61 Months Before (January 1996 – January 2001)** | **5 Months After (February 2001 – June 2001** |
| Fatal Crashes | | | | |
| 50 km/h | 52 | 3 | 0.93 | 0.60 |
| 60 km/h | 113 | 11 | 1.95 | 2.20 |
| All Zones > 50 km/h | 220 | 20 | 3.82 | 4.00 |
| Serious Injury Crashes | | | | |
| 50 km/h | 940 | 57 | 15.95 | 11.40 |
| 60 km/h | 1618 | 154 | 27.61 | 31.80 |
| All Zones > 50 km/h | 2195 | 189 | 37.75 | 39.40 |
| Other Injury Crashes | | | | |
| 50 km/h | 1328 | 104 | 22.92 | 20.80 |
| 60 km/h | 2155 | 153 | 37.25 | 31.40 |
| All Zones > 50 km/h | 2705 | 197 | 47.20 | 40.80 |
| All Casualty Crashes | | | | |
| 50 km/h | 2320 | 164 | 39.80 | 32.80 |
| 60 km/h | 3886 | 318 | 66.80 | 65.40 |
| All Zones > 50 km/h | 5120 | 406 | 88.77 | 84.20 |

Table 4 shows the estimated net reductions in crashes involving pedestrians in 50 km/h zones, relative to the comparison speed zones, following the introduction of the reduced speed limit. Interpretation of Table 4 is the same as for Table 2 with the additional note that a negative crash reduction indicates an estimated crash increase.

**Table 4:** *Estimated crash reduction in 50 km/h zones relative to both 60 km/h zones and to all other speed zones following the introduction of the 50 km/h default speed limit – pedestrian involved crashes*

| | 50 km/h Zones relative to 60 km/h Zones | | 50 km/h Zones relative to All Other Speed Zones | |
|---|---|---|---|---|
| **Crash Severity** | **Crash Reduction Estimate** | **Statistical Significance** | **Crash Reduction Estimate** | **Statistical Significance** |
| Fatal Crashes | 44.82% | 0.4225 | 40.93% | 0.4513 |
| Serious Injury Crashes | 46.22% | 0.0005 | 40.11% | 0.0028 |
| Fatal + Serious Injury Crashes | 46.14% | 0.0003 | 40.24% | 0.0019 |
| Other Injury Crashes | -4.31% | 0.7719 | -2.61% | 0.8528 |
| All Casualty Crashes | 22.17% | 0.0229 | 19.39% | 0.0414 |

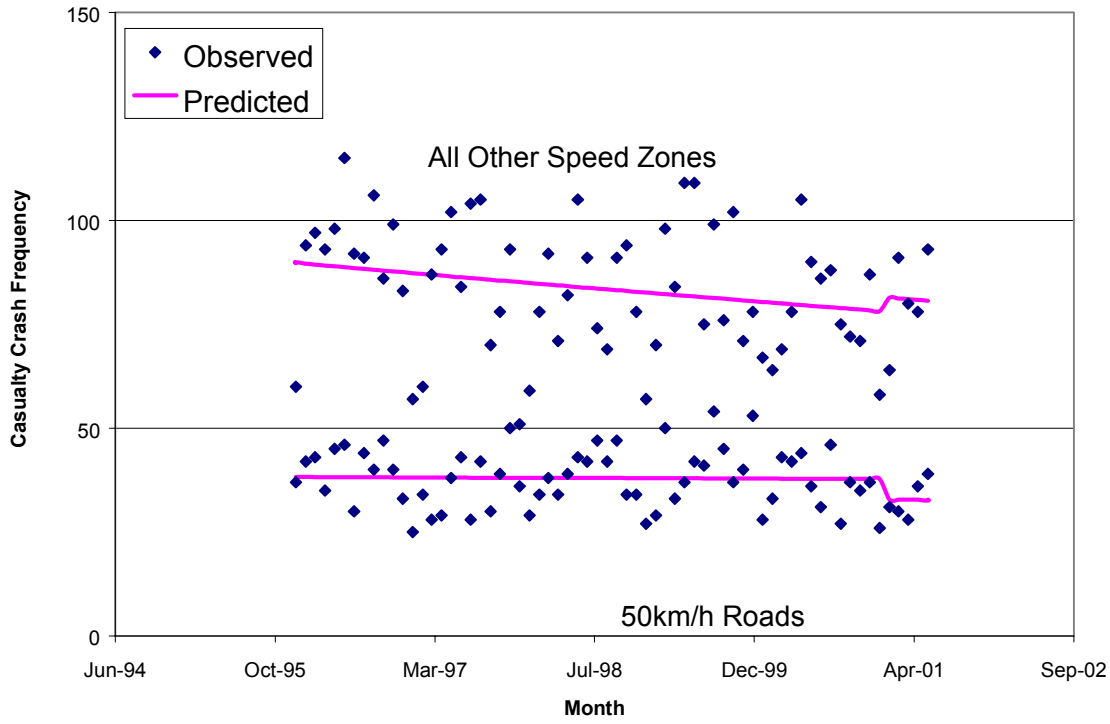
*NB: Negative crash reductions indicate an estimated crash increase (which could be due to chance variation in crash frequencies rather than indicative of a real increase in crash risk)*

Table 4 shows statistically reliable estimated net reductions in pedestrian serious injury crashes in 50 km/h zones of 40% relative to all other speed zones, and 46% relative to 60 km/h zones. No statistically reliable change in other (minor) injury crashes was observed. This latter result could be due to insufficient data being considered at this stage.

When the fatal, serious injury and minor injury pedestrian crashes were pooled, there was a statistically reliable estimated reduction in all pedestrian casualty crashes in 50 km/h zones of 19% relative to all other speed zones, and 22% relative to 60 km/h zones.

Figure 2 shows the actual and Poisson model predicted monthly crash frequencies for all pedestrian involved casualty crashes in 50 km/h zones and all other speed zones. Interpretation of Figure 2 is the same as that for Figure 1. As before, the difference in the step changes in the modelled monthly crash counts for the 50 km/h and comparison roads after the introduction of the 50 km/h default speed limit represents the net change on 50 km/h roads.

**Figure 2:** *Observed and modelled (predicted) monthly casualty crash frequency in 50 km/h zones and all other speed zones – pedestrian involved crashes.*




## 4.0 CONCLUSIONS

This report presents interim results of analysis of the effects of the introduction of the 50 km/h default speed limit in built-up areas in Victoria on casualty crashes. Considering crashes of all types, analysis has shown a statistically reliable reduction in casualty crash frequency on roads with the new default limit of 13.3 percent relative to roads that have remained 60 km/h and 12.3 percent relative to all roads not affected by the change. When considering crashes involving pedestrians, analysis has shown a statistically reliable reduction in crash frequency for all casualty crashes on roads with the new default limit of 22.2 percent relative to roads that have remained 60 km/h and 19.4 percent relative to all roads not affected by the change. When considering fatal and serious injury (those involving a reported hospital admission) crashes involving pedestrians, statistically reliable reductions of 46.1 percent relative to roads that have remained 60 km/h and 40.2 percent relative to all roads not affected by the change were estimated.

It should be noted that the results presented in this report consider the effects of the 50 km/h default speed limit introduction in only the first five months after introduction. The results are also subject to a number of assumptions and qualifications which are given below. Ongoing work is being undertaken considering a longer period of data after implementation of the lower default limit as well as other specific crash types.

## 5.0 QUALIFYING REMARKS

Analysis presented here has been able to show some statistically reliable estimated net crash reductions due to the implementation of the 50 km/h default speed limit in Victoria. Validity of the results relies on a number of assumptions. It is assumed that labelling of the current speed zoning of crash locations by Vicroads through the use of the TAC Safecar speed zone coverage is accurate. It also assumes that the form of the statistical models used for analysis are correct and that the comparison groups in the analysis adequately represent the effect of other factors affecting crash history in the 50 km/h zones other that the speed change.

Hypothesis testing in the analysis presented above is based on a two tailed alternative hypothesis. That is, it makes no assumption that the introduction of the 50 km/h default speed limit will either decrease or increase crash frequency on the affected roads. This is the most conservative assumption. If it is believed that the only likely affect of the 50 km/h speed limit is to reduce crash frequency, a one tailed alternative hypothesis could be employed meaning each of the significance values given in Tables 2 and 4 would be halved. Point effect estimated would not change.

It should be also noted in interpreting the results of this study that it only examines the crash effects of the 50 km/h implementation in the first 5 months after introduction. Further analysis is planned looking at a longer period of after-change data to determine if the crash effects are lasting, or only transient in the period immediately after implementation.