EVALUATION OF THE CRASH EFFECTS OF THE CHANGES IN SPEED ZONES IN VICTORIA DURING 1993-1994 (EXCLUDING 100 to 110km/h)

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ABSTRACT

During late 1992 and early 1993, a rationalisation of speed limits on Victorian roads was undertaken in order to achieve credible speed limits which were uniform with the rest of Australia. Under the rationalisation, posted speed limits either increased or decreased on many roads. This study estimated the casualty crash effects of the speed zone changes implemented in Victoria for speed zone changes other than the 100km/h to 110km/h changes. Effects have been estimated for the program of speed zone changes as a whole, for Melbourne and the rest of Victoria, general increase and decrease of zoned speed and for each particular type of speed zone change. Results are further related to results of speed monitoring.

In Metropolitan Melbourne, assessment of the general effects on casualty crash frequency of increasing zoned speed showed a statistically significant 9.3% increase. In contrast decreasing zoned speed resulted in no statistically significant change in casualty crash frequency. Results for particular speed zone changes were also obtained. These were generally consistent with the results of speed monitoring. Analysis of the casualty crash frequency change for all speed zone changes combined in the rest of Victoria as well as analysis by specific speed zone changes showed no statistically significant changes in crash frequency. The net effect of the speed zone rationalisation over Victoria as a whole was a statistically significant increase in overall crash frequency of 5.4%.

KEYWORDS: speed limit, evaluation, statistical analysis, injury accident

INTRODUCTION

During late 1992 and early 1993, a rationalisation of speed limits on Victorian roads was undertaken in order to achieve credible speed limits which were uniform with the rest of Australia. As part of this rationalisation, many speed zoning changes occurred across Victoria, with some of the most notable being the phasing out of 75 km/h speed zones and the introduction of 50, 70 and 80 km/h zones. Under the rationalisation, posted speed limits on some road sections were increased whilst on other road sections the posted speed limits were decreased.

The Parliamentary Inquiry into the Revision of Speed Limits (Road Safety Committee, 1995) details the speed zone changes which were implemented under the rationalisation and the lengths of road to which they apply. According to the Parliamentary Inquiry, the total length of road affected by these changes considered in this study was 2475km, or 9.3% of the total arterial road system. Of this road length, 1925km saw a speed zoning increase whilst 550km saw a speed zoning decrease. Of the total length with changed speed zone, 1810km (94%) changed by 5 km/h, whilst the remaining 6% changed by between 10 and 30km/h . This corresponds to 50% of the urban arterial road network having undergone a speed change, compared with only 3% of the rural arterial network. Allowing for the relative lengths of the urban and rural networks, this represents approximately 482km of rural road and 1993km of metropolitan road experiencing a speed zoning change. It should be noted that these figures include the speed zone change from 100 to 110km/h affecting some 435km of road. Evaluation of this particular speed zone change was not commissioned in this study.

The objective of this evaluation study was to determine whether the speed zone changes implemented in Victoria, other than 100 km/h to 110 km/h, affected casualty crash frequencies on the road segments to which they apply.

STUDY DESIGN

Evaluation method and site sampling

A quasi-experimental study design was used incorporating the use of control groups to adjust for the influences of other factors besides the speed zone changes on crash frequency. Use of control groups was necessary to reflect the influence a number of major road safety programs and other social and economic factors had on road trauma in Victoria during the period of speed zone rationalisation (Newstead et al, 1995). Quasi-experimental study designs are often used in the evaluation of the effectiveness of accident black-spot treatments (Corben et al, 1990; BTCE, 1993). One issue which often arises as part of these studies is that of regression-to-the-mean which can be a problem in analysis when treatment sites are selected on the basis of high accident frequency as in the case of accident black-spot treatments. Regression to the mean should not be an issue in this study as sites chosen for speed zone changes were not generally chosen on the basis of accident history.

The program of speed zone changes in Victoria has involved rezoning a large number of discrete lengths of road. It was impractical to include every length of road on which a speed zone change had occurred because of the large number of sites. Consequently a sample of the sites with speed zone changes was taken for analysis with the view that the results obtained from analysis of the sample are representative of all speed zone changes in Victoria.

Analysis stratification and Hypotheses tested

To provide maximum detail on the effects of speed zone changes on crash frequency, the analysis was graduated into a number of levels. The analysis stratification levels used, from coarsest to finest, were; all speed zone changes in all areas aggregated, aggregated speed zones where speed limits increased and aggregated speed zones where speed limits decreased, each individual type of speed zone change across all areas. Because of the known differences between roads and crash patterns in metropolitan Melbourne and the rest of Victoria the analysis was performed at each of the 3 graduated levels for metropolitan Melbourne and the rest of Victoria separately as well as for Victoria as a whole.

The aim of the statistical analysis undertaken in this study was to determine whether speed zone changes had significantly influenced casualty crash frequency. Hence, the global null hypothesis being tested in all the analyses presented is that of no casualty crash frequency change due to the program of speed zone rationalisation. In formulating an alternative hypothesis for the statistical test procedure, there is no clear a-priori reason to expect speed zone changes may increase or decrease casualty crash frequency for either speed increases or decreases. This is because crash risk is not merely a function of absolute traffic speed but also factors such as variance in vehicle speeds within a traffic flow. Consequently, a two tailed alternative hypothesis was appropriate to use for determining the statistical significance levels of the tests presented here. This statistical test structure has been used in hypothesis testing at all the levels of analysis undertaken.

DATA

VicRoads supplied information on each of the speed zone changes that had been undertaken as part of the rationalisation. The information supplied for each speed zone change included: municipality of change (LGA), location start and end points on the road for each change, speed zoning before and after the change and date of the change. For reasons of control matching described below, all speed zone changes occurring in an LGA were sampled, with the LGAs used sampled at random from those available.

Within metropolitan Melbourne, 19 LGAs were sampled and all the speed zone changes in each analysed. The location of the Melbourne LGAs sampled ranged from inner city to urban fringes, with implementation of the speed zone changes within the sampled LGAs ranging from July 1993 to December 1993. 26 LGAs were sampled from the rest of Victoria and include a mix of large population centres as well as largely rural LGAs. Speed zone change implementation dates in these LGAs ranged from January 1994 to June 1994. Analysis of the length of road with speed zone changes in those LGAs selected in each of Melbourne and the rest of Victoria showed sufficient coverage to meet the statistical analysis power requirements discussed above.

The crash database used in the analysis was the VicRoads database of Police reported casualty accidents in Victoria (Green 1991). Analysis centred on data from the January 1990 to June 1997. Variables of interest in the crash data were: crash location, crash date, crash type (DCA) and crash severity. For the LGAs sampled for use in the analysis there was a total of 44,279 casualty crashes over the data period.

Based on the available crash data and the implementation dates of the speed zone changes, the following before and after treatment study periods were chosen for use under the quasi-experimental analysis design. For metropolitan Melbourne the study “before” period was defined as July 1990 to June 1993 and the study “after” period as July 1994 to June 1997. For the rest of Victoria the before period was July 1990 to June 1993 and the after period was July 1994 to June 1997. These chosen before and after periods were of equal length hence providing a balanced analysis and covered the same calendar months eliminating possible confounding effects of seasonal bias which are known to exist in the crash data.

ANALYSIS METHODS

Site identification and crash data extraction

The desktop mapping package ArcView 2.1b was used to map sites with speed zone changes in the selected LGAs recorded on hard copy. Crash location data was identified for speed zone change site using the generated ArcView coverage. Control crashes were selected from those remaining in each LGA not at treated sites and were matched on two criteria; (1) LGA of treatment site, and (2) broad speed zoning before and after crash. Criterion 1 controls for the effects of broad road safety programs, such as speed camera usage and Random Breath Testing, as well as economic effects in the local district. Criterion 2 controls for specific features such as road type and adjacent land usage that are factors determining the broad speed zone of a particular road. For speed zone changes resulting in an adjusted speed of 80km/h or more, control crashes were assigned from roads zoned between 80km/h and 100km/h in the same LGA. Speed zone changes resulting in an adjusted speed of 70km/h or less were assigned control crashes from roads zoned 60km/h in the same LGA. Crashes were labelled as occurring before or after the speed zone change, and in either the treatment or control group in preparation for analysis.

Statistical analysis methods

A log-linear statistical analysis technique suitable for the analysis of quasi-experimental study designs as described by Bruhning and Ernst (1985) was employed here. This method arranges the treatment and control crash data before and after treatment for each speed zone change site in a series of 2x2 contingency tables. A log-linear model with Poisson error structure, appropriate for the variability in the count data, of the form

$$\ln(n_{ijk}) \; ? \; ?_0 \; ? \; ?_i \; ? \; ?_{ij} \; ? \; ?_{ik} \; ? \; ?_{ijk}$$

where n is the number of crashes in the contingency table cell, i is the site index, j is the treatment or control group index and k is the before or after treatment index, was then fitted to the data. Significant treatment effect in each group, i, was then assessed by testing the significance of the $?_{ijk}$ parameter for each group. The magnitude of the treatment effect was also assessed by the magnitude of this parameter and suitable confidence limits were calculated.

RESULTS

Metropolitan Melbourne

Table 1 details the results of the casualty crash frequency analysis performed for metropolitan Melbourne. Results are presented for analysis of the total program effect across all speed zone changes, general effects of speed zone increases and speed zone decreases and the effects of each type of speed zone change across all LGAs analysed in metropolitan Melbourne. The estimated percentage change in casualty crash frequency for each hypothesis tested are shown in Table 1 along with 95% confidence limits on each estimate. In interpreting these results, a negative sign on the result indicates casualty crash frequency reduction whilst positive estimates indicate crash frequency increase. As well as the 95% confidence limits and point estimates, the significance level of the test of the null hypothesis is given. Small values of the significance level indicate significant casualty crash frequency change due to speed re-zoning. For completeness, Table 1 also shows the number of crashes in the combined before and after treatment study periods for both the treatment and control sites. The number of cases in each of these cells gives an indication of the statistical power available in each analysis, with more cases giving greater power to identify statistically significant casualty crash frequency change.

Table 1: Results of crash frequency analysis - metropolitan Melbourne

	Number of casualty crashes in analysis			***95% Confidence Limits***

	Treatment	Control	Percentage Change	Lower Limit	Upper Limit	Sig. Level
Particular Speed Zone Changes						
90 - 80	324	546	-13.35%	*-33.70%*	*13.25%*	0.2939
75 - 70	1433	4121	-0.13%	*-11.42%*	*12.60%*	0.9834
100 - 80	147	432	**-45.81%**	***-61.98%***	***-22.76%***	**0.0007**
60 - 70	1547	4122	10.15%	*-1.99%*	*23.80%*	0.1045
75 - 80	3359	6874	**10.72%**	***1.95***	***20.24%***	**0.0157**
60 - 80	268	2234	-6.03%	*-26.28%*	*19.78%*	0.6152
100 - 90	26	165	21.42%	*-35.81%*	*129.67%*	0.5507
75 - 60	75	2031	**42.65%**	***-5.67%***	***115.71%***	**0.0923**
Other	43	2210	-18.62%	*-49.01%*	*29.88%*	0.3876
Increase or Decrease Speed Zone Changes						
Increase Speed Zone Change	5174	13230	**9.25%**	***2.39%***	***16.58%***	**0.0076**
Decrease Speed Zone Change	2005	7295	-4.30%	*-13.40%*	*5.77%*	0.3898
Across All LGAs for all Speed Zone Changes						
All Accidents	7222	22735	**4.65%**	***-0.83%***	***10.51%***	**0.0969**

Statistically significant at 5% level (dark shading)
Statistically significant at 10% level (light shading)

Examination of the results presented in Table 1 shows two statistically significant changes in casualty crash frequency at the 5% level of significance associated with specific speed zone changes in metropolitan Melbourne. The changes from 100 to 80km/h and 75 to 80 km/h resulted in a casualty crash change significant at the 5% level. For the 100 to 80km/h change a decrease in casualty crash frequency of 45.81% was associated with the speed zone change (p*=0.0007). For the 75 to 80 km/h change an increase in casualty crash frequency of 10.72% was observed (p*=0.0157). One other individual speed zone changes analysed showed a result worthy of note. The decreased speed zoning from 75 to 60 km/h was associated with an increase in casualty crash frequency of 42.65% percent (p*=0.0923). Whilst this significance probability is not less than 5% it is sufficiently small to be described as marginally statistically significant, indicating a likely effect associated with this speed zone change. Whilst this result may look counter intuitive, there are possible explanations for the observed crash increase, such as an increase in the variance of travel speeds on the re-zoned road section, which will be further discussed below. All other individual speed zone changes with crash change results shown in Table 1 had null hypothesis test significance probability greater than 0.10 indicating that no statistically significant changes in crash frequency due to speed zone changes were found.

Table 1 also shows the results of testing the effects of speed zone changes in metropolitan Melbourne, broadly classified by zones with increased speeds and zones with decreased speeds. For roads where speed zones increased, an increase in casualty crash frequency of 9.3%, with a statistical significance probability of 0.0076 was observed. For roads where speed zoning decreased, no statistically significant change in casualty crash frequency was found (significance probability = 0.3898). The estimated net impact of all speed zone changes analysed in metropolitan Melbourne, also shown in Table 1, is a 4.65% increase in casualty crash frequency with a marginal statistical significance probability of 0.0969.

Using the proportion of sites sampled for analysis in Melbourne and the before treatment crash rate, the estimated 4.65% increase in casualty crashes numbers across all Melbourne represents estimated increase in the order of 235 casualty crashes per annum due to all speed zone changes. Examining individual speed zone changes, an estimated increase of 10.72% in casualty crash frequency for the 75 to 80km/h speed zone changes represents in the order of 188 casualty crashes per annum. An estimated increase of 43% in casualty crash frequency for the 75 to 60km/h changes represents approximately 151 casualty crashes per annum across all Melbourne. A decrease of 46% of casualty crash frequency for the 100 to 80 km/h speed zone changes translates to a saving of approximately 44 casualty crashes per annum.

Rest of Victoria

Results of the casualty crash frequency analysis for speed zone changes in the rest of Victoria are presented in Table 2. The format and interpretation of the results presented in Table 2 are the same as for Table 1 above which details the results of the metropolitan Melbourne analysis.

Table 2: Results of crash frequency analysis - rest of Victoria

	Number of casualty crashes in analysis			*95% Confidence Limits*		
	Treatment	Control	Percentage Change	Lower Limit	Upper Limit	Sig. Level
Particular Speed Zone Changes						
75 – 70	15	658	6.42%	*-36.11%*	*77.25%*	0.8110
100 – 80	7	538	12.40%	*-36.71%*	*99.21%*	0.6990
60 – 70	30	516	4.17%	*-36.27%*	*70.28%*	0.8705
75 – 80	119	566	-11.80%	*-39.07%*	*27.67%*	0.5057
75 – 100	6	661	15.05%	*-34.27%*	*101.37%*	0.6236
60 – 80	4	374	-1.05%	*-44.06%*	*75.03%*	0.9710
Other	4	344	13.20%	*-35.92%*	*99.97%*	0.6693
Increase or Decrease Speed Zone Changes						
Increase Speed Zone Change	159	2117	-1.89%	*-22.64%*	*24.41*	0.8750
Decrease Speed Zone Change	22	1196	9.01%	*-25.56%*	*59.93%*	0.6572
Across All LGAs for all Speed Zone Changes						
All Accidents	185	3657	2.33%	*-15.39%*	*23.75%*	0.8122

Table 2 shows the overall casualty crash frequency increase for all speed zone changes combined in the rest of Victoria to be estimated as a 2.33%. However, the result is not statistically significant leading to the conclusion that speed zone changes have not led to an overall change in crash frequency in this region. Examination of each of the individual speed zone change types or aggregations by increase or decrease speed zone change in Table 2 shows none of the speed zone change categories considered to have resulted in a statistically significant change in casualty crash frequency, supporting the overall result.

Whole of Victoria

For completeness, the crash frequency analysis was also carried out for Victoria as a whole to assess the casualty crash frequency effect overall. The results of the combined analysis are presented in Table 3. Interpretation of the results in Table 3 is the same as for Tables 1 and 2. As expected from the relative number of crashes available for analysis in Tables 1 and 2, the estimated casualty crash effects shown in Table 3 for the whole of Victoria are dominated by the metropolitan Melbourne results. Hence the results of Table 3 closely follow those of Table 1 and there were no different conclusions to those detailed for the analysis of speed zone changes in metropolitan Melbourne.

Table 3: Results of crash frequency analysis - all of Victoria

	Number of casualty crashes in analysis			*95% Confidence Limits*		
Speed Zone Changes Across All LGAs	Treatment	Control	Percentage Change*	Lower Limit	Upper Limit	Sig. Level
Particular Speed Zone Changes						
90 – 80	324	546	-13.35%	*-33.70%*	*13.25%*	0.2939
75 – 70	1448	4779	1.24%	*-9.84%*	*13.67%*	0.8349
100 – 80	154	970	**-22.22%**	***-41.78%***	***3.91%%***	**0.0891**
60 – 70	1577	4638	**11.02%**	***-0.86%***	***24.31%***	**0.0699**
75 - 80	3478	7440	**9.97%**	***1.47%***	***19.17%***	**0.0205**
75 - 100	6	661	15.05%	*-34.27%*	*101.37%*	0.6236
60 - 80	272	2608	-5.27%	*-24.22%*	*18.43%*	0.6348
100 - 90	26	165	21.42%	*-35.81%*	*129.67%*	0.5507
75 - 60	75	2031	**42.65%**	***-5.67%***	***115.71%***	**0.0923**
Other	47	2554	-12.30%	*-38.53%*	*25.11%*	0.4689
Increase or Decrease Speed Zone Changes						
Increase Speed Zone Change	5333	15347	**9.07%**	***2.46%***	***16.10%***	**0.0064**
Decrease Speed Zone Change	2027	8491	-1.35%	*-10.37%*	*8.57%*	0.7808
Across All LGAs for all Speed Zone Changes						
All Accidents	7407	26392	**5.43%**	***0.12%***	***11.03%***	**0.0452**

Statistically significant at 5% level

Statistically significant at 10% level

Relation to speed monitoring

As part of the submissions made to the Parliamentary Inquiry into the revision of Victoria's speed limits (Road Safety Committee, 1995), both the RACV and VicRoads submitted speed monitoring data at a sample of sites where the speed limit had changed. Data was collected both before and after the change. Appendices F and G in the Parliamentary Inquiry report detail the results of analysis of the speed monitoring data. Whilst the data presented is representative of a limited number of sites, it was considered useful to compare the published findings to the results of the analysis undertaken here in an attempt to link any recorded speed changes with the estimated changes in crash frequency.

Table 4: Summary of speed monitoring results presented in the Parliamentary Inquiry report and related casualty crash frequency analysis results. Metropolitan Melbourne.

Zone Change	Mean Speed / Compliance	Speed Distribution	Casualty Crash Frequency Analysis Results
60-70 Divided	**RACV** Speeds relatively unchanged Majority complying to new limit and less exceeding the limit **VicRoads** Speeds unchanged. Greater compliance.	**RACV** Distribution narrowed in 7 out of 8 locations **VicRoads** Distribution narrowed	10.2 % increase *(-2.0,23.8)* 0.1045 significance
60-70 Undivided	**RACV** Slight increase in speeds Increase in complying to new limit Less exceeding the limit **VicRoads** Small speed increase. Greater compliance	**RACV** Half sites narrowed and half sites widened **VicRoads** Not stated	
75-80 Divided	**RACV** Speeds unchanged at 80-85km/h. Less below the limit **but** proportion of high risk drivers (>20km/h over) remained the same **VicRoads** Speeds unchanged, less drivers below limit. Same number of excessive speeders (>20km/h over)	**RACV** Slight widening in distribution for 6 of 8 locations **VicRoads** Not stated	10.7% increase *(-2.0,20.2)* *0.0157* significance
75-80 Undivided	**RACV** Increase in speeds **VicRoads** Speed increases; mean up 9km/h, 85th percentile up 14km/h	**RACV** Half sites narrowed and half sites widened **VicRoads** Not stated	
75-70 Divided	**VicRoads** Slight decrease in speeds with notable number exceeding limit excessively	**VicRoads** Not stated	0.13% decrease *(-11.4,12.6)* *0.9834 significance*
75-70 Undivided	**RACV** Speeds unchanged Reduction in complying to new limit and increase in exceeding the limit	**RACV** Slight widening or no change in distribution for 7 of 8 locations	

Table 4 summarises the results of the speed monitoring data presented in the Parliamentary Inquiry report along with the key results from the casualty crash frequency analysis described above. The RACV detail the sites monitored, with all being located in metropolitan Melbourne. The exact location of the VicRoads sites, however, is not stated in the Parliamentary Inquiry report, hence it was presumed these also lie in metropolitan Melbourne. Consequently, it was considered relevant to compare all the speed monitoring results available to the results of the Melbourne casualty crash analysis.

As shown in Table 4, the results of VicRoads and RACV speed monitoring are generally consistent in their conclusions. These results are also consistent with the results of the casualty crash frequency analysis, shown in Table 4 for comparison. For the speed zone change from 60 to 70km/h, there was small mean speed increases observed on undivided roads and no mean speed increases observed on divided roads. Whilst speed distributions narrowed on the divided roads, the effects on undivided roads were less clear with some distributions widening and others narrowing. No significant changes in casualty crash frequency were observed for this speed zone change which is consistent with the results of speed monitoring finding only slight increase or no mean speed change and generally an indication of a narrowing of speed distributions. Casualty crash analysis of the speed zone change from 75 to 80km/h in metropolitan Melbourne found a statistically significant 10.7% increase in crash frequency. Results of speed mo nitoring suggest this may be due to the observed slight speed increases, particularly on undivided roads, along with the a continued number of vehicles exceeding the speed limit excessively, particularly on undivided roads, even at the new higher speed limit. In addition there is a suggestion of widened speed distributions, again particularly on undivided roads, which is known to contribute to higher crash risks. From speed monitoring at sites with a speed zone change from 75 to 70km/h, little change was recorded in the mean travel speeds resulting in the reduced compliance with the new speed limit. There was also little change in the distribution of speeds. These are both consistent with results of casualty crash frequency analysis. Both found no statistically significant change in casualty crash frequency at sites with this speed zone change.

DISCUSSION

Overall, the results of the evaluation presented here give indications of the effects that the revision of Victoria's speed limits have had on casualty crash frequency. Results of analysis in metropolitan Melbourne indicate that the increased speed zoning, with no coincidental road geometry changes, was generally associated with an increase in casualty crash frequency, reflected particularly in the 75 to 80 km/h speed zone change. Speed monitoring results suggest this may be a result of higher mean speeds, plus a wider distribution of speeds in some of these zones.

Specifically, results indicate that decreasing speed zoning in metropolitan Melbourne did not generally result in statistically significant change in casualty crash frequency. There are however some notable exceptions when examining particular speed zone decreases. For the 100 to 80 km/h speed zone change, a significant crash reduction of 45.8% was estimated. This result could perhaps suggest that the original 100km/h speed zoning was too high on the roads concerned, with 80km/h representing a travel speed with which more people are willing to comply. It should also be noted that this speed zone change typically occurred in urban fringe areas on roads possibly not of a high engineering standard. Speed monitoring data, which was not available for the study, would have been necessary to support this hypothesis. The other notable speed zone decrease is the change from 75 to 60 km/h zoning that appears to have increased casualty crash frequency. This is possibly the result of the speed zone change increasing the variance in travel speeds with some drivers refusing to reduce travel speed from that which they have been used to travelling at in the past. Again, speed monitoring data would be needed to support this theory.

To generalise results of this study, it must be assumed the estimated crash effects of speed zone changes for the sites examined in this study are generally representative of the crash effects speed zone changes would have at any site. If the assumption is valid, the results in Melbourne point to some important implications for road authorities to consider for speed zoning in the future. Firstly, casualty crash increases may be likely when increasing zoned speeds, even by as little as 5km/h. Conversely, when reducing posted speed limits, there appears to be a reluctance for drivers to uniformly reduce travel speeds to comply with the new limits, leading to no change in crash frequency. In some cases, lowering of speed limits may lead to an increase in the distribution of travel speeds causing an increase in crash rates. A means of lowering speed limits whilst achieving a corresponding reduction in crash frequency through general driver compliance with the new posted limit may be to use speed enforcement, such as speed camera or laser deployment, for a period of time following re-zoning.

Results of the present analysis for the rest of Victoria indicate that the speed zone revisions have resulted in no statistically significant changes in casualty crash frequency either overall or for any particular speed zone change. As noted, the speed revisions in this area generally have been implemented in transition zones between 100 km/h open roads and 60 km/h rural towns with the stretches of road effected being typically quite short. This has resulted in a relatively small number of crashes available for analysis and has perhaps limited the potential for large crash effects. It is, however, interesting to note that the magnitude of the crash effects estimated for the rest of Victoria are, although not statistically significant, generally consistent with those estimated for metropolitan Melbourne.

The ability to generalise the results of this study is of particular interest in relation to the 50km/h default urban speed limit recently introduced in Victoria. As yet the 50km/h speed limit in Victoria has not been evaluated in terms of its crash effects. Results of this study suggest it is possible that introduction of the 50km/h limit may have little effect on crash frequency, which would be contrary to the expected effects of the program. It would also be contrary to the effects found upon the introduction of 50km/h speed limits in other states, such as New South Wales (NSW RTA, 2000), where significant crash reductions were associated with introduction of the new limit. However, introduction of the 50km/h limit in NSW was different to that in Victoria in that is involved extensive community consultation and erection of signage. Introduction of the limit in Victoria was generally not accompanied by erection of signage or community consultation but only by a relatively extensive media advertising campaign. It is the media campaign that also makes the Victorian 50km/h introduction different to the speed zone changes studied here and hence may possibly give rise to different crash effects than those measured here. In addition, the results presented here pertain mostly to speed zone changes on arterial roads whereas the 50km/h zones in Victoria were implemented predominantly on local roads. This key difference could also lead to dramatically different effectiveness of the Victorian 50km/h implementation to that of the program evaluated here. Proper evaluation of the 50km/h introduction in Victoria is paramount to establish the effectiveness of the program. Results of such an evaluation will be interesting to compare with those here.

CONCLUSIONS

Analysis of the effects of speed zone changes on casualty crash frequency in metropolitan Melbourne showed an overall increase in casualty crash frequency of 4.7%, although this result was of marginal statistical significance and should be interpreted with caution. Assessment of the general effects on casualty crash frequency of increasing zoned speed showed a highly statistically significant increase in casualty crash frequency of 9.3% but decreasing zoned speed showed no statistically significant change in casualty crash frequency. For particular speed zone changes, the change from 100 to 80 km/h showed a highly statistically significant casualty crash reduction of 46%. Increased speed zoning from 75 to 80 km/h showed a statistically significant casualty crash frequency increase of 10.7% and the change from 75 to 60 km/h showed a marginally statistically significant casualty crash frequency increase of 43%. The results of analysis of casualty crash frequency in metropolitan Melbourne were generally consistent with the results of speed monitoring.

Most of the speed zone changes which occurred in the rest of Victoria took place on the fringes of country towns in the speed transition zones between 100 km/h zones of the open highway and 60 km/h zones of the built up town areas. Analysis of the overall change in casualty crash frequency for all speed zone changes combined in the rest of Victoria as well as analysis by specific speed zone changes showed no statistically significant changes in crash frequency.

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