TECHNICAL NOTE

SURVEY OF PEDESTRIANS AND CYCLISTS INVOLVED IN CRASHES AT CHRISTCHURCH HOSPITAL

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ABSTRACT

Pedestrians and cyclists involved in crashes with motor-vehicle were surveyed over two 4 week periods at Christchurch hospital (emergency department). Telephone surveys were also undertaken of people who had reported a cycle or pedestrian crash to ACC in 2002. The survey was designed to capture more detailed information on crashes than was available from Police records, and focused on more severe crashes.

The questionnaire covered the following areas; demographics, travel mode, cycle type, date, time and location of crash, light conditions, weather, crash type, footpath and road conditions, main crash causes, estimate of vehicle and cycle speeds, trip purpose, details on injuries sustained and emergency services that attended (to check with other databases). This technical note presents the key findings from this survey.

The technical note also provides information on reporting rates for serious pedestrian and cycle crashes and the compliance rates (those crossing on green man) of pedestrians at traffic signals by time of day.

INTRODUCTION

During the period 2002 to 2004 research on pedestrian and cycle crash rates was carried out by the author, for Transfund NZ. The key outcome of this research was the preparation of crash prediction models for the active modes at traffic signals, roundabouts and urban mid-block arterials. These research results have previously been published by Turner (2004). This technical note brings together some of the other important findings of the research project, including 1) surveys of cycle and pedestrian crash victims at the Christchurch hospital, 2) a review of the reporting rates of pedestrian and cycle crashes, by comparing three crash databases (CAS, St Johns Ambulance and ACC) and 3) measurements of pedestrian compliance rates (with green man) at traffic signals by hour of day (and hence traffic volume).

The objectives of the hospital and ACC interviews was 1) to obtain information on cycle and pedestrian accidents not readily available from Police reports and CAS data and 2) to obtain statistics on the number of cycle and pedestrian road accidents at traffic signals, roundabout and mid-block locations where no motor vehicle was involved.

Prior to commencing the interviews, the study team was required to obtain ethical approval of the survey questionnaire and the method by which the people in the health sector would be approached and interviewed, as well as how the data were to be recorded and published. The 'Ethical Approval' process is a requirement for all research in the health sector in New Zealand. Each region of New Zealand has an 'Ethics Committee', which typically has twelve members. Half represent the medical profession and the rest are described as 'lay members'. The questionnaire, the patient consent form and patient information form all had to be approved by the Ethics Committee. This took some months to complete.

SURVEY METHODS

Pedestrian and cycle accident casualties were interviewed using several methods as outlined below.
Four sets of data were collected:

- **Pilot Study:** This required the hospital staff to call an answer service, to get an interviewer to attend. This began on 1 December 2002 and continued until the end of February 2003. In parallel with this, questionnaires were left at a number of medical centres around Christchurch. A third approach involved mailing out questionnaires to accident casualties on the ACC database. The response to these techniques was very low.

- **Main Study 1:** The first four-week period of in-house interviews in the Emergency Department at Christchurch Hospital were conducted from 2 June – 29 June 2003. People were interviewed as they came into the Emergency Department by research staff or as they progressed through the treatment (particularly if severely injured).

- **Main Study 2:** The second four-week period of in-house interviews in the Emergency Department at Christchurch Hospital were conducted from 3 – 30 November 2003 from 7am to 9.30pm each day.

- **Main Study 3:** ACC telephone interviews were conducted from 23 February 2004 and covered accidents that happened in the 2002 calendar year. People from Christchurch, Palmerston North and Hamilton were interviewed.

The final method proved the most effective and efficient at collecting a large amount of data. However a lot of useful data was also collected during the two 4 week periods at Christchurch Hospital. Most accident victims were keen to be involved in the interview process.

SAMPLE SELECTION AND SURVEY QUESTIONNAIRE

Christchurch Hospital interviews
Only pedestrian and cyclist accidents where the accident occurred on a public road or footpath in Christchurch City were interviewed at Christchurch Hospital. The key determinant was that the accident occurred on the road reserve. Accidents both involving and not involving motor vehicles were included in the survey.

ACC interviews
People who were involved in pedestrian and cycle accidents on public roads, were interviewed in Christchurch, Palmerston North and Hamilton. In the main study, ACC data were supplied for the year 2002. Each accident casualty was called and interviewed using the same questionnaire used at the hospital by telephone.

The same questionnaire was used for all studies. A copy of the survey questionnaire can be found in the main study report (Turner et al. 2006). The questionnaire included the following factors:

- **Demographics** (age and gender)
- **Travel mode** (pedestrian, cyclist, other e.g. skateboarding)
- **Cycle type** (mountain bike, 10 speed, other) and set up (e.g. lights)
- **Date and time of accident**
- **Location of accident:** (road, footpath or “other”)
- **Light conditions:** (dark, at twilight, or in the daylight)
- **Weather:** (during accident or other conditions)
- **Accident type** (e.g. pedestrian vs. car, pedestrian only)
- **Road, footpaths or cycleway conditions** (e.g. loose gravel)
- **Cause of accident** (often several factors for each accident)
- **Accident description** (a description of the sequence of events and a diagram)
- **Estimate of speed of vehicles and cyclists**
- **Trip purpose** (e.g. school, recreation, work)
- **Injury sustained during accident** (e.g. grazes, bruises and head injury)
- **Emergency services that attended accident** (if any)
- **Information on previous pedestrian and/or cycle accidents** (in the past two years)

SURVEY RESULTS

In total 311 completed survey questionnaires were obtained, of which 264 occurred on-road. The remaining 47 accidents occurred off-road and were not included in the analysis. The key results from the surveys are given below. Additional results can be found in Turner et al. (2006)

Age of cyclists and pedestrian involved in crashes

The age demographics of casualties and those who walk or cycle are compared in the following two figures. For each age group the proportion of total trips undertaken by that age group are compared with the proportion of those surveyed in this study. The proportion of those who walk or cycle in each age group was obtained from the LTSA Travel Survey (LTSA 2000a).

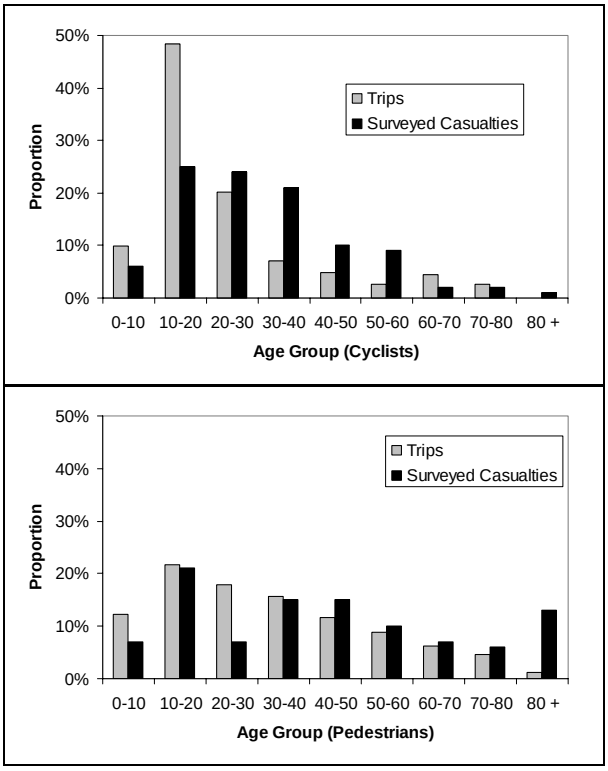


Figure 1 and 2: Relationship between proportion of total cycle and pedestrian trips undertaken by each age group and proportion of total cycle and pedestrian accidents in each age group

Figure 1 shows the comparison between those surveyed as casualties and those who cycle. This shows that generally the proportion of cyclists matches the proportion of casualties surveyed in each age group. However, the age group from 10 to 20 makes up a high proportion of cycle trips but lower proportion of causalities and cyclists between 30 and 60 years old, particularly 30 to 40, feature higher in the number of accident casualties surveyed than they contribute to proportion of cycle trips. This may be a result of cyclists in this age group being more likely to travel down higher volume roads and having a higher exposure by travelling longer distances.

Figure 2 shows the comparison between the ages of those casualties that were surveyed in this study and the proportion of pedestrians of different ages from the LTSA (2000a) travel survey. From this graph it can be observed that the number of trips undertaken by a

particular age group was generally proportional to those surveyed casualties. However there is one particularly noticeable exception when comparing the number of trips and number of surveyed casualties in the 80+ age group. This is clearly a vulnerable group in society due to decreased physical ability and mental response time.

Purpose of Trip

Figure 3 shows the trip purpose of pedestrian and cyclist accident casualties surveyed. Figure 3 shows that a large percentage of cycle trips are either commuter or recreational trips. Pedestrian trips were predominantly for recreational or "other" purposes (such as shopping). Surprisingly few of the pedestrian accident casualties were on the journey to or from work.

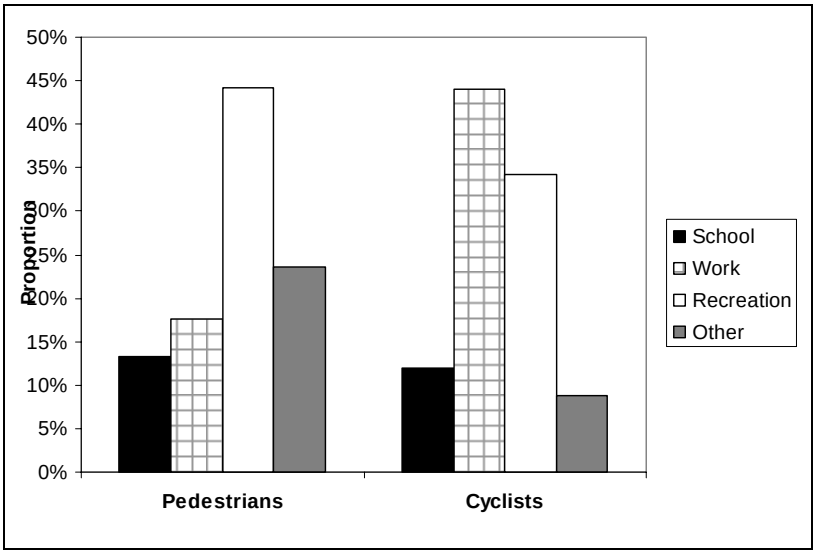
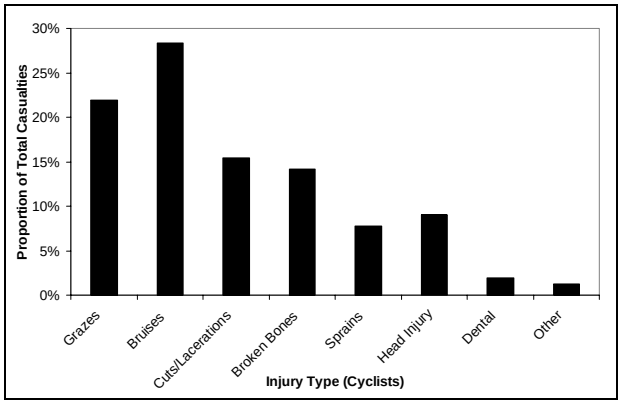


Figure 3: Trip purposes of pedestrian and cycle accident casualties surveyed

Major injury sustained

The survey data for this study was disaggregated into the most severe type of injury the cyclist or pedestrian suffered. Figure 4 and 5 shows the most severe injury suffered by cycle and pedestrian accident casualties. Grazes and bruises occurred in a larger proportion of the injuries sustained by both pedestrians and cyclists. Broken bones were more common in cyclist crashes. This is to be expected given the generally higher collision speeds.



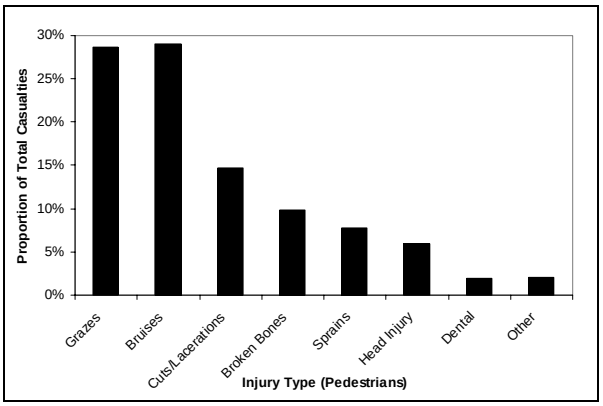


Figure 4 and 5: Cycle and Pedestrians injuries by type

Key Accident Causes

Figure 6 and 7 show the causes stated by accident casualties for cycle and pedestrian accidents respectively.

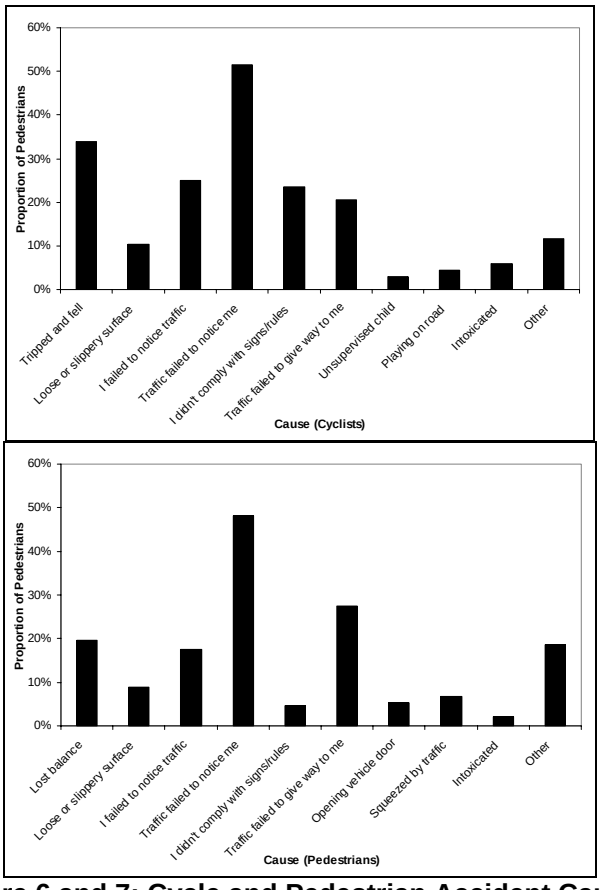


Figure 6 and 7: Cycle and Pedestrian Accident Causes

The percentage of cyclists reporting they lost balance or contribute their injury to loose or slippery surface is 28%. A high percentage (76%) of cyclists stated that other traffic failed to

notice them or failed to give way to them. Surprisingly, the number of cyclists that reported drivers opening doors on them or where 'squeezed by traffic' was less than 5%.

The percentage of pedestrians reporting that they tripped and fell or contribute their injury to loose or slippery surface is 44%. A high percentage (72%) report that other traffic failed to notice them or failed to give way to them. 24% of the injured pedestrians admitted that they did not comply with the traffic rules. This compares with the average proportion of pedestrians that cross with the 'green man' at traffic signals of 70%, at sites in Christchurch, as follows.

PEDESTRIAN COMPLIANCE RATES AT TRAFFIC SIGNALS

Pedestrian crossing data were divided into:

1. Those that crossed with the green pedestrian signal ("the green man"),

2. Those who began to cross on the red pedestrian signal ("red man" or flashing red man), and

3. Those that crossed up to 50 metres away from the intersection or crossed at the intersection without activating the pedestrian phase.

Using these data, the proportion of pedestrians that cross on the "green man" or "red man" when the pedestrian phase is activated was determined. These proportions do not include those pedestrians that crossed at the intersection without activating the pedestrian phase or up to 50m away from the intersection. Figure 8 shows the proportion of pedestrians that crossed on the 'red man' when the pedestrian phase had been activated by intersection type and time of day, alongside crossing minutes surveyed in each hourly period.

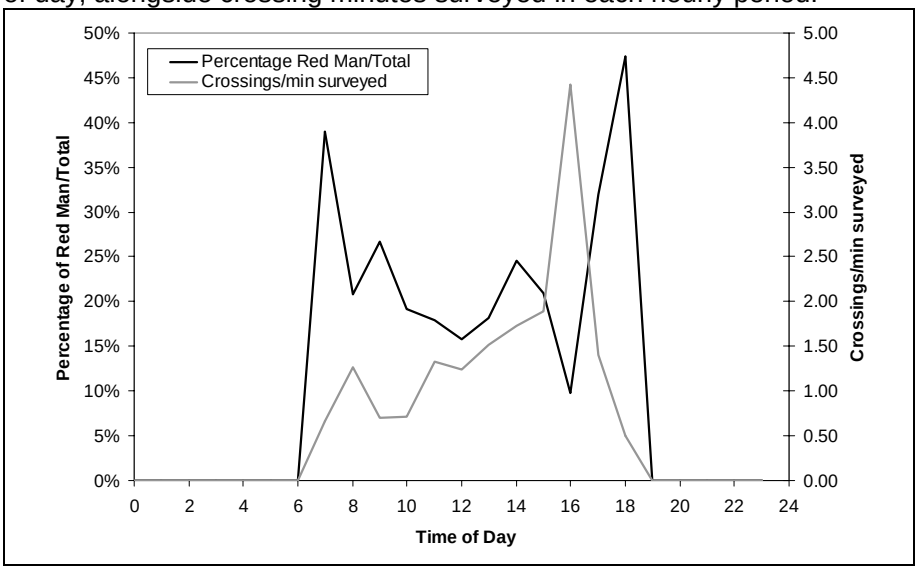


Figure 8: Crossings per minute and percentage that cross on the "red man" in all of Christchurch

Figure 8 shows that when flows are at their highest (in the evening peak) then a larger percentage of pedestrians appear to cross on the 'green man' (see dip in profile to around 10% at 16:00 hours). This is likely to be the result of vehicle flows being high at this time of the day. Pedestrians may only be able to cross when the pedestrian phase is in operation. It is interesting that the proportion that cross with the red-man peaks just after this time, possibly due to pedestrians being in more of a hurry to get home after work. A similar trend occurs in the morning peak period.

Reporting Rates (Database comparison)

Accident data were collected from the following three sources, so that the level of accident reporting from each source could be compared:

- Ministry of Transport CAS Database
- ACC Database
- St John Database

The Ministry of Transport's accident database is the primary database providing accident statistical information to those working in the land transport area. ACC supplied a database containing information on people injured while cycling or walking in Christchurch, Hamilton and Palmerston North in 2002. These data contained details of the person injured, the data of accident, type of injury, and general scene of accident. St John provided a database of all callouts logged involving motor vehicle, cyclist and pedestrian accidents in the Canterbury, West Coast and Nelson/Marlborough regions between 2000 and 2002. These data contained a description of the location of the accident and the date and time of accident.

Our analysis of CAS and St John data in Christchurch for the three-year period between 2000 and 2002 indicated that for every cyclist injury accident reported in the CAS database, there is an additional 0.84 reported in the St John database (Table 1).

Table 1: Reported Number of Cycling Accidents (2000 – 2002)

CAS	St John	Matching	Underreporting Factor
339	402	117	1.84

A further analysis was undertaken using 2001 data from CAS, St Johns and ACC. Figure 9 below illustrates the matching of these data.

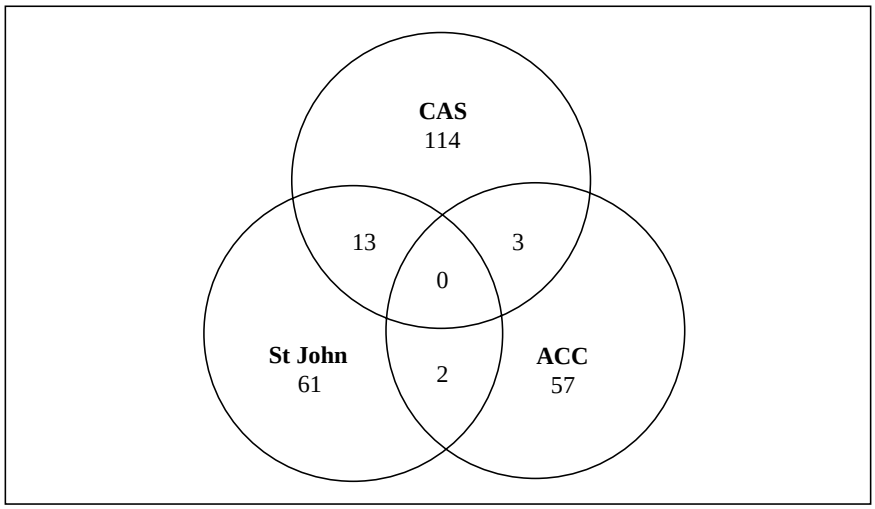


Figure 9: Cycle Accidents in Christchurch 2001

These data indicate that for every accident recorded in the CAS database, there is an additional 0.92 accidents reported in either the St John or ACC database. Notably, there are a particularly small proportion of accidents in the ACC database (8%) that match with accidents in either the CAS or St John database. Comparatively CAS (12%) and St John (20%) have a higher proportion of accidents matching with the other two databases. It is unclear whether accidents coded as minor would be picked up in the ACC database. It is

likely that the majority of St John accidents are serious accidents involving hospital admission. Hence, it is expected that a number of the CAS accidents would not be picked up in St John database. The comparison indicates that either there is a significant proportion of accidents not reported in each of the databases or that the data on location and time/date of accident from each source are incorrectly given or coded. Further research is required to determine the level of under-reporting in each database.

REPORTING RATES FOR PEDESTRIANS

Our analysis of CAS and St John data in Christchurch for the three-year period between 2000 and 2002 indicated that for every pedestrian injury accident reported in the CAS database, there is an additional 0.47 reported in the St Johns database.

Table 2: Reported Number of Pedestrian Accidents (2000 – 2002)

CAS	St Johns	Matching	Underreporting Factor
260	227	104	1.47

Pedestrian accidents were difficult to identify in the ACC database hence no analysis was undertaken with their data.

CONCLUSIONS/SUMMARY

The key results from the research are as follows:

1. The number of cycle crashes observed in the 10 to 20 year age group was much lower than the number of trips made by this age group. The reverse was found in the 30 to 40 age group which had a higher proportion of crashes compared to the number of trips, although this age group is more likely to travel on higher volume roads and make longer trips.
2. Pedestrian crashes were more prevalent on recreational and other (eg. shopping trips) compared with commuter trips. The over 80 plus age group were over-represented in the crash statistics compared with there number of trips.
3. The major crash injuries for both cyclists and pedestrians were crazes and bruises. Head injuries were more common in cycle crashes than pedestrian crashes.
4. Around 30% of cyclists reported losing balance, often on loose or slippery surfaces. 76% of cyclists reported that vehicles failed to see them or give-way. Only 5% of cycle crashes involved the opening of a car door or being squeezed by traffic.
5. Around 45 % of pedestrians reported tripping, often on loose or slippery surfaces. 72% reported traffic failed to notice them or give-way. 24% of pedestrians admitted not complying with the green man at traffic signals, slightly down on what was observed.
6. The observed non-compliance rates (on red man) at traffic signals varied from 10 to 40%, with the lowest levels in the middle of the day and during the middle of the peak periods, when traffic volumes were highest. Peak non-compliance occurred just before the morning peak and just after the evening peak, when a high proportion of trips are by commuters. However this does not seem to cause too many crash problems as commuters are overall under- represented in the crash statistics.
7. When comparing the crash reports in the three databases available (ACC, CAS and St Johns Ambulance) there appears to be a lot of under-reporting as there is not a lot of common crashes in the databases. In particularly, the ACC database has few crashes reported in the CAS and St Johns Ambulance databases.

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