Cycling Data and Indicator Guidelines

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Commonwealth Department of Health and Aged Care

In '*Developing an Active Australia: a framework for action for physical activity and health*', it is recommended that the Department of Health and Aged Care 'establish operational links to recognise the roles and responsibilities of relevant sectors, such as transport and the environment, in the implementation of a national physical activity strategy'. These Cycling Data and Indicator Guidelines will assist in understanding the benefits of cycling for the health, transport and environment of all Australians.

The Department encourages Australians to become physically active to improve their health, through activities that can be easily incorporated into everyday life, such as walking and cycling as a means of transport and recreation.

Australian Bicycle Council

The Australian Bicycle Council oversees the advancement of cycling in Australia, via the implementation of "Australia Cycling – The National Strategy". The Council functions as the Austroads Bicycle Reference Group, to provide advice to on cycling matters, research needs, and emerging issues.

These Cycling Data and Indicator Guidelines provides State and Territory government agencies and key stakeholder organisations with the framework for the collection of cycling data and the development of cycling indicators. When data is collected and indicators calculated as outlined in these guidelines, it can then be aggregated to obtain a national picture of cycling.

Contents

1. Executive summary

The development of the 'Guidelines for Cycling Data and Cycling Indicators' has arisen from objective 5.2 of 'Australia Cycling, The National Strategy 1999-2004' – "to identify data requirements and report comparable state and territory data about cycling to provide a national perspective". These Guidelines provide a framework for the reporting of comparable state and territory cycling data. The Australian Bicycle Council (ABC) undertook responsibility for the development of this framework with funding provided by the Commonwealth Department of Health and Aged Care. On behalf of the ABC, VicRoads, through the Bicycle Programs section was responsible for the management of the project. The Consultant who developed these guidelines was Steer Davies Gleave.

One of the key goals of the National Cycling Strategy is an increased participation in cycling. The development of the 'Guidelines for Cycling Data and Cycling Indicators' will allow the measurement of progress towards this key goal, as well as other objectives within the strategy. They will also guide each state in collecting cycling data that will allow the creation of a national picture of cycling.

The Guidelines do not imply a requirement for the states or territories to collect or report cycling data. Rather they provide guidance for those that choose to collect and report. A fundamental principle of the guidelines is that the data should be collected in such a way that it can be compared with that collected by other states and territories. To this end the Guidelines set out a nominated core set of data that the states and territories are encouraged to follow.

These Guidelines recommend reporting on 19 items of base cycling data and 30 cycling indicators. The indicators are derived by normalising the base data against either population characteristics or bicycle network characteristics. Base data and indicators have been selected based on outputs and outcomes. For example, the length of bicycle network is an output and the number of kilometres cycled is an outcome. Cycling inputs such as funding and processes have not been included as it was determined that these are not as relevant to the cyclist as direct outputs and outcomes. Furthermore their inclusion would have expanded the nominated set of base data and indicators to a level that would be unmanageable.

The base data and indicators have been organised under five categories that best represent the breadth of cycling output and outcome information. These categories are ownership (including theft), infrastructure, usage, cyclists and safety (including crashes). It is recommended that a three-staged approach to collecting and reporting of the nominated base data and indicators be used. Stage 1 indicators represent the information that is the most important at a broad level. Stage 2 and 3 indicators include information that is more disaggregate and provides depth of information within each of the five categories. There are eight indicators in Stage 1, 11 in Stage 2 and 11 in Stage 3.

There is much data that is already collected and reported in a consistent and comparable manner on a state by state basis as well as nationally. States and territories can therefore focus their data collection efforts and resources on the remaining data. States and Territories can of course collaborate on, or independently undertake data collection exercises. It is recommended that the reporting of the nominated cycling data and indicators occurs at least every two years.

2. Introduction

The Guidelines nominate a set of fundamental data, external rates and indicators to be collected and reported by each state and territory. It is proposed that the fundamental data and indicators be reported on a regular basis. The report will provide a picture of the 'State of Cycling' in each state and territory, and will over time identify trends in the cycling usage, safety, infrastructure, ownership and cyclist demographics. The guidelines contain:

- A description of the fundamental data, rates and indicators
- Guidance on the aggregation of the data and indicators
- Guidance on the frequency of data collection
- Guidance on survey practice and process for the collection of the data
- Guidance on existing data sources
- Guidance on 'State of Cycling' reporting frequency.

The 'Guidelines for Cycling Data and Cycling Indicators' has been developed to facilitate each state and territory to collect a common set of cycling data and to report this data in a manner that is consistent and can be compared and aggregated. The guidelines:

- Do not prescribe specific collection methodologies
- Do not prescribe when data should be collected
- Do provide a framework for the data to be collected
- Do define the indicators and prescribe the required accuracy of the data

2.1 Fundamental data

Fundamental data is the base data that needs to be collected. Fundamental data would be reported in a 'State of Cycling' report and includes such things as the length of the bicycle network, the absolute numbers of bicycles owned and the absolute number of fatalities.

2.2 Cycling indicators

In order to compare states and territories and aggregate data from different states and territories it is necessary to normalise the fundamental data. Normalising data transforms the absolute numbers – for example, 5000 bicycles – to a rate – for example, 0.45 bicycles per person. These are then referred to as indicators. Normalised data or indicators allow for direct comparison between states with significantly different population sizes and bicycle networks.

2.3 External rates

In order to establish indicators, the data needs to be rated against other information, such as the number of people in the study area or the length of the bicycle network. The rate should be closely related to the data. Compare the following two indicators.

- The number of bicycles stolen as a proportion of the population.
- The number of bicycles stolen as a proportion of the number of bicycles owned.

The first indicator doesn't provide useful information because the rate isn't related to the fundamental data.

2.4 Outputs and outcomes

The focus of the data and indicators is clearly on outputs and outcomes. This approach has been taken as it is recognised that there can be different ways to achieve outputs and outcomes for cycling. The objective of the 'State of Cycling' reports is to measure progress towards cycling outputs and outcomes. Each state and territory will measure the progress of cycling in the context of the government policy, administrative structures and available resources relevant to them. The report does not seek to address how effective these different approaches are, but to measure how much progress is being made to further cycling.

2.5 Indicators – breadth and depth

The matrix on the following page sets out five categories to describe these cycling outputs.

- Ownership (incorporating theft)
- Infrastructure
- Usage
- Cyclists
- Safety (incorporating crashes)

These five categories provide the **breadth** to our knowledge of the state of cycling. Within each of these categories there are three levels – these provide the **depth**. This breadth and depth of knowledge is accumulated and reported on over time. Stage 1 indicators will be reported in the first 'State of Cycling' report, Stage 1 and 2 in the second report and Stage 1, 2 and 3 in the third.

2.6 Finite set of indicators

The nominated set of data and indicators have been selected as the most relevant set of indicators for which progress on the 'State of Cycling' could be measured following consultation with cycling representatives from all states and territories.

Cycling Indicators Breadth

Category	Ownership	Infrastructure	Usage	Cyclists	Safety
	Stage 1 I1.1 No. of bicycles owned per capita	I1.2 Length (km) of urban bicycle network per urban road network (km)	I1.3 Percentage		
Depth					

Table 2.1 Indicators

Ownership	Infrastructure	Usage	Cyclists	Safety
No. of bicycles owned	Length and type of bicycle network facilities in urban/non-urban areas	Bicycle kilometres travelled per annum	No. of cyclists	No. of fatalities
No. and type of bicycles sold per annum	No. of public bicycle parking places	Bicycle trips and their purposes per annum	Age	No. of police reported crashes
No. and type of bicycles stolen per annum		Bicycle trips and purposes per weekday/weekend	Gender	No. of hospital treated-casualties by length of stay
		Hours cycled per annum	License holding	
		Trip lengths	Personal income	
		Trip purposes		

Table 2.2 Fundamental data

3. Existing data sources

3.1 Introduction

There are a number of existing data sources which will be useful in developing the cycling indicators. The most relevant currently available data sets are outlined below. Further details on these databases, including contact details of the organisations who hold them can be found in Section '9'. In identifying these databases, the emphasis was on recently collected data, currently collected data and data that is likely to be collected in the near future. This data is the most relevant to the proposed 'State of Cycling' report.

3.2 The Australian Bureau of Statistics Australian Population Census

Since 1961 the Australian Bureau of Statistics has conducted a census of population and housing every five years. The objective of the census is to measure accurately the number and key characteristics of people in Australia on census night and details about their housing.

The census of population and housing is the recommended source for the key population characteristics used as the denominator in the cycling indicators. These include the number of people, age, sex and gross personal income.

3.3 The Victorian Activity & Travel Survey (VATS)

The Victorian Activity and Travel Survey (VATS) is a household-based survey conducted by the Transport Research Centre (TRC) at RMIT University. It provides a detailed description of daily travel and the out-of-home activity patterns of household members in Victoria. The survey records all travel by all members of the responding households in the survey sample. It covers 365 days of the year; this means that seasonal variations in travel and activity patterns can be observed. The survey samples households within the Melbourne Metropolitan Statistical District (MSD). VATS is the recommended data source for Melbourne data on cyclists and cycling trips.

3.4 The Sydney Household Travel Survey (HTS)

The HTS involves a personal interview carried out each day of the year. The survey is conducted by the Transport Data Centre, which is an agency of the NSW State Government. Data is reported on by financial year. Information is collected on the mode of travel used, the purpose of each trip, location of origin and destination, and time of departure and arrival. Detailed socio-demographic information is collected on the household, such as dwelling type and household structure, as well as the age, gender, employment status, occupation and income of each member of the household. Details of all vehicles used by the household are also collected. The Sydney HTS is the recommended data source for Sydney data on cyclists and cycling trips.

3.5 1999 Adelaide Household Travel Survey

This household travel survey involved a randomly selected sample of 9000 homes in the Adelaide statistical division. The survey was conducted between 29 March 1999 and 31 July 2000. All members of the sampled households were asked to report on two consecutive travel days. These travel days were rotated through the sample over the survey period, to insure that an equal number of households were sampled for each day of the week. Each household received a 'memory jogger', where they recorded basic

details about their travel. These details as well as personal and household details were then recorded in a face-to-face interview. The survey recorded travel by all modes. There are, however, no plans to repeat this survey in the near future.

3.6 Canberra–Quenbeyan Household Interview Survey 1997

A Household Interview Travel Survey was conducted in Canberra and Quenbeyan during the late summer and autumn of 1997. The survey sample covered 1791 dwellings in 176 zones, 19 875 trips and 5011 people were surveyed. The pilot survey was conducted between 8 and 9 February 1997 and the main survey between 25 February and 23 April 1997, with a break over the Easter period. The survey did not include weekends or public and school holidays. The design called for an equal number of surveys to be carried out for each day of the week. Residents under five were excluded. Respondents were asked about their travel over a 24-hour period, including travel by bicycle.

3.7 ACT Travel and Activity Data Survey.

The ACT's Planning and Land Management (PALM) group is in the second stage of a scoping study looking at the feasibility of an ACT Travel and Activity Data survey. The objective of the second stage is the full specification of the selected travel and activity survey and database system.

No commitment has been made at this stage to the undertaking of a survey once the pilot studies are completed. If such a survey were undertaken it is likely that it would adopt the continuous survey approach, with similar questions to the VATS and the Sydney HTS.

3.8 Queensland Regional Cycling Network Report – 1999

Queensland Transport engaged Ove Arup and Partners to undertake a study on the existing bicycle facilities, infrastructure and resources allocated to cycling by Queensland local authorities. This study should provide base data on cycling facilities and allow comparisons to be made in later years.

3.9 SafeST Research - Queensland – 1998 & 1999

This study undertaken by MCR for Queensland Transport/BCM partnerhship presents the findings of a statewide telephone survey of adults on a range of issues including bicycle usage and behaviours of adults, bicycle and helmet usage of children, safety campaigns, SafeST programs, and choices of transport modes. This study was undertaken in 1998 and again in 1999. It is planned for this study to be undertaken annually to provide trending data.

3.10 Injury Deaths Australia 1979–1998

The National Injury Surveillance Unit (NISU) has developed a data set that reports Australian injury related deaths from 1979, in a uniform fashion. NISU plans to release one set of summary tables each year – the latest set of summary tables includes 1998. These tables present injury and poisoning death counts and rates per 100 000 population by five-year age groups and sex. Information on cycling injuries is restricted to deaths – see Section '9.7' for explanatory notes on key aspects related to cycling injuries.

3.11 National Hospital Morbidity Database (NHMD)

The Australian Institute of Health and Welfare (AIHW) maintains a National Hospital Morbidity Database (NHMD). The NHMD is compiled by the Institute from data supplied by the state and territory health authorities. It is a collection of electronic summary records for patients separated, in public and private hospitals in Australia. All records are based on separation dates.

Records are for hospital separations (discharges, transfers, deaths or changes in type of care) for each financial year. A record is included for each separation, not for each patient, so patients who separated more than once in the year have more than one record in the database. It is worth noting that separations are prone to influence from funding policies such as case-mix. Therefore, care must be taken to differentiate changes in the number of separations recorded over time resulting from changes in funding policies, from those changes resulting from other reasons.

Almost all hospitals in Australia are included – public acute and Department of Veterans' Affairs, public psychiatric, private acute and psychiatric and private free-standing day hospitals.

The National Hospital Morbidity Database compiles data using the ICD-10-AM classification for external causes of injury. This classification includes categories for injuries to cyclists. The database is compiled annually, with a summary of the data released in the following June. Following this the data are also available beyond this publication (provided that requests for the data are approved by the states and territories, where applicable). Fees are charged for some requests.

3.12 Serious Injury Database, Australian Transport Safety Bureau.

The Australian Transport Safety Bureau (ATSB) collects national road toll statistics; they then analyse the data and publish their results. A detailed research data set is compiled from material forwarded by each jurisdiction. The data is derived primarily from crash unit record data forwarded from police and transport authorities in each state and territory. This is called the Serious Injury Database. It comprises unit records of each serious crash – that is, crashes that are either fatal or result in hospitalisation, unit records on each vehicle involved, unit records on each person injured and unit records on each driver or rider.

Cycles and cyclists are identified separately in the records on vehicles and people. The database comprises about 30 data items about the crash, vehicles and people. The database covers the period from 1989 to 1996. Later material is available for some states and territories, but national data post 1996 is not currently available.

In 1991, the Federal Office of Road Safety (FORS, now ATSB), published a report titled 'Road crashes resulting in hospitalisation, Australia, 1991 – ISSN 1321-4179". In the report the overall police and hospital counts are also compared in an assessment of the strength of the two data sources. One of the key findings of the report, with regard to cyclist was that 'the police data appear to have underestimated pedal cyclists, especially child cyclists." The police count of pedal cyclists hospitalised across Australia, represented only 20% of hospital admissions for pedal cyclists.

In 1993, the Federal Office of Road Safety (FORS, now ATSB), published a report titled 'Development of data Collection Methodology: Crashes resulting in hospitalisation and casualty crashes not resulting in hospitalisation – ISBN 0 642 5126 8". One of the key findings of the report was that "much road safety research has been based on the use of Police-reported crash data. This report has shown that these data have the following major problems: underreporting and inaccuracy in coding of crash severity and lack of information on the nature of the injury. The magnitude of these problems varies among jurisdictions ad among crash types. Underreporting is greater for crash types involving children and non-motor vehicles."

The ATSB (formerly FORS) has noted the need for the inclusion of hospital based data, and the issue with the recording of hospital separations being prone to influence from funding policies such as case-mix. It has been observed that while admissions have been on the increase, stays in hospital greater than two days have remained stable. The ATSB is therefore currently working on only including records of hospital stays of two days or more in the Serious Injury Database.

3.13 Bicycle Imports

The Bicycle Industries and Traders Association (BITA) purchases data on bicycle imports from Australian Customs. This data is reported quarterly in categories determined from the customs recording requirements – children's bikes, adult bikes, frames, forks, frames with forks, and front-wheel-out bikes and is published in the magazine *Bicycle Trade*.

Bicycle imports do not necessarily reflect sales in the same period, as wholesalers and retailers will have older stock for sale as well as new stock. The Australian bicycle market is dominated by imports. The number of Australian made bicycles is negligible.

3.14 WA Attitudes Towards & Participation In Cycling, Wave 3 – March 2000

In March 1999, Hides Consulting Group Pty Ltd was commissioned by the Department of Transport (WA) to conduct research into the effectiveness of a cycling awareness campaign by Bikewest. The aim of the research is to monitor changes in the behaviour, attitudes and intentions of the population to cycling and cyclists. This report summarises the findings as reported in March 2000; where appropriate, comparisons are made with the earlier surveys.

Specifically, the research aims to provide information on

- bike ownership
- purposes of riding
- estimated distance travelled per week
- proportion of the population that respondents estimate regularly ride a bike
- intention of non-owners to buy a bike
- associated reasons
- factors that might encourage non-owners to buy a bike.

The research undertaken consisted of a telephone survey of 402 adults aged 18 and over residing in Perth, excluding those that are, for example, infirm, hospitalised, in aged care. The raw data set was weighted by Australian Bureau of Statistics gender and age census estimates to ensure the sample accurately reflected the Perth population.

3.15 WA 'Cycle Instead' Television Ad Campaign Evaluation – Dec 1999

During 1999 Bikewest produced two television advertisements as part of their 'Cycle Instead' campaign that aimed to increase the proportion of journeys made by bicycle amongst people aged 25 to 55 years. Bikewest commissioned Hides Consulting Group Pty Ltd in October 1999 to conduct an evaluation of the 'Cycle Instead' television campaign. The overall objective of the campaign evaluation was to assess the effect of the television advertisements on the public's attitudes and behaviour towards cycling.

Specific objectives of the research were to ascertain the

- current cycling behaviour of respondents

- information sources used by respondents in relation to cycling issues
- level of awareness of the 'Cycle Instead' campaign
- unprompted and prompted recall of the two cycling television advertisements
- impact of the television advertisements on cycling attitudes and behaviour
- selected demographic information.

The research undertaken consisted of a telephone survey of 400 adults, aged 18 years and over residing in Perth, excluding those that are infirm, hospitalised, in aged care, etc. The raw data set was weighted by Australian Bureau of Statistics gender and age Census estimates to ensure the sample accurately reflected the Perth population.

3.16 ABS Household Supplementary Surveys

The Australian Bureau of Statistics undertakes surveys of the population in addition to the regular census. These surveys are either undertaken by the ABS in the course of their normal activities or are specially commissioned in response to requests from the states and territories. In the past there has been a number of specially commissioned surveys which examined amongst other things – cycling. These surveys are city / state specific and are in most cases at least ten years old. The data from these surveys can provide a useful historical perspective. References for some of these ABS supplementary surveys have been included below.
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ABS 9215.5: Bicycle Usage and Safety, Western Australia

Contains data on patterns of bicycle ownership and usage, destinations of bicycle trips, usage of safety accessories on bicycles and safety gear worn by cyclists, level of bicycle theft and bicycle accident rate and severity.

ABS 4505.1: Bicycle Use and Safety, New South Wales

Covers the extent of bicycle riding, patterns of use, bicycle accidents, theft, use of safety equipment and factors that would encourage cycling. Includes some regional data.

ABS 4503.4: Bicycle Usage And Safety, Adelaide Statistical Division

Estimates, derived from a household survey, on bicycle ownership and usage; use of safety devices and protective equipment and incidence of bicycle accidents and thefts.

ABS 9201.2: Travel to Work, School and Shops, Victoria

Details of travel patterns of commuters to work, school and shops. The extent of use of public transport, reason for not using public transport, time of day trip made and distance travelled. Demographic information on commuters is available. Comparisons with previous survey in 1984 are also included.

ABS 9201.4: Journey to Work, School and Shop, Adelaide Statistical Division

Provides information about modes of travel to and from work and to place of education. Details are available on time of departure, time taken, whether passengers taken, reasons for taking/not taking passengers and reasons for not using public transport. Information is also available on the activities conducted on the way to and from work.

4. Survey practices and processes

4.1 Introduction

While these Guidelines do not prescribe specific survey techniques for collecting cycling data, there are four main recommended types of surveys.

- Document and database searches
- Counts
- Intercept surveys
- Home interviews

This section will make some general comments about data collection issues and then make some specific comments in relation to the above types of surveys.

4.2 Data collection area

It is recommended that the base data is collected in study areas that are consistent with the geographic areas used by the Australian Bureau of Statistics (ABS). This will ensure consistency with the population characteristics used to determine the indicators; also reporting of the base data and the cycling indicators will be based on these geographic areas. For specific information on these geographic areas please refer to the ABS. Given the fact that there is a relative low rate of cycling, it is recommended that indicators are not used for anything more geographically specific than a statistical division (a statistical division corresponds closely to the definition of a capital city).

4.3 Sampling

Most of the data collected for calculating cycling indicators will come from sample surveys. While this is clearly the case for usage data obtained from household travel surveys it is also the case for other data that might appear to be census data. For example, even though accident records might include all fatal bicycle accidents in a given year, data collected over one year is simply a sample from data over a longer period of time. Even if the average fatal accident rate did not change over time, each year would give a different number of fatal accidents, simply due to sampling errors (chance events).

In deciding how large a sample to obtain, three factors need to be considered.

4.3.1 Confidence limits

How precise do we want the sample results to be? If the average number of cycling trips per person per year is 20, would we be happy with an estimate that says it is between 10 and 30? Or would we want it to be more precise – say between 15 and 25, or between 19 and 21? The more precise estimate can only be obtained by collecting a larger sample of data. The range we specify is called the ‘confidence limits’.

4.3.2 Levels of confidence

No matter what confidence limits we specify above, we can be sure that with some samples the estimated answer will lie outside that range – for example, our sample happened to have, purely by chance, a large number of non-cyclists. If we repeated our sample selection over and over again, sometimes we would obtain results that lie outside our confidence limits. The proportion of results from repeated sampling that lie inside our confidence limits is called the ‘level of confidence’. Once again, we can only increase our

level of confidence by increasing the sample size. By convention, a level of confidence of 95% is often used for sample surveys – that is, we are willing to have our estimated answer lie outside the confidence limits, around the true mean, on 5% of occasions.

Both the level of confidence and especially the confidence limits need to be set by the client. Lower confidence limits and higher levels of confidence will require larger and more expensive samples.

4.3.3 Inherent variability

Variables, which are more inherently variable, will require larger sample sizes than variables that are less inherently variable. The extent of this variability needs to be estimated from prior knowledge before the required sample size can be calculated.

In estimating sample sizes, there are two types of variable that need to be considered: continuous variables and discrete variables. A continuous variable has a mean that can be any finite number – for example, the average hours spent cycling per year. The variability of a continuous variable can be measured by the standard deviation, while the relative variability can be measured by the coefficient of variation – the standard deviation divided by the mean. A discrete variable is one that measures the presence or absence of a characteristic. The mean of a discrete variable is given as the percentage of the population having that characteristic – for example, the proportion of people who cycle on any given day.

For each type of variable, sample sizes are calculated in slightly different ways (the details of these methods may be found in Richardson et al, 1995, pp 103-115). The required sample sizes for various conditions have been summarised in Tables 5.1 and 5.2 below. In each of these tables the required sample is much smaller than the population from which the sample is being selected – that is, less than 20% of the population. If this is not the case, refer to Richardson et al. (1995) for an explanation of how to correct for this effect. These tables also assume that a level of confidence of 95% is being used.

Table 4.1 shows the required sample size for estimating a continuous variable. As a first step, the standard deviation of the variable to be measured must be estimated from prior experience or other surveys. This is then expressed in terms of the coefficient of variation by dividing the estimated standard deviation by the estimated mean. The confidence limits must then be selected as a proportion of the estimated mean. The required sample size is then read from the table. For example, assume that you need to estimate a continuous variable and from a previous survey you found that the mean was 250 and the standard deviation was 100. The coefficient of variation is then 40%. Assume that the new estimate from the sample survey needs to lie within 5% of the mean – that is, within 12.5 of either side of the estimated mean of 250. From Table 4.1, we see that we need a sample size of 246 observations.

Coefficient of Variation	Confidence Limit as a Proportion of Mean					
	1%	5%	10%	20%	50%	100%
10%	384	15	4	1	0	0
20%	1537	61	15	4	1	0
30%	3457	138	35	9	1	0
40%	6147	246	61	15	2	1
50%	9604	384	96	24	4	1
60%	13830	553	138	35	6	1
70%	18824	753	188	47	8	2
80%	24586	983	246	61	10	2
90%	31117	1245	311	78	12	3
100%	38416	1537	384	96	15	4
110%	46483	1859	465	116	19	5
120%	55319	2213	553	138	22	6
130%	64923	2597	649	162	26	6
140%	75295	3012	753	188	30	8
150%	86436	3457	864	216	35	9
160%	98345	3934	983	246	39	10
170%	111022	4441	1110	278	44	11
180%	124468	4979	1245	311	50	12
190%	138682	5547	1387	347	55	14
200%	153664	6147	1537	384	61	15

Table 4.1 Sample sizes for continuous variable (95% level of confidence)

Table 4.2 shows the required sample size for estimating a discrete variable. As a first step, the estimated mean proportion must be obtained from some source or from experience. The confidence limits must then be selected as a proportion of the estimated mean proportion. The required sample size is then read from the table. For example, assume that a discrete variable is required to be estimated, and from a previous survey it was found that the mean proportion was 40%. Assume that the new estimate from the sample survey needs to lie within 10% of the mean – that is, within four percentage points of either side of the estimated mean of 40%. From Table 4.2 we see that we need a sample size of 576 observations.

Mean Proportion	Confidence Limits as % of Mean Proportion					
	1%	5%	10%	20%	50%	100%
0.01	3803184	152127	38032	9508	1521	380
0.05	729904	29196	7299	1825	292	73
0.10	345744	13830	3457	864	138	35
0.15	217691	8708	2177	544	87	22
0.20	153664	6147	1537	384	61	15
0.25	115248	4610	1152	288	46	12
0.30	89637	3585	896	224	36	9
0.35	71344	2854	713	178	29	7
0.40	57624	2305	576	144	23	6
0.45	46953	1878	470	117	19	5
0.50	38416	1537	384	96	15	4
0.55	31431	1257	314	79	13	3
0.60	25611	1024	256	64	10	3
0.65	20686	827	207	52	8	2
0.70	16464	659	165	41	7	2
0.75	12805	512	128	32	5	1
0.80	9604	384	96	24	4	1
0.85	6779	271	68	17	3	1
0.90	4268	171	43	11	2	0
0.95	2022	81	20	5	1	0
0.99	388	16	4	1	0	0

Table 4.2 Sample sizes for discrete variables (95% level of confidence)

4.4 Expanding the sample data to population estimates

Results obtained from a sample survey only describe the characteristics of that sample. However, under certain conditions, those results can be used to estimate the characteristics of the population from which the sample was drawn. For example, if

- the sample was drawn in a truly random and representative fashion from the population, then the population results can be estimated by expanding the sample results by the inverse of the sampling fraction.
- the sample is not representative of the population, it can be used to estimate the population characteristics, provided that the relationship between the sample and the population is known.

Therefore, it is always important to know how the sample relates to the population from which it is drawn. In household travel surveys, we can expand samples by comparing the sample results with results obtained from the ABS Census of Housing and Population. For example, the number of households of various sizes in the sample is compared with the number of households of various sizes in the census. By calculating the ratios between the census and the sample survey results, expansion factors are calculated that ensure the expanded sample survey results have the same distribution of household size as the census.

A similar process can be applied to all types of sample survey, provided that some information is obtained about the population at the same time as information is collected about the sample. For example, if

- an intercept survey is conducted on a bicycle path, then it is imperative that some information also be collected about the population of cyclists using that path at that time. At a minimum, the total number of passing cyclists should be counted. Preferably, other easily recorded information such as age and sex of passing cyclists should also be collected to compare with the characteristics of the sampled cyclists, and to enable the calculation of appropriate population expansion factors.

A more complete description of the need for collecting such information is provided in Richardson (1999).

4.5 Designing surveys

As mentioned earlier, there are four main survey types that could be useful in collecting data for cycling indicators. They are:

- Document and database searches
- Counts
- Intercept surveys
- Home interview surveys

4.5.1 Document and database searches

In order to minimise the cost and effort involved, much of the data to be used calculating the cycling indicators will come from existing sources. These data could be in the form of reports, data tabulations or unit record files. In using data from these sources, however, it is important to ask a number of questions.

- What was data originally collected for? This will influence a wide range of decisions about the data collection.
- What population was represented by the data? For example, some household travel surveys exclude children under ten. This may be a problem when studying cycling, given the number of children under ten who cycle. Similarly, some surveys don't include weekend travel; this could exclude large amounts of recreational cycling.
- What definitions are used for the variables? While using the same words, different surveys will have different definitions for key variables. For example, what is the definition of a 'cycle'? What is meant by a 'trip'? Some surveys collect and report information on single-mode 'trip stages', while others collect and report on 'multi-mode trips', where minor modes such as bicycle are over-ridden by major modes such as train.
- Was the sample selected in a random and representative manner? If not have the various biases in the sample data been recognised and corrected to obtain representative population results?
- How was the data collected? What quality control procedures were employed? Different survey methods have different inherent biases. If these biases are left uncorrected, a comparison between different surveys could be more of a comparison between survey methods than a comparison of the variable.

4.5.2 Counts

While existing data sources provide some information, you will probably need to collect further information in the field. One of the simplest methods, especially for gathering overall measures on the level of cycling, is to count passing cyclists. While such surveys provide little information about the characteristics of cyclists, they do provide information on the overall magnitude of bicycle flows. If collected continually, such data can be very useful in providing control counts of total bicycle flows. In considering a count the following questions need to be addressed.

- Are the counts to be done manually or automatically? Manual counts are the simplest, but they are costly on an ongoing basis. There are also the problems of selecting survey sites and times of observations, which can seriously bias the count data. Automatic bicycle counters are now available, but they are relatively expensive initially.
- Where are the counts to take place? Ideally, the counts should take place at random sites on the bicycle network. If an inventory of the bicycle network is available, it is not too difficult to select a set of random survey sites from which population estimates of bicycle flow can be calculated. Survey sites should not be selected on the basis of convenience, unless due account is taken of the site

selection biases in the expansion of the sample survey results to obtain estimates of how extensively the total network is used (see Richardson, 1999).

- When are the counts to be performed? If manual counts, they should be done at certain times of the day, on certain days of the week and at certain times of the year. It is well known that bicycle flows vary by time of the day, day of the week and season of the year. Hence any survey will need to account for these biases. In addition, recent research (Richardson, unpublished) has shown that bicycle flows are affected by weather conditions – lower in very hot, very cold and very wet weather. These findings have two important implications. First, if a count is done on a very hot, very cold or very wet day, then the results will need to be adjusted up to account for the effect of inclement weather on bicycle flows. Second, and more importantly, if a count is done on a fine and dry day (as almost all bicycle counts are), then the results will need to be adjusted down to account for the fact that bicycle flows on fine dry days are higher than they are on an average day. Indeed, bicycle counts done under any weather conditions will need to be adjusted to reflect the flows that would have been observed on an average day of the year.

4.5.3 Intercept surveys

While counts are useful in obtaining overall magnitudes of bicycle use, they do not provide much information about the characteristics of the cyclist or of the trip being undertaken. To find this information, contact must be made with the cyclist. Because cycling is a relatively rare activity, it is difficult to obtain this information by random selection from the population (as would occur in a household interview). A more economical means is to go to a bicycle track or path and select respondents from a passing population of cyclists. This type of survey has the same problems with choosing a survey site and time as does counts. In addition, there are five extra problems:

- In order to perform an intercept survey, it is necessary to randomly select cyclists from the passing flow. Various methods are available to ensure a truly random selection of cyclists. The simplest of these methods involves selecting a sampling interval (n) – every n^{th} cyclist is selected for the intercept survey. It is critical that interviewers adhere rigidly to this selection process and don't select those cyclists who look like they would be easiest to interview.
- Once selected, it is important that the cyclist stops. It is known that there are biases in which type of cyclist is most likely to stop for an interview. For this reason, it is important that basic characteristics – age, sex and size of the group in which the cyclist is riding – of all the selected cyclists are obtained.
- Once stopped, it is important that the cyclist completes any trackside interview, which may be undertaken. In some cases the trackside interview is the complete survey. However, in an intercept survey, the cyclist is being intercepted in the middle of a trip. If the survey requires details about the whole trip or about the whole day of cycling, obviously any information given in the trackside survey can only estimate later behaviour or events.
- If information is required for the whole trip, then the cyclist needs to agree to fill out a questionnaire later. They could, instead, provide a phone number for a follow-up by phone.
- Only a proportion of those accepting the questionnaire or agreeing to a follow-up will actually complete the survey. Since there are known biases in this process, the importance of collecting basic information about all selected cyclists is again emphasised.

A more complete description of the processes involved in an intercept survey of cyclists is provided in Richardson (1999).

4.5.4 Home interviews

While intercept surveys can provide detailed information about the characteristics of cyclists and cycling trips, they do not provide information about the total spectrum of trips undertaken by the general population. For this information you need to undertake a more general survey of the population, in which details of all trips undertaken are obtained. However, these surveys do not provide much information about

cycling trips, simply because cycling is only a small proportion of all trips undertaken. They do, however, place cycling trips in context and are necessary for calculating mode shares and other parameters.

All existing household travel surveys use some form of home interview, and these will continue to yield valuable information about cycling trips as an integral part of overall travel survey. The following discussion applies to new surveys that aim to collect data for calculating cycling indicators

There are essentially three options for home interviews data.

- personal face to face interview
- personal telephone interview
- mail-out and mail-back self-completion questionnaire

Personal face-to-face interview

A personal face-to-face interview is involves an interviewer asking a number of questions and recording the responses.

The advantages of this method for the current study would be:

- Higher response rates– response rates of the order of 75% to 85% are not uncommon. This tends to minimise the effects of non-response bias.
- Consistent responses – the interviewer can explain the meaning of questions or how to answer particular questions
- Scope to collect qualitative information – attitudes, opinions, open-ended verbal answers and other non-quantitative information are much more readily collected in a personal interview than in a questionnaire.
- Better control over respondent interest – the interviewer can maintain the respondent's interest and ensure that the full set of questions is completed.

While being particularly effective in several aspects of transport data collection, personal interviews are not without their disadvantages.

- They are relatively expensive. Typically they would be three to ten times more expensive per returned questionnaire than a self-completion or phone survey.
- Because they tend to cluster households or survey sites on a geographic basis, they can reduce the 'effective sample size', which reduces the accuracy of estimates from the data.
- Because they involve interaction between an interviewer and a respondent they are rarely, if ever, completely neutral. The resulting interviewer bias may affect each participant and hence the data collected in various ways.

In summary, personal interviews are best suited to attitude surveys – that is, surveys where the concepts are complex or where there is a complex series of sequencing required. They are, however, more expensive than other types of survey; the need to cover large geographic areas means that they are not practical in a metropolitan, city or statewide approach.

Telephone surveys

The telephone survey method has a number of advantages.

- They offer the possibility of wide geographic coverage without clustering.
- Because they are performed from a central location, it is easier to supervise the interviewers and so maintain a higher level of quality control.
- They use of Computer Assisted Telephone Interviews (CATI), which allows rapid checking of responses for consistency and answers are automatically entered into the computer.

- They are generally cheaper than personal interviews. They require fewer interviewers and there are no field or travel costs.
- They allow for a central core of multilingual interviewers who can be called to the phone when language problems occur.
- They result in a 60 to 75% response rate, because they can be supported by an introductory letter and several call-backs at different times.
- However, the telephone survey method also has some disadvantages.
- There is a limit on the length of survey that can be successfully completed over the phone. While some individuals will be willing to spend as much as 20 minutes or more being interviewed by telephone, the overall response rate drops rapidly after about 10 to 15 minutes.
- The number of people in a household with whom it is possible to carry out the interview is almost always limited to one.
- Because of the fact that only those households with phones can be included in a telephone survey, there is an obvious potential for sample bias to occur. Although phone ownership is over 95% in most Australian cities, and random digit dialling can be used to eliminate the problem of unlisted numbers, it is known from previous analyses that households without phones are also more likely not to own bicycles. Therefore, a telephone survey will over-represent bicycle users in the selected sample.
- Unlike other forms of survey, there is no chance of follow up for non-respondents in a telephone survey. If a respondent refuses to participate in the survey, then little or no background information on this respondent can be obtained.

Self-completion questionnaires

Self-completion questionnaires are one of the most widely used ways of surveying transport use. Self-completion questionnaires allow the respondent to complete the questionnaire in their own time. They have a number of advantages.

The primary advantages of a self-completion survey include:

- They are generally much less expensive than a comparable personal interview.
- They allow wide geographic coverage because postal charges do not vary by distance.
- They eliminate interviewer bias.
- They allow the respondent to choose the time and place in which they complete the questionnaire

However the self-completion questionnaire is not without considerable difficulties.

- Response rates are generally low – reported response rates of between 20 and 50% are not uncommon; this allows ample opportunity for serious biases to enter the data.
- The layout and wording of the questionnaire must be extremely clear and simple –definitions must be clear and easily understood by the population being studied – the amount of time and effort which must be put into questionnaire design is therefore considerable.
- Responses from self-completion surveys tend to be skewed towards the more literate sectors of the population – this will seriously skew the results.
- Only simple, one stage questions can be asked – questions that require complex filtering usually need the skill of an interviewer.
- There is often no chance to probe further to clarify ambiguous or unclear answers – in self-completion questionnaires, the answers on the questionnaire must be accepted as final.

In summary, self-completion questionnaires are characterised by the ease with which they can cover a wide geographical area and their moderate cost. However, response rates are generally lower and substantial effort needs to be invested in their physical design and appearance. Finally, the desirability of using reminder letters or questionnaires to increase response rates means that the entire survey period needs to be considerably longer than for personal interviews.

5. Aggregating Indicators and Reporting Frequency

Aggregating Indicators

Fifty three percent of the nation's population live in the five largest cities – Sydney, Melbourne, Brisbane, Perth and Adelaide. A further 10% live in the remaining capital cities – an overall proportion (63 percent) which has remained relatively constant since 1971. Almost two-thirds of Australia's population lives in cities over 100 000. Many of the remaining urban centres are provincial cities or towns in rural areas. Remote towns and indigenous settlements accommodate around 2% of Australia's population (Newman et al., 1996, as reported in EINSoER-hs)

Size of Urban Centre	Population	Percent Share	Cumulative Percent Share	No. of Urban Centres
1,000,000 and over	8,529,482	47.7%	47.7%	4
500,00 - 999,999	978,100	5.5%	53.2%	1
100,000 - 499,999	1,650,347	9.2%	62.4%	8
50,000 - 99,999	546,220	3.1%	65.5%	8
20,000 - 49,999	1,197,677	6.7%	72.2%	42
10,000 - 19,999	689,243	3.9%	76.0%	51
Less than 10,000	1,790,533	10.0%	86.0%	628
Total Urban	**15,381,602**	**86.0%**		**742**
Localities 200 - 1,000	450,267	2.5%	88.5%	919
Rural balance	2,049,248	11.5%	100.0%	
Total	**17,881,117**	**100.0%**		

Source: ABS (1997), Demography Section, Special Tabulation (as reported in Environmental Indicators for National State of the Environment Reporting – human settlements.

Table 5.1 Number of urban centres and localities, Australia 1996

In developing national cycling indicators, two conflicting factors must be taken into account:

Cycling data is currently much more available in the capital cities of Australia. Very few surveys of cycling have been conducted in provincial cities or rural areas. A major exception to this trend is the '1985–86 Survey of Day-to-Day Travel in Australia', conducted for the Federal Office of Road Safety (FORS). This survey covered about 18 000 households, including 14 500 in capital cities and 3500 in provincial cities and rural areas. This is unlikely to change in the future, as survey resources are directed towards the larger urban areas.

- From the limited data that is available (FORS 1985–86), it appears that cycling plays a larger role in transport outside of the capital cities. In NSW, the bicycle mode share in areas outside Sydney was 4.5% compared with 1.6% in Sydney (Milthorpe et al., 1993). Corresponding analyses on Victorian data show that the bicycle mode share in areas outside Melbourne was 5.6% compared with 3.1% in Melbourne.

These conflicting factors pose a problem. While national cycling use would be enhanced by including non-capital city data, it is likely that such data would be more difficult to obtain. One option is to simply report on capital city cycling, since the environmental imperative for increasing cycling is most urgent in the capital cities. Alternatively, one could allow for non-capital city cycling by assuming that the bicycle mode share in non-capital cities is a multiple of that in capital cities (based on a more complete analysis of the FORS 1985 data).

Whichever of the above methods is adopted, the national aggregate figures must be calculated as a population-weighted average of the individual results for each city or region.

Reporting Frequency

It is recommended that the cycling indicators be reported every two years. This will allow information to be presented as soon as possible after it has been collected but also acknowledges the constraints on the resources available to collect this data.

If states and territories collect and report with the same frequency, it will assist in comparing the data between states and territories. Most of the existing databases outlined in the section 'Existing data sources' are reported within 12 months of their collection. The exception is the NISU Routine Surveillance Data Report. There may be other alternative data sources available for cycling injuries and deaths, such as the Australian Transport Safety Bureau (ATSB) Serious Injury Database, once hospital data is also included. It is therefore possible to produce a 'State of Cycling' report about 12 months after the year in which the data is collected. Details of when the major relevant data sets are released is included in Section '9'.

With many of the current data sets reported annually and a reporting frequency of every two years, data should be aggregated for the two years; this will increase the number of data records and the accuracy of the findings.

The extreme is that data is reported, for example, every five years in line with the census. Five years is considered too long to be useful to the states and authorities as an input to the development of cycling policy and strategy. A reporting cycle of five years would also suffer with changes in staff and possibly governments, which could lead to the demise of the strategy.

6. Stage 1 – Indicators and data

There are eight Stage 1 indicators covering the five cycling categories of ownership, infrastructure, usage, cyclists and safety. The data and indicators selected represent the 'big picture', and provide a basic snapshot of cycling. It is suggested that these indicators and data would be reported in the first 'State of Cycling' report.

- I1.1 Bicycle ownership per capita
- I1.2 Bicycle network coverage (urban)
- I1.3 Cycling mode share
- I1.4 Cycling trip purposes
- I1.5 Proportion of population cycling
- I1.6 Cyclists age and gender
- I1.7 Cyclist injury rates – hospital reported
- I1.8 Cyclist crash rates – police reported

I1.1 Bicycle ownership per capita — Ownership

PURPOSE	This indicator provides a measure of the proportion of the population that have access to a bicycle and therefore, the opportunity to cycle.
DERIVATION (Base data/rate)	Bicycle ownership per capita is the total number of working bicycles owned by the population in the study area divided by the total number of the population normally residing in the study area.

Base Data – Bicycle Ownership

DEFINITION	Bicycle ownership is the number of bicycles in good working order that are owned by an individual or household.
SURVEY QUESTION	Bicycle ownership can be determined by either individual or household. When collecting this data, you should ask: How many bicycles in good working order does this household/do you keep at this dwelling?
SAMPLE SIZE	To estimate bicycle ownership per capita in the study area at a level of confidence of 95%, it is recommended that 576 respondents from a randomly drawn sample of individuals are surveyed. This is based on Table 4.2, with an assumed mean proportion of 0.40 bicycles per person, and a confidence limit of 0.04 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA	Travel and activity surveys where these are undertaken (see Section '9') If bicycle ownership is obtained through a sample survey, expanded to the total population, bicycle ownership per capita can be directly derived.

Definition of Terms

Bicycle	A bicycle is a vehicle with two or more wheels that is built to be propelled by human power through a belt, chain or gears.
Good working order	Good working order means a bicycle requires minimal maintenance to be ridden. Minimal maintenance could include pumping tyres up, but would not include replacement of any parts such as wheels, pedals or chains. Good working order is considered to be a term that most people would understand.

I1.2 Bicycle network coverage (urban) Infrastructure

PURPOSE This indicator provides a comparison between the length of the bicycle network and the length of the road network.

DERIVATION (Base data/rate) Bicycle Network Coverage (Urban) is the total length (km) of the urban bicycle network divided by the total length (km) of the urban road network.

Base Data – Bicycle Network (urban)

DEFINITION The bicycle network includes all on-road bicycle lanes and off-road bicycle paths within the urban study area that have been signed as such by the appropriate authority. It includes signed lanes on roads and signed paths whether they are adjacent to roads or through parkland or other off-road space.

FACTORS A weighting of 0.5 should be applied to bicycle lanes that exist in one direction only on a road, unless that road is also one way.

Peak hour bicycle lanes should be weighted by a factor equal to the duration over which the bicycle lane can be used divided by 24 hours, and then divided by two as these lanes are unidirectional.

For example – peak hour bicycle lane 7:30am to 9am inbound, and 4pm to 6:30pm outbound. The factor should be 4 hours÷24×2.

SAMPLE SIZE A census of the bicycle network is required.

Rates – Road Network (urban)

DEFINITION The length (km) of the total urban road network. No disaggregation by road type (arterial, subarterial, etc.) is required.

SAMPLE SIZE A census of the urban road network (including local roads) is required.

Existing Data Sources

BASE DATA Asset management systems by local councils and state road authorities are likely to be good sources of this data.

RATE The asset management systems of local councils and state road authorities are likely to be good sources of this data.

Definition of Terms

Bicycle lane For the purposes of these guidelines, on-road bicycle lanes are solely those lanes that have been signed as a bicycle lane by the appropriate authority. Wide kerbside lanes and sealed shoulders (unless signed as bicycle lanes) are therefore not included.

Bicycle path Off-road bicycle paths and off-road shared paths for the purposes of these guidelines are solely those paths that have been signed as bicycle paths or shared paths by the appropriate authority. Tracks and footpaths through parks and recreation areas (unless signed as bicycle paths or a shared paths) are therefore not included.

I1.3 Cycling Mode Share — Usage

PURPOSE — This indicator provides a measure of how much travel is undertaken by bicycle.

DERIVATION — The total number of trip stages by bicycle in the study area divided by the total number of trip stages by all modes, including walking, in the study area. The indicator is usually expressed as a percentage.

Base Data – Bicycle Trip

DEFINITION: — A bicycle trip stage is any travel from one stop to another stop, undertaken by bicycle, for any purpose.

SURVEY QUESTION — Travel information is most easily recalled by recalling activities. An example of a travel survey form is included in Section 11

NOTES — Travel recorded as home to home – that is, where no other destination is recorded – is counted as two trip stages.

SAMPLE SIZE — To estimate the total number of trip stages cycled per annum by residents who live in the study area, at a level of confidence of 95%, 9500 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.2, with an assumed mode share of 0.02, and a confidence limit of 0.002 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA — Travel and activity surveys, where these are undertaken (see Section 9 Existing data sources)

Definition of Terms

Trip — A trip is any travel linking two primary destinations for any purpose (except change mode).

Stop — A stop is any destination travelled to for any purpose, including changes of mode. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.

Trip Stage — A trip stage is any single-mode travel between stops.

I1.4 Cycling Trip Purposes Usage

PURPOSE This indicator identifies the main purposes for travel by bicycle.

DERIVATION The number of trip stages by bicycle by each purpose as a proportion of all bicycle trip stages in the study area for an average day.

Base Data – Bicycle Trip Purpose

DEFINITION Bicycle trip stage purpose is the reason for making the trip.

SURVEY QUESTION When asking about a bicycle trip stage, respondents should be asked: Why did you go to (destination)? Typically travel surveys provide respondents with a range of choices. The recommended coding of these responses into the seven purpose categories is shown below.

Shopping: To buy something.

Education: For education.

Work: Journey to work, work-related business.

Home: To arrive home.

Social/Recreation: Indoor and outdoor social or recreational activities.

Change mode: To change from one mode of transport to another.

Other: Medical/Dental, personal business, to pickup/deliver something, to pickup or drop off someone, to accompany someone.

SAMPLE SIZE To estimate the proportion of trip stages cycled to work, education, shopping and social/recreation by residents who live in the study area at a level of confidence of 95%, 3500 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.2, with an assumed purpose share of 0.10 for each of the above purposes, and a confidence limit of 0.01 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA Travel and activity surveys where these are undertaken (see Section 9 - Existing data sources.)

Definition of Terms

Trip A trip is any travel linking two primary destinations for any purpose (except change mode).

Stop A stop is any destination travelled to for any purpose, including changes of mode. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.

Trip Stage A trip stage is any single-mode travel between stops.

I1.5 Proportion of Population Cycling — Usage

PURPOSE — This indicator measures the proportion of the population that cycles on an average day.

DERIVATION — The number of people who have cycled at least once on their survey day, divided by the total number of people in the study area.

Base Data – No. of people who have cycled at least once on Survey Day

DEFINITION — The number of people who live in the study area who have cycled in the study area at least once on their survey day.

SURVEY QUESTION — If the base data is obtained through a special survey, all respondents should be asked

> Did you cycle at all today?
> ❑ Yes ❑ No

If this base data is being obtained from a wider travel survey, respondents should be asked to complete a travel diary, recording all travel by all modes for a single day. A good example is included in Section 11.

SAMPLE SIZE — To estimate the number of residents who have cycled at least once on any given day within the study area at a level of confidence of 95%, 12,400 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.2, with an assumed proportion cycling of 0.03 and a confidence limit of 0.003 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA — Travel and activity surveys where these are undertaken (see Section 9 – Existing data sources.)

I1.6 Cyclists Age and Gender — Cyclists

PURPOSE — This indicator details cyclist age and gender, which are two of the most relevant characteristics of cyclists.

DERIVATION — The age and gender of people who have reported at least one bicycle trip, as a proportion of the total number of cyclists who are males and females in the age groups in the study area.

Base Data – Cyclist Age and Gender

DEFINITION: — The age and gender of people who have reported at least one bicycle trip.

SURVEY QUESTION

Sex ❑ Male ❑ Female

Year of birth _____

The results should be reported as the proportion within each age-sex group that have cycled at least once on the Survey Day.

SAMPLE SIZE — To estimate the proportion of residents in four age groups and two genders who have reported at least one bicycle trip on any given day within the study area at a level of confidence of 95%, 4800 respondents from a randomly drawn stratified sample of individuals is recommended (600 in each strata). This is based on Table 4.2, with an assumed proportion cycling within each strata of 0.04, and a confidence limit of 0.008 – that is, 20% of the mean proportion.

Existing Data Sources

BASE DATA — Travel and activity surveys where these are undertaken (See Section 9. - Existing data sources.)

I1.7 Cyclist Injury Rates – Hospital Reported — Safety

PURPOSE	This indicator provides a broad measure of the level of risk involved in cycling, based on hospital collected data.
DERIVATION (Base Data / Rate)	Cyclist injury rates are the number of hospital separations of cyclists divided by the total number of hours cycled by cyclists, within the study area.

Base Data – Cyclist Hospital Separation

DEFINITION	A cyclist hospital separation is where a person is recorded as a separation by a hospital, following an accident while cycling.
SAMPLE SIZE	A census of all hospital separations in the study area per annum.
NOTES	Hospital separations are prone to influence by funding policies.

Rates – Hours Cycled

DEFINITION	The total time in hours of all cycling trips by residents in the study year.
NOTES	Hours are a better measure of exposure than kilometres for cyclists. Time is generally reported more accurately than distance in travel surveys; however, times are often reported to the nearest five minutes. If trip time is not recorded it can be estimated by multiplying distance by the average speed of cyclists, which should be determined for the study area.
SURVEY QUESTION	Sampled individuals who cycle should be asked When did you leave Stop X? When did you arrive at Stop X+1?
SAMPLE SIZE	To estimate the total number of hours cycled per annum per resident who lives in the study area at a level of confidence of 95%, 1540 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.1, with an assumed coefficient of variation of 200%, and a confidence limit that is 10% of the mean.

Existing Data Sources

BASE DATA	The Australian Institute of Health and Welfare (AIHW) maintains a National Hospital Morbidity Database (NHMD).
RATE	Travel and activity surveys where these are undertaken (see Section 9 Existing data sources)

Definition of Terms

Stop	A stop is any destination, travelled to for any purpose, including modal interchanges. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10
Hospital Separation	In hospital terms 'separation' refers to the episode of care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care.

I1.8 Cyclist Crash Rates – Police Reported Safety

PURPOSE	This indicator provides a broad measure of the level of risk involved in cycling, based on police reported data.
DERIVATION (Base Data / Rate)	The no. of serious injuries, including fatalities, of cyclists as recorded by the police, divided by the total no. of hours cycled within the study area.

Base Data – Cyclist Serious Injury (Police Reported)

DEFINITION	A serious cycling injury is where a person is injured while they were cycling, *and* the police record it as a serious injury. A cycling fatality is where a person dies as a result of an accident while cycling. The cyclist may not die immediately but death must be a direct result of the incident.
SAMPLE SIZE	A census of all serious injuries and fatalities as recorded by the police.

Rates – Hours Cycled

DEFINITION	The total time in hours of all cycling trips by residents in the study year.
NOTES	Hours are a better measure of exposure to risk than kilometres for cyclists. Time is generally reported more accurately than distance in travel surveys; times are often reported to the nearest five minutes. If trip time is not recorded it can be estimated by multiplying distance by the average speed of cyclists, which should be determined for the study area.
SURVEY QUESTION	Sampled individuals who cycle should be asked: When did you leave Stop X?. When did you arrive at Stop X+1?
SAMPLE SIZE	To estimate the total number of hours cycled per annum per resident who lives in the study area at a level of confidence of 95%, 1540 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.1, with an assumed coefficient of variation of 200%, and a confidence limit that is 10% of the mean.

Existing Data Sources

BASE DATA	The Serious Injury Database – Australian Transport Safety Bureau.
RATE	Travel and activity surveys where these are undertaken (see Section 9 Existing data sources).

Definition of Terms

Police reported	When people are injured in a car crash, by law this must be reported to the police. However, it is known that where a cyclist is injured in a crash, often the police are not notified, or if notified the incident may not be recorded by the police.
Stop	A stop is any destination travelled to for any purpose, including changes of mode. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10

7. Stage 2 – Indicators and data

There are 11 Stage 2 indicators covering the five cycling categories of ownership, infrastructure, safety, usage and cyclists. The data and indicators selected represent a detailed picture of cycling. This includes indicators in new areas such as 'sales', as well as extending some of the indicators from Stage 1, such as 'cyclist injury rates by age and gender'. It is suggested that these indicators and data would be reported in the second 'State of Cycling' report.

- I2.1 Bicycle sales per capita
- I2.2 Percentage of bicycles stolen
- I2.3 Bicycle network by facility type (urban)
- I2.4 Bicycle network coverage (non-urban)
- I2.5 Bicycle parking places per bicycle trip
- I2.6 Cycling trip purposes by weekday or weekend
- I2.7 Cycling trip length
- I2.8 Percentage of the population that cycle at least once per week
- I2.9 Cyclist injury rates, hospital reported – by age and gender
- I2.10 Cyclist crash rates, police reported – by age and gender
- I2.11 Bicycle education

I2.1 Bicycle Sales per Capita — Ownership

PURPOSE	This indicator increases our understanding of total bicycle ownership, as bicycle sales per capita are a measure of the rate of increase of new bicycle ownership.
DERIVATION (Base Data/Rate)	Bicycle sales per capita is the total number of bicycles sales in the study area divided by the total population normally residing in the study area.

Base Data – Bicycle Sales

DEFINITION	Bicycle sales are the number of bicycles sold in the study area per annum.
SAMPLE SIZE	A census of all sales in the study area per annum.
NOTE	Bicycle sales data is not readily available either at a national, or state and territory level. However, most bicycles sold in Australia are imported; bicycle imports data is currently available at the national level and is recommended as a proxy for sales data until such time as sales data becomes available. Bicycle imports are reported in the following categories – children's bikes, adult's bikes, frames, forks, frames with forks, and front-wheel-out bikes.

Rates – Total Population

DEFINITION	The number of people who normally reside in the study area.

Existing Data Sources

BASE DATA	Australian Customs or from the Bicycle Industries and Traders Association (BITA).
RATE	The ABS – 'Population by Age and Sex, Australian States and Territories' (Cat. No. 3201.0), published annually.

Definition of Terms

Children's bikes	Australian Customs defines a children's bike as having a wheel diameter of 508mm or less.
Adult bikes	Australian Customs defines an adult's bike as having a wheel diameter of greater than 508mm.

I2.2 Percentage of Bicycles Stolen — Ownership

PURPOSE	Bicycle theft is a significant problem faced by cyclists. This indicator is a measure of the extent of this problem.
DERIVATION (Base Data/Rate)	The percentage of bicycles stolen is the total number of bicycles reported stolen to the police per annum in the study area divided by the total number of bicycles owned by the population of the study area.

Base Data – Bicycles Stolen

DEFINITION	Bicycles stolen is the number of bicycles that are reported to the police as stolen per annum.
SAMPLE SIZE	A census of all bicycles reported stolen to the police per annum.
NOTE	Bicycle theft tends to be under-reported. States and territories can estimate the level of under reporting in their areas by conducting surveys as required or by using data previously collected, where this is up to date.

Rate – Bicycle Ownership

DEFINITION	Bicycle ownership is the number of bicycles in good working order owned by an individual or household.
SURVEY QUESTION	Bicycle ownership can be collected at either the individual or the household level. When collecting ownership data, by whatever method, sampled individuals or households should be asked How many bicycles in good working order does this household/do you keep at this dwelling?
SAMPLE SIZE	To estimate bicycle ownership per capita in the study area at a level of confidence of 95%, 576 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.2, with an assumed mean proportion of 0.40 bicycles per person, and a confidence limit of 0.04 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA	Police authorities in each state and territory.
RATE	Travel and activity surveys where these are undertaken (see Section 9 – Existing data sources.)

Definition of Terms

Bicycle	A bicycle is a vehicle with two or more wheels that is built to be propelled by human power through a belt, chain or gears.
Good working order	Good working order means a bicycle requires minimal maintenance to be ridden. Minimal maintenance could include pumping tyres up or just dusting a bike off, but would not include replacement of any parts such as wheels, pedals or chains.

I2.3 Bicycle Network by Facility Type (Urban) Infrastructure

PURPOSE This indicator details the proportion of different types of bicycle facilities that make up the total bicycle network in the urban area.

DERIVATION (BASE DATA/RATE) The length (km) of each bicycle facility type divided by the total length (km) of the urban bicycle network.

Base Data – Bicycle Facility Types (Urban)

DEFINITION The distance (km) of all links of the total urban bicycle network categorised into two bicycle network types – Bicycle lanes (on-road) and Bicycle paths (off-road).

FACTORS A weighting of 0.5 should be applied to bicycle lanes that exist in one direction only on a road, unless that road is also one way.

Peak hour bicycle lanes should be weighted by a factor equal to the duration over which the bicycle lane can be used divided by 24 hours, and then divided by two as these lanes are usually unidirectional.

For example – peak hour bicycle lane 7:30am to 9am inbound, and 4pm to 6:30pm outbound. The factor should be (4 hours÷24)/2 hours.

SAMPLE SIZE A census of the bicycle network is required.

Base Data – Bicycle Network (Urban)

DEFINITION The bicycle network includes all on-road bicycle lanes and off-road bicycle paths within the urban study area that have been signed as such by the appropriate authority. It includes signed lanes on roads, and signed paths whether they are adjacent to roads, or through parkland or other non-road space.

FACTORS As above.

SAMPLE SIZE See above.

Existing Data Sources

BASE DATA The asset management systems of local councils and state road authorities are likely to be good sources of this data.

RATE The asset management systems of local councils and state road authorities are likely to be good sources of this data.

Definition of Terms

Bicycle lane On-road bicycle lanes are solely those lanes that have been signed as a bicycle lane by the appropriate authority. Wide kerbside lanes and sealed shoulders (unless signed as bicycle lanes) are therefore not included.

Bicycle path Off-road bicycle paths and off-road shared paths for the purposes of these guidelines are solely those paths that have been signed as bicycle paths or shared paths by the appropriate authority.

I2.4 Bicycle Network Coverage (Non-Urban) Infrastructure

PURPOSE	This indicator is an important measure of the length of bicycle network in comparison to the sealed road network in non-urban areas.
DERIVATION (BASE DATA/RATE)	Bicycle network coverage (non-urban) is the total length (km) of the non-urban bicycle network divided by the total length (km) of the non-urban sealed road network.

Base Data – Bicycle Network (Non-Urban)

DEFINITION	The bicycle network includes all on-road bicycle lanes and off-road bicycle paths within the urban study area that have been signed as such by the appropriate authority. It includes signed lanes on roads, and signed paths whether they are adjacent to roads, or through parkland or other non-road space.
FACTORS	A weighting of 0.5 should be applied to bicycle lanes that exist in one direction only on a two way road.
SAMPLE SIZE	A census of the non-urban bicycle network is required.

Rates – Road Network (Non-Urban)

DEFINITION	The length (km) of the total non-urban sealed road network. No disaggregation by road type – arterial, subarterial – is required.
SAMPLE SIZE	A census of the non-urban sealed road network is required.

Existing Data Sources

BASE DATA	The asset management systems of local councils and state road authorities are likely to be good sources of this data.
RATE	The asset management systems of local councils and state road authorities are likely to be good sources of this data.

Definition of Terms

Bicycle lane	On-road bicycle lanes are solely those lanes that have been signed as a bicycle lane by the appropriate authority. Wide kerbside lanes and sealed shoulders (unless signed as bicycle lanes) are therefore not included.
Bicycle path	Off-road bicycle paths and off-road shared paths for the purposes of these guidelines are solely those paths that have been signed as bicycle paths or shared paths by the appropriate authority. Tracks and footpaths (unless signed as bicycle paths or shared paths) are therefore not included.
Sealed Shoulders	Sealed shoulders do not need to be signed but do need to meet the width requirements of Austroads 'Guide to Traffic Engineering Practice – Part 14 Bicycles'.

I2.5 Bicycle Parking Places per Trip Stage — Infrastructure

PURPOSE	Adequate parking facilities give cyclists the opportunity to lock their bicycles in a place that is convenient and secure. This indicator measures the provision of public parking places and compares this to the level of cycling undertaken.
DERIVATION (Base Data/Rate)	The number of publicly accessible secure bicycle parking places divided by the total number of bicycle trip stages per day in the study area.

Base Data – Bicycle Parking Places

DEFINITION	Bicycle parking places must be accessible to the general public – that is, railway or bus stations, but not schools or office buildings. These must provide parking rails in single or in clusters, parking rails inside enclosures or bicycle lockers. No breakdown by these different types of parking place is required.
NOTE	The number of parking places is the number of bicycles that can be adequately secured – e.g, a free-standing bicycle rail = 2 parking places.
SAMPLE SIZE	A census of all publicly accessible bicycle parking places is required.

Base Data – Bicycle Trip Stages

DEFINITION	The total number of bicycle trip stages per day in the study area, where a bicycle trip is any travel by bicycle from one stop to another stop for any purpose.
SURVEY QUESTION	Travel information is most easily recalled by recalling activities. An example of a travel survey form is included in Section 11.
NOTES	Any travel from home and back to home without any other destination recorded is counted as two trip stages.
SAMPLE SIZE	To estimate the average number of trip stages cycled per day per resident in the study area, at a level of confidence of 95%, 1540 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.1, with an assumed coefficient of variation of 200%, and a confidence limit that is 10% of the mean trip stages per day.

Existing Data Sources

BASE DATA	The asset management systems of local councils are likely to be good sources of this data.
RATE	Travel and activity surveys where these are undertaken (see Section 9 – Existing data sources).

Definition of Terms

Bicycle parking rail	Parking rails must be a shape that allows a cyclist to lock the bicycle's front wheel, frame, and back wheel to the rail. They must be able to support the entire bicycle (not just the front or back wheel, be securely fastened to the ground or wall.
Trip Stage	A trip stage is any single-mode travel between stops.

I2.6 Cycling Purposes by Weekday or Weekend Usage

PURPOSE — This indicator helps to identify the key differences in bicycle trip purpose by weekday and weekend bicycle travel.

DERIVATION (Base Data/Rate) — The number of trip stages by bicycle by each purpose, as a proportion of all bicycle trip stages in the study area for an average weekday and an average weekend day.

Base Data – Bicycle Trip Purpose

DEFINITION — Bicycle trip purpose is the reason for making a trip. This should be recorded by day of the week. Seven categories of trip purpose should be reported – shopping, education, work, home, social/recreation, change of mode and other.

SURVEY QUESTION — When asking about a bicycle trip stage, respondents should be asked: Why did you go to (destination)? Typically travel surveys provide respondents with a range of choices. The recommended coding of these responses into the seven trip purpose categories is shown below.

Shopping: To buy something.

Education: For education.

Work: Journey to work, work-related business.

Home: To arrive home.

Social/Recreation: Indoor and outdoor social or recreational activities.

Change mode: To change from one mode of transport to another.

Other: Medical/Dental, personal business, to pickup/deliver something, to pickup or drop off someone, to accompany someone.

SAMPLE SIZE — To estimate the proportion of stops cycled on weekdays and weekends to work, education, shopping and recreation by residents who live in the study area at a level of confidence of 95%, 3500 respondents from a randomly drawn sample of individuals is recommended for each of weekday and weekend travel. This is based on Table 4.2, with an assumed purpose share of 0.10 for each of the above purposes, and a confidence limit of 0.01 – that is, 10% of the mean proportion.

Existing data Sources

BASE DATA — Travel and activity surveys where these are undertaken (see Section 9 – Existing data sources).

Definition of Terms

Trip — A trip is any travel linking two primary destinations for any purpose (except change mode).

Stop — A stop is any destination, travelled to for any purpose, including modal interchanges. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.

Trip Stage — A trip stage is any single-mode travel between stops.

I2.7 Cycling Trip Length Usage

PURPOSE	This indicator describes the distribution of cycling trip length and the average trip length, which are important characteristics of cycling.
DERIVATION	Distribution – the percentage of bicycle trips stages in each trip length interval. Average - The total length of all trip stages by bicycle in the study area divided by the total number of trip stages by bicycle in the study area.

Base Data – Bicycle Trip Length Categories

DEFINITION:	A bicycle trip stage is any travel from one stop to another undertaken by bicycle for any purpose.
SURVEY QUESTION	Travel information is most easily recalled by recalling activities. An example of a travel survey form is included in Section 11.
NOTES	Any travel that goes from home to home is counted as two trip stages.
TRIP LENGTH INTERVALS	Trip lengths are to be recorded in 1km intervals beginning with 0-1 km through to 19 – 20 km.
SAMPLE SIZE	To estimate the average distance cycled per trip stage by residents in the study area at a confidence level of 95%, it is recommended that 140 bicycle trips from a randomly drawn sample of trips are surveyed (using Table 4.1, assuming a Coefficient of Variation of 60% on trip length per trip and a confidence limit of 10% of the mean). Given that about 2% of all trips are cycling trips and that the average trips per person is about 4 per day, this equates to a random sample of about 1750 people.

Existing Data Sources

BASE DATA	Travel and activity surveys where these are undertaken (see Section 9)

Definition of Terms

Trip	A trip is any travel linking two primary destinations for any purpose (except change mode).
Stop	A stop is any destination travelled to for any purpose, including changes of mode. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.
Trip Stage	A trip stage is any single-mode travel between stops.

I2.8 Percentage of the population that cycle at least once per week — Usage

PURPOSE This indicator provides the proportion of the population that cycle on a regular basis, which in turn is useful in understanding how many people are likely to benefit from bicycle funding and infrastructure.

DERIVATION The number of people, who have cycled at least once in the last week, divided by the total number of people in the study area.

Base Data – Number of people who have cycled at least once in the last week

DEFINITION The number of people who live in the study area who have for whatever purpose cycled at least once in the last week.

SURVEY QUESTION Respondents should be asked

Did you cycle at all in the last seven days? ❑ Yes ❑ No

SAMPLE SIZE To estimate the number of residents in the study area who have cycled at least once in the last week in the study area at a confidence level of 95%, 7300 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.2, with an assumed proportion cycling of 0.05 and a confidence limit of 0.005 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA Travel and activity surveys where these are undertaken (see Section 9.) Note, however, that the above question about cycling in the past week is not currently asked in any Australian travel surveys, and would need to be added to the list of questions.

I2.9 Cyclist Injury Rates – Hospital Reported – by Age & Gender — Safety

PURPOSE	This indicator helps us to identify which groups are over represented in cycling crashes and therefore have a higher level of risk involved in cycling.
DERIVATION (Base Data/Rate)	Cyclist injury rates are the number of hospital separations of cyclists by age and gender divided by the total number of hours cycled by cyclists by the same age and gender categories, within the study area.

Base Data – Cyclist Hospital Separation by Age and Gender

DEFINITION	A cyclist hospital separation is where a person is recorded as a separation by a hospital, following an accident while cycling. Cyclist hospital separations are then disaggregated by gender and by age, in ten year increments.
SAMPLE SIZE	A census of all hospital separations in the study area per annum.
NOTES	Hospital separations are prone to influence by funding policies.

Rates – Hours Cycled by Age and Gender

DEFINITION	The total time in hours of all cycling trips by residents in the study year. Hours cycled are then disaggregated by gender and by age, in ten year increments.
NOTES	Hours are a better measure of exposure than kilometres for cyclists. Time is generally reported more accurately than distance in travel surveys; times are often reported to the nearest five minutes. If trip time is not recorded it can be estimated by multiplying distance by the average speed of cyclists, which should be determined for the study area.
SURVEY QUESTION	Sampled individuals who cycle should be asked When did you leave Stop X? When did you arrive at Stop X+1?
SAMPLE SIZE	To estimate the average number of hours cycled per annum by residents in the study area, at a confidence level of 95%, 1540 respondents from a randomly drawn sample of individuals is recommended for each age-sex combination for which data is required (using Table 4.1, assuming a Coefficient of Variation of 200% on hours cycled per person and a confidence limit of 10% of the mean).
NOTE	Collecting reliable data on cycling trips by children is difficult. Caution should be used when reporting cyclist injury rates by primary and high school aged children.

Existing Data Sources

BASE DATA	The Australian Institute of Health and Welfare (AIHW) maintains a National Hospital Morbidity Database (NHMD).
RATE	Travel and activity surveys where these are undertaken (see Section 9).

Definition of Terms

Stop	A stop is any destination, travelled to for any purpose, including modal interchanges. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.
Hospital separation	In hospital terms 'separation' refers to the episode of care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care.

I2.10 Cyclist Crash Rates - Police Reported – by Age & Gender — Safety

PURPOSE — This indicator provides another way of assessing which groups are over represented in cycling crashes and therefore have a higher level of risk in cycling.

DERIVATION (Base Data/Rate) — The number of serious injuries, including fatalities, by age and gender of cyclists as recorded by the police divided by the total number of hours cycled by the same age and gender groups, within the study area.

Base Data – Cyclist Serious Injury (Police Reported)

DEFINITION — A serious cycling injury is where a person is injured while they were cycling, *and* the police record it as a serious injury.

A cycling fatality is where a person dies as a result of an accident while cycling. The cyclist may not die immediately but death must be a direct result of the incident.

SAMPLE SIZE — A census of all serious injuries and fatalities as recorded by the police.

Rates – Hours Cycled

DEFINITION — The total time in hours of all cycling trips by residents in the study area. These hours are then disaggregated by gender and by age, in ten year increments.

NOTES — Hours are a better measure of exposure to risk than kilometres, for cyclists. Time is generally reported more accurately than distance in travel surveys; times are often reported to the nearest five minutes.

If trip time is not recorded it can be estimated by multiplying the distance by the average speed of cyclists, which should be determined for the study area.

SURVEY QUESTION — Sampled individuals who cycle should be asked

When did you leave Stop X?

When did you arrive at Stop X+1?

SAMPLE SIZE — To estimate the average number of hours cycled per annum by residents in the study area, at a confidence level of 95%, 1540 respondents from a randomly drawn sample of individuals is recommended for each age-sex combination for which data is required (using Table 4.1, assuming a Coefficient of Variation of 200% on hours cycled per person and a confidence limit of 10% of the mean).

NOTE — Collecting reliable data on cycling trips by children is difficult. Caution should be used when reporting cyclist injury rates by primary and high school aged children.

Existing Data Sources

BASE DATA — The Serious Injury Database – Australian Transport Safety Bureau.

RATE — Travel and activity surveys where these are undertaken (see Section 9 – Existing data sources).

Definition of Terms

Police reported — When people are injured in a car crash, by law this must be reported to the police. However, it is known that where a cyclist is injured in a crash, often the police are not notified, or if notified the incident may not be recorded by the police.

Stop — A stop is any destination, travelled to for any purpose, including modal interchanges. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.

I2.11 Bicycle Education — Safety

PURPOSE	This indicator provides a measure of the formal preparation for cycling that is undertaken in the community.
DERIVATION (Base Data/Rate)	The number of people who have satisfactorily completed a bicycle education course by the end of primary school as a proportion of the total number of people who have completed primary school.

Base Data – Bicycle Education

DEFINITION	'Bike Ed' or equivalent bicycle education program.
SAMPLE SIZE	To estimate the proportion of students who have satisfactorily completed a bicycle education course by the end of primary school, 900 respondents from a randomly drawn sample of first year high school students is recommended. This is based on Table 4.2, with an assumed proportion of 30% and a confidence limit of 10% of the mean proportion.

Rates – first year High School Population Numbers

DEFINITION	The number of students in the study area enrolled in the first year of high school.
SAMPLE SIZE	A census of the total number of students in the study area enrolled in the first year of high school.

Existing data Sources

BASE DATA	None known.
RATE	The department of education in each state and territory would be able to provide figures of enrolment in the first year of High School.

Definition of Terms

Bicycle education	'Bike Ed' or equivalent bicycle education program.
Bike Ed	Bike Ed has been developed as a national bicycle education program by the Federal Office of Road Safety in conjunction with VicRoads. Bike Ed is a practical course which includes safety checks of bicycles and equipment, bicycle handling and riding skills, road rules and cycling experience in both simulated and on-road environments. Bike Ed contributes to achieving learning outcomes primarily in the Health and Physical Education Key Learning Area of the Curriculum and Standards Framework.

8. Stage 3 – Indicators and data

- I3.1 Bicycle sales by bicycle type
- I3.2 Percentage of bicycles stolen by type
- I3.3 Bicycle network continuity (urban)
- I3.4 Bicycle network by facility type (non-urban)
- I3.5 Cycling kilometres by age and gender
- I3.6 Cycling trip purposes by age and gender
- I3.7 Cyclists license holding
- I3.8 Cyclists personal income
- I3.9 Percentage of cyclists wearing helmets
- I3.10 Cyclist injury rates – hospital reported – by severity
- I3.11 Cyclist crash rates – police reported – by location

I3.1 Bicycle Sales by Bicycle Type — Ownership

PURPOSE — Bicycle sales by bicycle type provides a measure of the proportion of new bicycles sold by type of bike, compared to the total number of new bicycles sold. This in turn provides an indication of the popularity of different types of cycling.

Derivation — Bicycle sales by bicycle type is the number of bicycles sales in the study area by type divided by the total number of bicycles sold in the study area. The indicator is usually expressed as a percentage for each bicycle type.

Base Data – Bicycle Sales by Type

DEFINITION — Bicycle sales by type is the number of bicycles sold in the study area per annum by type of bicycle. The categories of bicycle for the purpose of these guidelines includes racing bikes, mountain bikes, hybrid bikes and children's bikes.

SAMPLE SIZE — A census of all sales by type in the study area per annum.

NOTE — Bicycle sales by bicycle type data is not readily available at either at a national, or state and territory level. However, most bicycles sold in Australia are imported; bicycle imports data is currently available at the national level and is recommended as a proxy for sales data until such time as sales data becomes available.

Bicycle imports are reported in the following categories – children's bikes, adult's bikes, frames, forks, frames with forks, and front-wheel-out bikes. Bicycle sales in Australia are predominately sales of bikes imported into Australia. Bicycle sales of bikes made in Australia are negligible. Bicycle imports cannot be separated by State. Bicycle imports are not a direct measure of sales, although they are an indicator of sales.

Bicycle imports are reported in categories that are determined by the Australian Customs recording requirements. These categories include children's bikes, adult bikes, frames, forks, frames with forks, and front-wheel-out bikes.

Existing Data Sources

BASE DATA — Australian Customs or from the Bicycle Industries and Traders Association (BITA).

Definition of Terms

Children's bikes — Australian Customs defines a children's bike as having a wheel diameter of 508mm or less.

Adult bikes — Australian Customs defines an adult's bike as having a wheel diameter of greater than 508mm.

I3.2 Percentage of Bicycles Stolen by Type — Ownership

PURPOSE	Bicycle theft is a significant problem faced by cyclists. The percentage of bicycles stolen by type provides an indication of the most commonly stolen bicycle types.
DERIVATION (Base Data/Rate)	The percentage of bicycles stolen by type is the total number of bicycles reported stolen to the police in the study area by type divided by the total number of bicycles owned by the population in the study area.

Base Data – Bicycles Stolen by type

DEFINITION	Bicycles stolen by type is the number of bicycles that are reported to the police as stolen per annum by type of bicycle. The categories of bicycle for the purpose of these guidelines are racing bikes, mountain bikes, hybrid bikes and children's bikes.
SAMPLE SIZE	A census of all bicycles reported stolen to the police in the study area per annum by type.
NOTE	There is under reporting of bicycles stolen to the police. States and territories can estimate the level of under reporting in their areas by conducting surveys as required, or by using data previously collected where it is up to date.

Rate – Bicycle Ownership

DEFINITION	Bicycle ownership is the number of bicycles that are in good working order owned by an individual or household.
SURVEY QUESTION	Bicycle ownership can be collected either at the individual or household level. When collecting ownership data, by whatever method, respondents should be asked How many bicycles in working order does this household/do you keep at this dwelling?
SAMPLE SIZE	To estimate bicycle ownership per capita in the study area at a level of confidence of 95%, 576 respondents from a randomly drawn sample of individuals is recommended. This is based on Table 4.2 with an assumed mean proportion of 0.40 bicycles per person, and a confidence limit of 0.04 – that is, 10% of the mean proportion.

Existing data Sources

BASE DATA	Police reporting systems by the state and territory police authorities.
RATE	Travel and activity surveys where these are undertaken (see Section 9).

Definition of Terms

Bicycle	A bicycle is a vehicle with two or more wheels that is built to be propelled by human power through a belt, chain or gears.
Working order	Good working order means a bicycle requires minimal maintenance to be ridden. Minimal maintenance could include pumping tyres up or just dusting a bike off, but would not include replacement of any parts such as wheels, pedals or chains.

I3.3 Bicycle Network Continuity (Urban) — Infrastructure

PURPOSE — This indicator provides an understanding of the connectivity of the bicycle network in the urban area. Joining separate parts of the network not only expands the distances that cyclists can ride on routes dedicated to cycling, it also expands the accessibility that the network offers for more cyclists to more destinations.

DERIVATION (Base Data/Rate) — The length (km) of the greatest part of the urban bicycle network that is connected as a proportion of the total length (km) of the urban bicycle network.

Base Data – Connected Bicycle Network (Urban)

DEFINITION — The distance (km) of all links of the urban bicycle network that is connected. For two links to be connected, they must not be separated by a distance of more than 50metres. The intent of this definition is that a route that has a cycle lane crossing an intersection but is not marked through the intersection is defined as connected, whereas a route which has a portion – say from one intersection to another – not yet constructed is defined as not connected.

SAMPLE SIZE — A census of the bicycle network is required.

Rate – Bicycle Network (Urban)

DEFINITION — The bicycle network includes all on-road bicycle lanes and off-road bicycle paths within the urban study area that have been signed as such by the appropriate authority. It includes signed lanes on roads, and signed paths whether they are adjacent to roads, or through parkland or other non-road space.

SAMPLE SIZE — See above.

Existing Data Sources

BASE DATA — The asset management systems of local councils and state road authorities are likely to be good sources of this data.

RATE — The asset management systems of local councils and state road authorities are likely to be good sources of this data.

Definition of Terms

Bicycle lane	On-road bicycle lanes are solely those lanes that have been signed as a bicycle lane by the appropriate authority. Wide kerbside lanes and sealed shoulders (unless signed as bicycle lanes) are therefore not included.
Bicycle path	Off-road bicycle paths and off-road shared paths for the purposes of these guidelines are solely those paths that have been signed as bicycle paths or shared paths by the appropriate authority. Tracks and footpaths through parks and recreation areas (unless signed as a bicycle path or a shared path) are therefore not included.
Shared path	Off-road shared paths for the purposes of these guidelines are solely those paths that have been signed as a shared path by the appropriate authority. Tracks and footpaths through parks and recreation areas (unless signed as a shared path) are therefore not included.

I3.4 Bicycle Network by Facility Type (Non-Urban) — Infrastructure

PURPOSE	This indicator details the proportion of different types of bicycle network facilities that make up the total bicycle network in the non-urban area.
DERIVATION (Base Data/Rate)	The length (km) of each bicycle facility type divided by the total length (km) of the non-urban bicycle network.

BASE DATA – BICYCLE FACILITY TYPES (NON-URBAN)

DEFINITION	The bicycle network includes all on-road bicycle lanes and off-road bicycle paths (including rail-trails) within the non-urban study area that have been signed as such by the appropriate authority. The only exception is the inclusion of sealed shoulders, which do not have to be signed as a bicycle facility. The non-urban network for the purpose of these guidelines is categorised into three bicycle network types – Bicycle lanes (on-road), Bicycle paths (off-road) and Sealed shoulders. It includes signed lanes on roads, non-signed sealed shoulders on roads, and signed paths including rail trails whether they are adjacent to roads, or through parkland or other non-road space.
FACTORS	A weighting of 0.5 should be applied to bicycle lanes that exist in one direction only on a road, unless that road is also one way.
SAMPLE SIZE	A census of the non-urban bicycle network is required.

Rate – Bicycle Network (Non-Urban)

DEFINITION	The non-urban bicycle network includes all on-road bicycle lanes and off-road bicycle paths (including rail-trails) within the non-urban study area that have been signed as such by the appropriate authority. It includes signed lanes on roads, non-signed sealed shoulders on roads, and signed paths including rail trails whether they are adjacent to roads, or through parkland or other non-road space.
FACTORS	As above.
SAMPLE SIZE	As above.

Existing Data Sources

BASE DATA	The asset management systems of local councils and state road authorities are likely to be good sources of this data.
RATE	The asset management systems of local councils and state road authorities are likely to be good sources of this data.

Definition of Terms

Bicycle lane	On-road bicycle lanes are solely those lanes that have been signed as a bicycle lane by the appropriate authority. Wide kerbside lanes and sealed shoulders (unless signed as bicycle lanes) are therefore not included.
Bicycle path	Off-road bicycle paths and off-road shared paths for the purposes of these guidelines are solely those paths that have been signed as bicycle paths or shared paths by the appropriate authority. Tracks and footpaths through parks and recreation areas (unless signed as bicycle paths or shared paths) are therefore not included.
Sealed Shoulders	Sealed shoulders do not need to be signed but do need to meet the width requirements of Austroads 'Guide to Traffic Engineering Practice – Part 14 Bicycles'.

I3.5 Cycling Kilometres by Age and Gender Usage

PURPOSE This indicator provides a deeper understanding of the cycling undertaken by different cyclists.

DERIVATION The sum of the distance (km) cycled by cyclists on trip stages in each age and gender category divided by the number of cyclists within that age and gender category, on an average day.

Base Data – Bicycle Trip Length

DEFINITION: A bicycle trip stage is any travel by bicycle from one stop to another for any purpose.

SURVEY QUESTION Travel information is most easily recalled by recalling activities. An example of a travel survey form is included in Section 11.

NOTES Any travel that goes from home to home is counted as two trip stages.

SAMPLE SIZE To estimate the average kilometres cycled per annum by residents in the study area, at a confidence level of 95%, 1540 respondents from a randomly drawn sample of individuals is recommended for each age-sex combination for which data is required (using Table 4.1, assuming a Coefficient of Variation of 200% on kilometres cycled per person and a confidence limit of 10% of the mean).

Existing Data Sources

BASE DATA Travel and activity surveys where these are undertaken (see Section 9).

Definition of Terms

Trip A trip is any travel linking two primary destinations for any purpose (except change mode).

Stop A stop is any destination travelled to for any purpose, including changes of mode. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.

Trip Stage A trip stage is any single-mode travel between stops.

I3.6 Cycling Purposes by Age and Gender Usage

PURPOSE This indicator provides a deeper understanding of the cycling undertaken by different cyclists.

DERIVATION (Base Data/Rate) The number of bicycle trip stages by each trip purpose within each age and gender category as a proportion of all bicycle trip stages within each age and gender category in the study area for an average day.

Base Data – Bicycle Trip Purpose

DEFINITION Bicycle trip purpose is the reason for making the trip.

SURVEY QUESTION When asking about a bicycle trip stage, respondents should be asked: Why did you go to (destination)? Typically travel surveys provide respondents with a range of choices. The recommended coding of these responses into the seven trip purpose categories is shown below.

Shopping: To buy something.

Education: For education.

Work: Journey to work, work-related business.

Home: To arrive home.

Social/Recreation: Indoor and outdoor social or recreational activities.

Change mode: To change from one mode of transport to another.

Other: Medical/Dental, personal business, to pickup/deliver something, to pickup or drop off someone, to accompany someone.

SAMPLE SIZE To estimate the proportion of stops cycled to work, education, shopping and recreation by different age-sex groups who live in the study area at a level of confidence of 95%, 3500 respondents from a randomly drawn sample of individuals is recommended for each age-sex combination. This is based on Table 4.2, with an assumed purpose share of 0.10 for each of the above purposes, and a confidence limit of 0.01 – that is, 10% of the mean proportion.

Existing Data Sources

BASE DATA Travel and activity surveys where these are undertaken (see Section 9).

Definition of Terms

Trip A trip is any travel linking two primary destinations for any purpose (except change mode).

Stop A stop is any destination travelled to for any purpose, including changes of mode. Each stop is characterised by use of a single mode of access. An illustrated example is included in Section 10.

Trip Stage A trip stage is any single-mode travel between stops.

I3.7 Cyclists' Licence Holding Cyclists

PURPOSE The proportion of cyclists who hold motor vehicle licences can be used to compare against the licence holding characteristics of the general population. This can then be used to identify similarities and differences between cyclists and the general population.

DERIVATION The number of cyclists who hold a motor vehicle licence divided by the total number of cyclists, in the study area, where a cyclist is defined as anyone who lives in the study area who has taken a cycling trip on the survey day.

BASE DATA – LICENCE HOLDING OF CYCLISTS

DEFINITION The number of people who live in the study area who have for whatever purpose cycled in the study area at least once on their survey day, and who hold a motor vehicle licence.

SURVEY QUESTION If the base data is obtained through a special survey, all respondents should be asked:

Did you cycle at all today? ❑ Yes No ❑

Do you hold a motor vehicle licence? ❑ Yes No ❑

If this base data is being obtained from a wider travel survey respondents should be asked to complete a travel diary recording all travel by all modes for a single day. A good example is included in Section 11.

SAMPLE SIZE To estimate the proportion of cyclists in the study area who hold motor vehicle licences at a level of confidence of 95%, it is recommended that a randomly drawn sample of 96 cyclists are surveyed. This is based on Table 4.2, with an assumed proportion holding a licence of 80%, and a confidence limit that is 10% of the mean proportion. Given that cyclists are about 2% of the population, this means a sample of about 5000 of the general population.

Rates – All cyclists

DEFINITION: The rate for this indicator is the same as the base data.

Existing Data Sources

BASE DATA Travel and activity surveys where these are undertaken (see Section 9).

I3.8 Cyclists' Personal Income Cyclists

PURPOSE This indicator can be used to compare against the personal income characteristics of the general population. It can then be used to identify similarities and differences between cyclists and the general population.

DERIVATION The gross personal income (pre-tax) of cyclists, where a cyclist is defined as anyone who lives in the study area and who has taken a cycling trip on the survey day.

Base Data – Gross Personal Income (Pre-Tax) of Cyclists

DEFINITION Gross personal income (pre-tax) is defined as all income (including pensions and allowances) that the person usually receives from all sources.

SURVEY QUESTION

What is the gross income (including pensions and allowances) that the person usually receives each week from all sources?

Mark one box only.
Count all income, including:

family payment
additional family payment
rental assistance
pensions
unemployment benefits
student allowance
maintenance (child support)
workers compensation
superannutaion
wages
salary
overtime
commissions and bonuses
interest received
dividends
rents received (less expenses of operation)
business or farm income (less expense of operation)

Do not deduct:
tax
superannuation
health insurance

( ) $1,500 or more per week ($78,000 or more per year)

( ) $1,000 - $1,499 per week ($52,000 – $77,999 per year

( ) $700 - $799 per week ($36,400 - $41,599 per year)

( ) $600 - $699 per week ($31,200 - $36,399 per year)

( ) $500 – 599 per week ($26,000 – 31,199 per year)

( ) $400 - $499 per week ($20,800 - $25,999 per year)

( ) $300 - $399 per week ($15,600 - $20,799 per year)

( ) $200 - $299 per week ($10,400 - $15,599 per year)

( ) $160 – 199 per week ($8,320 - $10,399 per year)

( ) $120 - $159 per week ($6,240 - $8,319 per year)

( ) $80 - $119 per week ($4,160 - $6,239 per year)

( ) $40 - $79 per week ($2,080 - $4,159 per year)

( ) $1 - $39 per week ($1 - $2,079 per year)

( ) Nil income

( ) Negative income

NOTE This survey question is as asked in the 1996 Census. This will allow for direct comparability. Whenever the census question on gross income is updated, surveys of cyclists should reflect these changes.

SAMPLE SIZE To estimate the gross personal income of cyclists in the study area at a Level of Confidence of 95%, it is recommended that a randomly drawn sample of 1540 cyclists be surveyed. This is based on Table 4.1, with an assumed coefficient of variation of 200%, and a confidence limit that is 10% of the mean.

BASE DATA Travel and activity surveys where these are undertaken (see Section 9).

I3.9 Percentage of Cyclists Wearing Helmets — Safety

PURPOSE — This indicator provides the proportion of the population that wears a bicycle helmet while cycling; it is a measure of the compliance with the legal requirement to wear a helmet while cycling.

DERIVATION — The number of observations of cyclists where the cyclist is wearing a helmet as a percentage of the total number of observations of cyclists.

Base Data – Wearing Helmets

DEFINITION — The proportion of cyclists who are observed wearing their helmets while cycling.

SAMPLE SIZE — To estimate the proportion of cyclists wearing a helmet on any given day in the study area at a level of confidence of 95%, it is recommended that a randomly drawn sample of 384 cyclists be surveyed. This is based on Table 4.2, with an assumed proportion wearing a helmet of 80%, and a confidence limit that is 5% of the mean proportion.

Existing Data Sources

INDICATOR — There are a number of studies undertaken to assess the percentage of cyclists wearing helmets. Many of these may be out of date. However, if the percentage of helmet wearing is relatively stable, supplementary surveys may be used to update historic studies. Professional advice should be sought when considering this approach.

NOTE — The percentage of the population wearing helmets is directly estimated from an observational survey.

Definition of Terms

Bicycle helmet — For a helmet to be counted it must first comply with Australian standards for bicycle helmets. First, surveyors should become familiar with the range of bicycle helmets that comply with the Australian standards before conducting an observational survey. Second, the helmet must be worn according to the manufacturers instructions – for an observational survey the most important features include that the helmet is

- on the head
- the right way around
- with chin straps done up sufficiently.

I3.10 Cyclist Injury Severity Rates – Hospital Reported Safety

PURPOSE This indicator provides a deeper understanding of the consequences of cyclist crashes.

DERIVATION Cyclist injury severity rates are the number of hospital separations of cyclists categorised into different severity levels and divided by the total number of hospital separations of cyclists within the study area.

Base Data – Cyclist Hospital Separation by Severity

DEFINITION A cyclist hospital separation is where a person who is injured while cycling is recorded as a separation by a hospital. These hospital separations are then disaggregated by severity.

Severity is determined by the length of stay; the average length of stay should be reported as well as stays of less than two days (a minor injury) and two days or more (a severe injury).

SAMPLE SIZE A census of all hospital separations in the study area per annum.

NOTES Hospital separations are prone to influence by funding policies.

Existing Data Sources

BASE DATA The Australian Institute of Health and Welfare (AIHW) maintains a National Hospital Morbidity Database (NHMD).

Definition of Terms

Hospital separation The term 'separation' refers to the episode of care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care.

I3.11 Cyclist Crash Locations – Police Reported – by Location — Safety

PURPOSE — This indicator helps us to understand where cyclist crashes most commonly occur.

DERIVATION — The number of serious injuries, including fatalities, of cyclists as recorded by the police by location – on-road at signalised intersection, unsignalised intersection, midblock, other and off-road – divided by the total number of cyclist crashes as recorded by police.

Base Data – Cyclist Serious Injury (Police Reported) by Location

DEFINITION — A cyclist serious injury (including fatalities) is where a person sustains an injury as a result of an incident while cycling *and* this is recorded by the police as a serious injury. These are then disaggregated by location.

For the purpose of these guidelines, the location categories include on-road at signalised intersection, unsignalised intersection, midblock, other and off-road.

A cyclist fatality is where a person dies as a result of an incident while cycling. Death may occur at the time of the incident or later, but must be a direct result of the incident.

SAMPLE SIZE — A census of all serious injuries and fatalities as recorded by the police.

Existing data Sources

BASE DATA — The Serious Injury Database – Australian Transport Safety Bureau.

Definition of Terms

Police reported — When people are injured in a car crash, by law this must be reported to the police. However, it is known that where a cyclist is injured in a crash, often the police are not notified, or if notified the incident may not be recorded by the police.

Appendices

9. Details for Existing Data Sources

9.1 The Australian Bureau of Statistics Australian Population Census

Since 1961 the Australian Bureau of Statistics has conducted a census of population and housing every five years. The object of the census is to measure accurately the number and key characteristics of people in Australia on census night and the dwellings in which they live. All private dwellings, except diplomatic dwellings, are included in the census whether occupied or unoccupied. Basic community profiles are available in hard copy or electronic form for all standard census geographic areas.

The adjusted census count is updated quarterly using demographic statistics – on births, deaths and overseas and internal migration. ABS population estimates are provided in 'Australian Demographic Statistics' (Cat. no. 3101.0), produced quarterly and in 'Population by Age and Sex, Australian States and Territories' (Cat. no. 3201.0).

The census of population and housing is the recommended source of information for the key population characteristics used as the denominator in the Cycling Indicators. These include the number of people, their age, sex and gross personal income.

9.2 The Victorian Activity and Travel Survey (VATS)

All enquiries regarding the Victorian Activity and Travel Survey should be directed to:

Associate Professor Jenny Morris
Director, Transport Research Centre
PO Box 12103
Melbourne 8006
Victoria Australia
Ph: (03) 9925 5121
Fax: (03) 9925 1313
website: www.trc.rmit.edu.au

The Victorian Activity and Travel Survey (VATS) is a household-based survey conducted by the Transport Research Centre (TRC) at RMIT University to provide a detailed description of daily travel and out-of-home activity patterns of household members in Victoria. The survey records all travel by all members of the responding households in the survey sample. It covers all 365 days of the year, thus enabling seasonal variations in travel and activity patterns to be observed. The survey only samples households within the Melbourne Metropolitan Statistical District (MSD), but plans to extend it beyond the MSD to cover other areas in regional Victoria are on the way.

The sample of households drawn is a stratified random sample of the 57 'old' (prior to amalgamation) LGAs. Prior to 1998 approximately 30 households per day were sampled and currently 45 households per day are sampled. Sampled households are then randomly assigned a travel day. The object is to obtain a well balanced distribution of addresses across the week (by day of week) as well as across the year (by month) for each LGA. Response rates for the past five years ranged between 45% and 50%.

The annual VATS process begins in July each year and finishes in June the following year. The VATS databases, however, are based on the calendar year and are VATS 94, VATS 95, VATS 96, VATS 97 and VATS 98. VATS 99 is expected to be released in September 2000.

9.3 The Sydney Household Travel Survey (HTS)

All enquiries regarding the Sydney Household Travel Survey should be directed to

Tim Raimond
Client Services Manager, Transport Data Centre
NSW Department of Transport
GPO Box 1620, Sydney 2001
New South Wales
Australia
Tel: +61 2 9268 2243
Fax: +61 2 9268 2853

The HTS consists of a personal interview carried out each day of the year. The survey is conducted by the Transport Data Centre which is an agency of the NSW State Government. Data is reported on a financial year basis. Information is collected on the mode of travel used, the purpose of each trip, origin and destination, and time of departure and arrival. Detailed socio-demographic information is collected on dwelling type and household structure, as well as the age, gender, employment status, occupation and income of each household member. Details of all vehicles used by the household are also collected.

Approximately 5000 households in the Greater Sydney Metropolitan Region (GSMR) are sampled annually with an approximately 75% response rate – a annual response from approximately 3700 households, equating to approximately 10 000 people.

The relative standard error (RSE) for total trips in the GSMR is about 5% at the 95% confidence level for each years data. Pooling the data over three years reduces the RSE to less than 2.5% at the 95% confidence level for the GSMR, and a little over 5% at the 95% confidence level for SSDs within the study area. Data is expanded to represent the travel patterns of the whole population in the survey area using information on households and individuals from the ABS, including the 1996 census of population and housing.

Separate survey instruments are used for children aged 0 to 14 years, and for people aged 15 years and over. Travel information is collected at the stop [?] level.

9.4 The 1999 Adelaide Household Travel Survey

All enquiries regarding the 1999 Adelaide Household Travel Survey should be directed to

Lindsay Oxlad
Manager, Transport Systems Analysis
Transport SA
PO Box 1 Walkerville 5081
South Australia
Australia
Ph: (08) 8343 2985
Fax: (08) 8343 2630
Mobile: 0407 814 991
e-mail: lindsay.oxlad@transport.sa.gov.au

9.5 Canberra/Quenbeyan Household Interview Survey 1997

All enquiries regarding the 1997 Canberra/Quenbeyan Household Interview Survey should be directed to [TBA]

A Household Interview Travel Survey was conducted in Canberra and Quenbeyan during the late summer and autumn of 1997. The object of the survey was to obtain data about the travel habits and characteristics of Canberra and Quenbeyan residents to assist in transport planning.

The survey was designed with a stratified random sample. The stratification has three dimensions designed to reflect the most important areas from which to obtain data for model development and for policy formulation. These areas included average zonal trip cost, average zonal household income and average zonal net residential density. The sample size was then determined by assessing the minimum number of dwellings in each zone that could be sampled to provide data with a confidence level of 95%.

The survey sample covered 1791 dwellings in 176 zones, 19 875 trips and 5011 people were surveyed. The pilot survey was conducted between 8 and 9 February 1997 and the main survey between 25 February and 23 April 1997, with a break over the Easter period. The survey did not include weekends or public and school holidays. The design called for an equal number of surveys to be carried out for each day of the week. Residents under five were excluded. Respondents were asked about their travel over a 24 hour period, including travel by bicycle.

Information was sought from survey respondents on their travel for a 24 hour period. Travel by bicycle was included.

9.6 ACT Travel and Activity Data Survey.

All enquiries regarding the proposed ACT Travel and Activity Data Survey should be directed to [TBA]

The ACT's Planning and Land Management (PALM) group is in the second stage of a scoping study looking at the feasibility of an ACT Travel and Activity Data survey. The object of the second stage is the full specification of the selected travel and activity survey and database system. The work is comprised in two phases.

Phase 1 – The full specification of the preferred travel and activity database model for application in the ACT, including details of the database structure, data specification, survey and other data collection requirements and cost estimates for the establishment and maintenance of the database.

Phase 2 – The development of a plan for pilot testing and other research as necessary to confirm the costs and effectiveness of the specified model.

The work is to continue to develop the entire system identified in the previous work including all components of the recommended surveys.

Residence based surveys

- Postal survey of selected residents
- Face-to-face interview of household members at selected residential addresses
- Face-to-face interviews at selected institutional 'homes'

Work based survey

- Computer-aided telephone interviews of workers at their work places

No commitment has been made at this stage to undertaking a survey once the pilot studies have been completed. If such a survey were undertaken it is likely that it would adopt the continuous survey approach, and use similar questions to the VATS and the Sydney HTS.

9.7 National Injury Surveillance Unit

All enquiries on NISU's products and services should be directed to

National Injury Surveillance Unit
Mark Oliphant Building
Laffer Drive
Bedford Park 5042
South Australia
Australia
E-mail us at nisu@flinders.edu.au;
Web Site: www.nisu.flinders.edu.au/
Tel: +61 8 8374 0970,
Fax: +61 8 8374 0702,

The National Injury Surveillance Unit has developed a data set that reports Australian injury related deaths from 1979 on, in a uniform fashion. NISU plans to release one set of summary tables each year – the latest set of summary tables includes 1998. These tables present injury and poisoning death counts and rates per 100 000 population by five year age groups and sex.

For the purpose of electronic publication via the Internet, these aggregations are divided into five sections. Each section contains counts and rates for males, females and persons. For the less detailed aggregations (sections 1 to 4) summaries are included for each state and for Australia while, for the most detailed aggregation (section 5), summaries are for Australia only. The dataset can be queried directly on line. Depending on your browser, you should be able to use this information in another application by either cut and paste or save as a text file. Information on cycling injuries is restricted to deaths

Explanatory Notes – Data Sources

Death Data

Death data are obtained in unit record form from the Australian Bureau of Statistics. In these tables, each death has been reported according to the state or territory in which it was registered, which may differ from the place of usual residence. Also, each death is reported according to the calendar year in which it was registered. About 9% of deaths occurred in a year other than the year in which they were registered.

Population Data

Population data are obtained from the Australian Bureau of Statistics. Values up to and including 1992 are final estimates, adjusted following the 1991 census. Estimates for 1995 are the latest available from ABS. state and territory populations are based on place of usual residence.

Age adjustment

Age adjustment of data is used to calculate overall population rates that take into account the age distribution of the underlying population. This permits more reliable comparisons to be made between states with different age profiles and over time as age profiles shift. In accordance with Australian Institute of Health and Welfare guidelines, age adjustment is to the 1991 Australian population. These age adjusted rates appear in rate tables under the heading ‘Age Adj’.

Use of data based on small numbers of deaths

The tables in this report have been abridged to suppress rate information based on three or fewer cases. Care must be taken when interpreting rates based on small numbers of deaths. Information on methods for comparing full enumeration based rate data, taking into account the number of cases can be obtained from NISU.

Age classifications

The age of the deceased was unknown for a small number of deaths. These are included only on case count based tables under the heading 'NS'.

Injury Cause Classifications

Information on deaths originates with coroners, medical practitioners and people familiar with the deceased is recorded by state and territory Registrars of Births, Deaths and Marriages, and is further processed by the ABS. The key data item for present purposes – Cause of death – contains the four digit International Classification of Diseases (ICD9) external causes code (E-Code) attributed by ABS.

This publication includes all deaths that have an E-Code in the range 800.0 to 999.9. The E-Codes are defined by the International Classification of Diseases (ICD) 'Supplementary Classification of External Causes of Injury and Poisoning'. Revision 9 of the ICD has been used to code deaths registered in Australia since the beginning of 1979. Readers should recognise that the characteristics of the ICD9 coding system and of the data collection system results in some injury deaths being coded in ways that mean they may be left out of these tables.

Categories of mode of injury death

Many of the E-Code categories have been aggregated by NISU for more informative presentation in tables. They are based on the National Data Standards for Injury Surveillance December 1995 edition.

9.8 Serious Injury Database

Street address:
Australian Transport Safety Bureau
24–26 Mort Street
Braddon 2612
ACT
Australia

Postal address:
PO Box 967
Civic Square ACT 2608
Tel: 1800 621 372
Fax: 61 2 6274 6474
E-mail: General Information: atsbinfo@atsb.gov.au
Web site: www.atsb.gov.au

The Australian Transport Safety Bureau (ATSB) conducts an ongoing program of national road toll statistical collection, analysis and publication. A detailed research data set is compiled from material forwarded by each jurisdiction. The data is derived primarily from crash unit record data forwarded from police and transport authorities in each state and territory. This is called the Serious Injury Database. It comprises unit records of each serious crash – that is, fatal and hospitalisation – unit records about each involved vehicle and unit records about each injured participant or vehicle driver (even if not injured).

Bicycles and cyclists are separately identified in the vehicle and person records respectively. The database comprises about 30 data items about the crash, vehicles and persons. The database covers the period from

1989 to 1996. Later material is available for some states and territories but national data post 1996 is currently unavailable due to the unavailability of NSW data for that period. Data confidentiality requirements mean that none of the databases is available to parties outside ATSB.

There are limitations in the police hospitalisation crash data. Not all reportable road crashes come to police attention, in particular those involving young bicyclists and, to a lesser extent, motorcyclists or those with a relatively low level of injury. Neither are police at a crash scene always certain about whether or not those people injured

In summary police hospitalisation crash data underreports the level of hospitalisation particularly of bicyclists, and provides no data on the injury severity.

9.9 **National Hospital Morbidity Database (NHMD)**

Australian Institute of Health and Welfare (AIHW)

For information about AIHW e-mail: info@aihw.gov.aupubs@aihw.gov.au.
For information about AIHW publications e-mail: feedback@aihw.gov.au.
To comment on AIHW publications and services e-mail webmaster@aihw.gov.au.
To comment on the AIHW web site visit www.aihw.gov.au

Call us on 02 6244 1000 (International +61 2 6244 1000) or fax us on 02 6244 1299 (International +61 2 6244 1299).

Write to us at
Australian Institute of Health and Welfare
GPO Box 570
Canberra 2601
ACT
Australia

Visit us at
Australian Institute of Health and Welfare
6A Traeger Court
Fern Hill Park
Bruce 2617
ACT
Australia

The Australian Institute of Health and Welfare (AIHW) maintains a National Hospital Morbidity Database (NHMD). The NHMD is compiled by the institute from data supplied by the state and territory health authorities. It is a collection of electronic confidentialised summary records for patients separated (b) in public and private hospitals in Australia. All records are based on separation dates.

Records are for hospital separations (discharges transfers, death or changes in type of episode care) for each financial year, the following year. A record is included for each separation, not for each patient, so patients who separated more than once in the year have more than one record in the database.

Although data on separations in the NHMD can reflect an aspect of the burden of disease in the community, they do not usually provide a measure of the incidence or prevalence of conditions. This is

because not all persons with a type or degree of illness are treated in hospital and the number and pattern of hospitalisations can be affected by differing admission practices, differing levels and patterns of service provision and multiple admissions for some chronic conditions, in addition to the differing patterns of morbidity in the population.

The National Health Data Dictionary definitions form the basis of the database (c), ensuring a high standard of data comparability. Diagnoses, procedures and external causes are recorded using ICD-9-CM, the official Australian version of the International Classification of Diseases, 9th Revision, Clinical Modification.

Almost all hospitals in Australia are included (d) – public acute and Department of Veterans' Affairs hospitals, public psychiatric hospitals, private acute and psychiatric hospitals, and private free standing day hospital facilities. The total number of records for 1996–97 was 5.3 million.

The main data elements included in the NHMD are summarised in ## below.

The National Hospital Morbidity Database compiles data using the ICD-10-AM classification for external causes of injury. In this classification are categories for injuries to pedal cyclists. The database is compiled annually, with data for financial years released (in the form of a summary publication) in the June following. Following June, the data are also available beyond our publication (provided that requests for the data are approved by the states and territories, where applicable). Fees are charged for some requests.

The tables presented in the current report are not disaggregated to the level whereby cyclists can be identified. Therefore additional analysis of the database would be required. Efficiencies can be achieved through analysing the database and reporting for each state and territory as one project.

The Australian Institute of Health and Welfare offers a comprehensive data service based on the National Hospital Morbidity Database (NHMD). Confidentialised data based on records included in the database are available for a range of epidemiological and health service research and planning purposes including analyses based on the Australian system of Diagnosis Related Groups (AN-DRGs). A charge may apply depending on the exact requirements and complexity of the analysis undertaken.

The AIHW maintains a National Hospital Morbidity Database (NHMD). The National Hospital Morbidity Database (NHMD) is compiled by the institute from data supplied by the state and territory health authorities. It is a collection of electronic confidentialised summary records for patients separated (b) in public and private hospitals in Australia. All records are based on separation dates.

The National Health Data Dictionary definitions form the basis of the database (c), ensuring a high standard of data comparability. Diagnoses, procedures and external causes are recorded using ICD-9-CM, the official Australian version of the International Classification of Diseases, 9th Revision, Clinical Modification.

Almost all hospitals in Australia are included (d) – public acute and Department of Veterans' Affairs hospitals, public psychiatric hospitals, private acute and psychiatric hospitals, and private free standing day hospital facilities. The total number of records for 1996–97 was 5.3 million.

Main data elements included in the NHMD

The following data are included for each separation record:

Establishment data

- State or Territory of the hospital
- Sector (public, private)
- Rural, Remote and Metropolitan Area (RRMA) and other characteristics of the hospital (public hospitals only)

Demographic data

- Sex
- Date of birth
- Age, age group (in five-year groups)
- Country of birth
- Indigenous status
- State and local area of residence (usually Statistical Local Area)
- RRMA of patient's residence

Administrative data

- Accommodation status (the account category of the patient, e.g. eligible public patient, eligible private patient, ineligible patient)
- Compensable status (to indicate entitlement to claim compensation for the episode of care)
- Insurance status

Length of stay data

- Admission and discharge dates
- Leave days
- Same day flag (to indicate discharge on the same day as admission)

Clinical and related data

- Principal diagnosis (the diagnosis established after study to be chiefly responsible for occasioning the patient's episode of care in hospital)
- Additional diagnoses (include co-existing conditions and/or complications)
- Principal procedure (the most significant procedure that was performed for treatment of the principal diagnosis, or as another procedure)
- Additional procedures (all other procedures undertaken)
- Major Diagnostic Category (MDC) and Australian National Diagnosis Related Group (AN-DRG)
- Estimated average cost for the AN-DRG (for the public and private sectors)
- Type of episode of care (acute, rehabilitation, palliative, non-acute, other)
- Referral source (source from which the person was transferred/referred)
- Separation mode (status at separation: discharge/transfer/death and place to which person is released)
- Intended length of stay (same day or overnight)
- External causes of injury or poisoning (events or conditions associated with the occurrence of injury, poisoning or violence)
- Places of occurrence of external cause (places where the external cause of injury, poisoning or violence occurred)

For further information contact

Please contact on
Jenny Hargreaves or Geoff Davis, tel: 02 6244 1000 or fax: 02 6244 1166
or write to

Patient Morbidity and Services Unit
AIHW
GPO Box 570
Canberra 2601
ACT
Australia

1. Each AN-DRG represents a class of patients with similar clinical conditions requiring similar hospital services. Therefore, they provide a common basis for comparing factors such as cost effectiveness and quality of care across Australia.
2. A record is included for each separation, not each patient, so patients who separate more than once have more than one record in the database. The term 'separation' refers to the episode of care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care – for example, from acute to rehabilitation. Although data on separations can reflect an aspect of the burden of disease in the community, they do not usually provide measures of the incidence of conditions. This is because not all ill persons are treated in hospital and the number and pattern of hospitalisations can be affected by differing admission practices and differing levels and patterns of service provision in addition to the differing patterns of morbidity in the population.
3. The actual definitions used by the data providers may vary from year to year and between jurisdictions and sectors. Comparisons between the states and territories, reporting years and hospital sectors should be therefore made with caution.
4. Exceptions within the public sector – public hospitals not within the jurisdiction of a state or territory health authority or the Department of Veterans' Affairs – that is, hospitals operated by the Department of Defence and hospitals located in off-shore territories – and three small public district hospitals in Tasmania.
   Exceptions within the private sector – the only private hospital in the Northern Territory, the private free-standing day hospital facilities in the Australian Capital Territory and two private free-standing day hospital facilities in Tasmania.
   The scope of the data collection has also varied from year to year. Comparisons between the states and territories, reporting years and hospital sectors should therefore be made with caution.

The RRMA classification allocates locations to one of seven geographical area types, based on population size and an index of remoteness.

9.10 Reporting and Timing of Data Releases of Common Databases

Database	Frequency of reporting	Timing of data release
Australian Census of Population and Housing: Community Profiles, Australia 1996. (Cat no. 2020.0)	Every five Years	Approximately 12 months following the conduct of the census – for example, the community tables for Census 1996 was released around August 1997.
Population by age and sex, Australian states and territories, (Cat no. 3201.0). This publication provides a snapshot of the population in June each year.	Annually	Around December each year, for that year's population statistics – for example, population statistics for June 2000 will be available in December 2000.
Victorian Activity and Travel Survey (VAT). Data is reported on a calendar year (Jan–Dec) basis.	Annually	September of the year following data collection – for example, data for 1999 will be released about September 2000.
Sydney Household and Travel Survey (HTS). Data is reported on a financial year basis (Jul–Jun)	Annually	March/April of the year following data collection – for example, data for 1998–1999 was released in March/April 2000.
The National Injury Surveillance Unit (NISU) Routine Surveillance Data Report. Data is reported each calendar year.	Annually	Usually in April two years following the year being reported – for example, 1998 data is released in April 2000.
The Australian Transportation Safety Bureau, Serious Crash Database.	Annually	
National Hospital Morbidity Database (NHMD). Data is reported on a financial year basis (Jul–Jun)	Annually	In June the year following the financial year of collection – for example, the 1997–98 data was released in June 1999.

Table 10.1 Data release dates for common databases

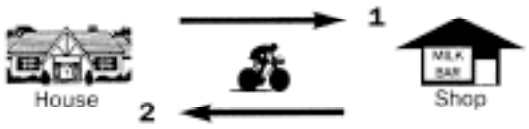
10. Schematic Definition of a 'Stop'

The following extract from the "Victorian Activity and Travel Survey example form", provides examples of travel and the number of stops undertaken by that journey.

- When recording your daily travel please think about any stopping places (or 'stops') along the way.
- **Each break in the journey is a 'stop'** (e.g. stopping off to buy petrol on the way to the gym counts as 2 'stops').

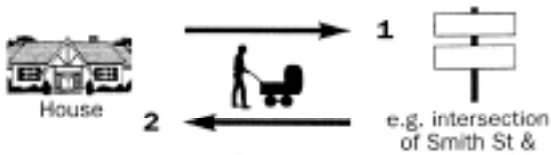
= 2 stops

- A trip going from home to somewhere (e.g. a shop) and back home would be 2 'stops' – one from home **to the shop,** and one from the shop back **to home.**



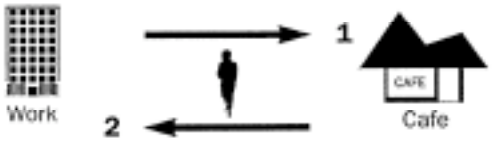
= 2 stops

- Sometimes trips don't involve making any stops along the way (e.g. going for a run, taking the baby for a walk). In these cases write in a stop as **the furthermost point of the walk.**



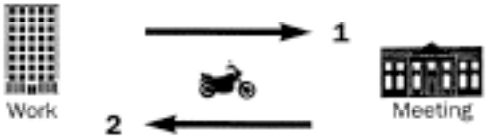
= 2 stops

- **Even short trips, like walking to lunch and back are important.**



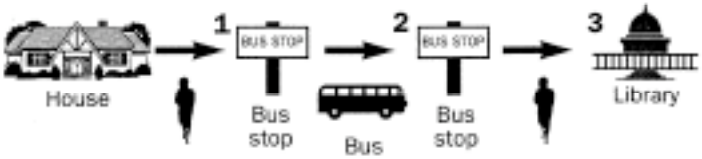
= 2 stops

- **So, too are work-related trips.**



= 2 stops

- **Remember to include all your transport 'stops'.** (e.g. bus stop).



= 3 stops

11. Examples of Travel Survey Forms

The following are copies of the survey instruments from some of the current household travel surveys in Australia.

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