Sydney Cycling Survey 2011
Methods and Findings

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Foreword

The Roads and Maritime Services (RMS) and the Bureau of Transport Statistics (BTS) commissioned Sinclair Knight Merz to undertake the Sydney Cycling Survey 2011. The main objective of this survey was to measure performance against the *NSW 2021* target to more than double the mode share of cycling among trips up to 10 km in the Sydney Greater Metropolitan Area by 2016. The survey also collected data suitable for the analysis of the incidence and nature of cycling, the characteristics of cyclists and cycling participation.

This report documents the survey methodology and estimation process, and presents the main findings. This report was prepared by SKM for the RMS and the BTS.

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Contents

Executive Summary

The *NSW 2021* strategic business plan establishes a target to more than double the mode share of cycling among trips up to 10 km in the Sydney Greater Metropolitan Area by 2016. In order to achieve this target, Roads and Maritime Services (RMS) and the Bureau of Transport Statistics (BTS) commissioned Sinclair Knight Merz to develop a survey method to monitor performance towards this target. This survey was first undertaken in November 2010 and was referred to as the Sydney Cycling Survey (SCS) 2010.

The Sydney Cycling Survey 2011 was conducted using computer assisted telephone interviews of a stratified sample of households in the Greater Metropolitan Area from 14 November to 4 December 2011. A total of 11,281 individuals from 4,153 households were interviewed. Data on individual and household demographics was obtained, as well as information on cycling participation. The 321 individuals who had cycled on the previous day were asked about the trips they had made by bicycle over that period. These interviews provided a total of 658 cycling trip observations (of which 574 were 10 km or less in length).

Population statistics were estimated using weights derived from the ABS estimated resident population for 2010. The BTS Household Travel Survey was used to provide an indication of travel by all modes along with the results of this survey to estimate a cycling mode share.

The key findings were as follows:

- 18.0% (CI[1]: 17.2%-18.8%) of the population cycled at least once in the previous week (2010: 11.9%) and 26.2% (CI: 25.3%-27.1%) cycled at least once in the previous month (2010: 22.2%).
- Males are far more likely to have ridden than females; 24% of males rode in the previous week compared with 13% of females.
- Children are far more likely to have ridden recently than adults; 58% of children aged under 10 had ridden in the past week, compared with 15% of those aged 30 – 49 and 6% of those aged over 50.
- Our best estimate is that on a typical day around 180,000 residents of the Sydney Greater Metropolitan Area ride a bicycle in a public area, making a total of around 369,000 cycling trip legs (of any length). Around 60% of these trips are for social, exercise or recreation purposes. Around 157,000 residents make cycling trips in public areas that are 10 km or shorter, equating to a total of around 327,000 trip legs per day[2].
- The cycling mode share estimate for trips of 10 km or less is 2.17% (CI: 1.87%-2.47%), a statistically insignificant difference over 2010 (1.91%). There is considerable variation across gender and age groups; females aged 50 or over have the lowest cycling mode share (0.21%) and males aged under 15 have the highest cycling mode share (7.67%).

[1] 95% confidence interval.

[2] Most individuals make two trips per day, or one round trip. Where a round trip is made it is divided into two trips, each of half the duration; this is consistent with the way in which round trips are handled in the Household Travel Survey.

1 Introduction

Sinclair Knight Merz (SKM) was commissioned by the NSW Roads and Maritime Services (RMS) and the Bureau of Transport Statistics (BTS) to develop and field a survey to monitor performance towards the *NSW 2021* strategic business plan target:

> *More than double the mode share of bicycle trips made in the Greater Sydney region, at a local and district level, by 2016.*
>
> *(NSW 2021, p20)*

Local trips were defined in the plan as trips of 5 km or less, while district trips were trips up to and including 10 km. The objective of this study was to design and field a survey instrument to allow monitoring of this target on an annual basis.

1.1 Defining the target

In designing the survey methodology, the definition of the *NSW 2021* target has been specified as follows:

- the **proportion** of bicycle trips, compared to walking, using a car or travelling by bus, rail, ferry and other modes that are equal to or under 10 km in length,
- "Greater Sydney": residents of the Sydney and Illawarra Statistical Divisions and the Newcastle Statistical Subdivision (referred to here as the Sydney Greater Metropolitan Area (GMA),
- **unlinked trips** (also referred to as trip stages or stops): trips broken down into stages where a change of mode is involved (e.g. a bicycle ride to a station, followed by a train trip and walk at the other end would be three unlinked trips), are more than 100 m in length and include changes of modes involving the same vehicle type (e.g. a walk from one train to another at one station) – these are hereafter simply referred to as "trips",
- all purposes of travel,
- persons of all ages are in scope[3],
- trips made by residents by bicycle that start and/or finish in the Greater Sydney area are included,
- the target is set for the 2016 financial year (i.e. 2016/17),
- only trips which are **10 km or under** in length are included, and
- average of all days in the week including weekend days.

Most importantly, the target is to achieve a **mode share** – and this requires an understanding of travel by all modes for trips of up to 10 km in length, not only cycling trips. The principle adopted in the present study was to use the best available survey data; the Household Travel Survey provides information on overall (all-mode, all-purpose) travel by residents of the study area, as

[3] This has implications for the survey methodology, as Australian Market Research Association guidelines prevent telephone interviewing of persons under 15 years of age.

this dataset represents our best understanding of overall travel in Sydney while the dedicated cycling survey provides data on cycling travel only.

1.2 Limitations of existing datasets

Existing datasets on travel in the Sydney GMA are insufficient to allow reliable monitoring of cycling mode share. The three main data sources available on travel in Sydney, and cycling in particular, are summarised in Table 1.1. The limitations identified here are most importantly the insufficient sample sizes for cycling travel in the Household Travel Survey (HTS), limited purpose in the ABS census (commuting only) and limited spread of permanent bicycle counters mean that a dedicated primary survey effort is required.

Table 1.1: Limitations of existing datasets to monitor NSW 2021 target

Dataset	Description	Issue
Household Travel Survey (HTS)	Rolling survey of approx. 3,500 households per annum, covering one day of travel (all modes, purposes) by all household members.	Insufficient sample size of cycling trips
ABS census journey to work	5-yearly population survey conducted on an August Tuesday. Scope limited to commuting travel and up to 3 modes provided by ABS (main mode only is usually provided).	Too infrequent for monitoring purposes, limited to commuting and conducted only on one day in a low cycling month (August).
Permanent bicycle counters	Automatic bicycle counters located on cycleways and shared paths in the Sydney area.	Do not provide information on non-cycling modes (so do not provide information on mode share), limited number of sites restrict ability to monitor across GMA and counts do not provide information on journey length (<10km or >10km).

1.3 Report structure

This report is structured as follows:

- **Section 2** describes the design of the survey instrument, including the sampling methods.
- **Section 3** describes the survey processing and provides summary statistics.
- **Section 4** provides the main survey results and analysis.

2 Survey design

2.1 Overview

The survey methodology is predicated on two principles:

1. The methodology should produce **unbiased** estimates which are **sufficiently reliable** to predict annual changes in a mode (cycling) which has a very small base mode share.
2. The methodology must be **cost effective** (or more correctly, must produce a sufficiently reliable estimate at minimum cost).

The method that has been adopted is as follows:

- a cross-sectional[4] computer-assisted telephone interview (CATI) survey,
- speak to any person in the household aged 18 or older who is available for interview,
- ask that person to provide basic demographic characteristics of all members of their household and when those individuals last rode a bicycle,
- ask all household members who have ridden yesterday (defined as midnight to midnight) for the details of their cycling trips – allow proxy reporting where another household member is unavailable,
- expand the cycling survey data to population estimates using benchmarks consistent with the 2010/11 HTS (derived from ABS estimated resident population estimates),
- determine all-mode trip rates for trips under 10 km from the HTS (2010/11[5]),
- estimate the 2011 cycling mode share for trips under 10 km.

We describe the design of the 2011 survey in more detail in the following sections. There were a number of changes since the 2010 survey which are pertinent when comparisons are made between the years. These changes are summarised in Table 2.1.

[4] A cross-sectional survey is a survey that interviews individuals (or, in this case, households) at one point in time. Ideally, one would repeat the survey with the **same** individuals/households over time to explore their changes in behaviour. Such a survey is a longitudinal survey, but for various reasons would be prohibitively expensive for this activity.

[5] Trips for all modes are based on unlinked trips except for walking.

■ **Table 2.1: Changes in Sydney Cycling Survey from 2010 to 2011**

Change	Rationale
7-day cycling travel diary reduced to 1-day cycling travel diary	Concern about respondent burden and accuracy of recall. However, this reduces the total number of bicycle trip observations. *Yesterday* is defined as the time from midnight to midnight on the most recently completed day.
Permit proxy reporting of cycling travel	In 2010 the travel diary could only be reported by the individual who made the travel (except for those aged under 15, in which case proxy reporting was accepted). This resulted in a large amount of sample loss, to which imputation methods were applied. In 2011 proxy reporting was allowed in all cases where an individual had ridden yesterday but was (a) unavailable to speak to the interviewer, and (b) the main respondent indicated they knew of the travel patterns of that individual.
Sampling fractions proportional to dwellings rather than journey-to-work cycling mode shares (i.e. proportionate rather than disproportionate sampling)	In 2010 sampling fractions were established proportional to journey-to-work cycling mode shares at an LGA level. The rationale was that this would serve as a proxy for cycling participation, hence increasing the proportion of cycling participants in the sample. In practice, journey to work travel was found to have little correlation to overall cycling rates. Instead, in 2011 sampling was divided into the 17 statistical subdivisions (SSDs) and targets set for each SSD based on dwellings (in effect, this method has the objective that all dwellings in the GMA have an equal probability of being selected for interview).
Change expansion target geography from SLA to SSD	Statistical Local Areas (SLAs) were used to expand the sample in 2010, resulting in small cell sizes and an inconsistency between the samplings strata (LGA) and expansion targets. To redress these issues in 2011 larger statistical subdivisions (SSDs) were used as the expansion targets, also providing consistency with the stratification.
Adjusted age bands in expansion process to better match cycling participation	In 2010 three age bands were used in the expansion and weighting: 0 – 14, 15 – 49 and 50+. To better reflect the differences that occur in cycling rates among different age groups an additional band has been added, and the young child threshold has reduced from 14 to 10, giving four bands: 0 – 10, 10 – 29, 30 – 49 and 50+. Each of these bands have sufficiently large sample sizes to allow for weighting the data, although it is noted the 10 – 29 age band will contain a wide range of individuals and licence holding.

Change	Rationale
Screener to interview only respondents aged 18+	In 2010 respondents aged 15+ were eligible for the survey. As a greater respondent burden was present in 2011 (due to proxy reporting) this screener was increased to 18+.
Elimination of random selection of main respondent	To allow for attitudinal questions to be asked of a household member aged 15+, in 2010 a random household member (using the most recent birthday method) was selected for interview. In 2011 attitudinal questions were not asked, so eliminating the need for the main respondent to be randomly selected.

2.2 Survey method

Computer-assisted telephone interviewing (CATI) was chosen as the most cost effective survey method, offering the best opportunity to obtain timely data and having the greatest control over sampling biases. The survey was conducted over a three week period from 14 November to 3 December 2011. The telephone interviews were conducted by Market Solutions on behalf of the project team. All interviewers were experienced in conducting telephone interviews and had been subject to training on the survey objectives prior to commencing fieldwork. The following quality assurance activities were undertaken specific to this project:

- all interviewers were given a training session[6] before working on the project,
- interviewers were provided with a survey manual to help them clarify complicated situations that may arise during interviews,
- one or several supervisors were present during interviews to answer questions of clarification from interviewers and to listen in to interviews in real-time,
- nightly summary statistics were provided to the research team to confirm the survey was proceeding as expected, and
- five attempts at recontacting non-responding telephone numbers were made and each was undertaken at different times of day and days of week (in order to minimise the likelihood of contact loss and non-response bias).

2.3 Sampling frame

A sampling frame is a database from which the sample is selected. The frame was a commercially available database of landline telephone numbers (both listed and unlisted) for the study area. Such a database excludes households that do not own a landline telephone[7], or those who have only obtained a landline recently (the database is updated in waves, but is fairly

[6] This training covered topics such as the purpose and objectives of the survey, the meaning of specific terms and questions and example cases to help interviewers classify difficult travel patterns.

[7] The Australian Communications and Median Authority (ACMA (2011) *Convergence and Communications: Australian household consumers' take-up and use of voice communications services*) estimates that 88% of Australian households have a landline telephone.

representative for 2009). This latter issue may limit the sample in areas where significant residential construction has occurred in recent times.

2.4 Sampling unit

The sampling unit for the survey was **households**. Within each household one person aged 18 or over was asked to report on the characteristics of their household and the persons usually resident within that household.

2.5 Sampling strata

In sample surveys the statistical uncertainty can be reduced by **stratifying** the sample. Stratification is the process of dividing a population into non-overlapping, homogenous groups of households or individuals and then specifying the number of samples to be obtained within each group. In this survey the number of samples were specified based on statistical subdivisions (SSDs), of which there are 17 in the study area.

The sampling frame consisted of telephone numbers referenced to a postcode. For each SSD postcode correspondences were prepared. These correspondences were, for some postcodes, approximate as some postcodes cross SSD boundaries. Where this was the case a manual assessment was made to allocate the postcode to one SSD only by assessing the most likely location of the population resident within that postcode. In almost all cases where postcodes significantly overlapped two SSDs the postcode was in a predominantly rural area, with one township. In such cases the postcode would be allocated to the SSD in which that township resides.

Each SSD varied significantly in population and the number of dwellings. A target of maintaining approximately constant sampling fractions across the SSDs was set, using household projections for 2010 provided by BTS[8]. In order to achieve these targets the survey team was required to achieve a spread of interviews approximately consistent with the proportion of households within each SSD. This spread was to be maintained in aggregate across all survey days and, as best could be achieved, on each survey session. In this way a situation was avoided where, for example, the interviewers focussed on particular geographic areas during each survey session.

[8] Projections for 2010 were the most recently available, and in any case are used as the expansion targets in the HTS 2010/11 with which the SCS data will be compared. As such, a consistent set of expansions are used.

- **Table 2.2: Statistical subdivision targets (household projections for 2010 – private occupied dwellings only, source: BTS)**

Statistical Subdivision	No. of households	Proportion
Inner Sydney	162,958	7.9%
Eastern Sydney	110,710	5.4%
St George-Sutherland	172,476	8.3%
Canterbury-Bankstown	116,144	5.6%
Fairfield-Liverpool	120,234	5.8%
Outer South Western Sydney	84,412	4.1%
Inner Western Sydney	73,115	3.5%
Central Western Sydney	125,322	6.1%
Outer Western Sydney	115,905	5.6%
Blacktown	100,761	4.9%
Lower Northern Sydney	133,791	6.5%
Central Northern Sydney	152,648	7.4%
Northern Beaches	94,383	4.6%
Central Coast	124,518	6.0%
Newcastle	211,532	10.2%
Wollongong	110,768	5.4%
Illawarra SD (Balance)	56,986	2.8%
Total	*2,066,663*	*100.0%*

2.6 Qualifiers

Qualifiers are screener questions used to identify respondents who are in scope for a survey. As we are interested in travel by all residents of the Sydney GMA the only qualifiers are of a practical nature:

1) only respondents who are conversant in the English language were interviewed,
2) respondents households must be located within the Sydney GMA, and
3) respondents must be aged 18 or over.

Given these qualifiers, the vast majority of households would qualify for the survey.

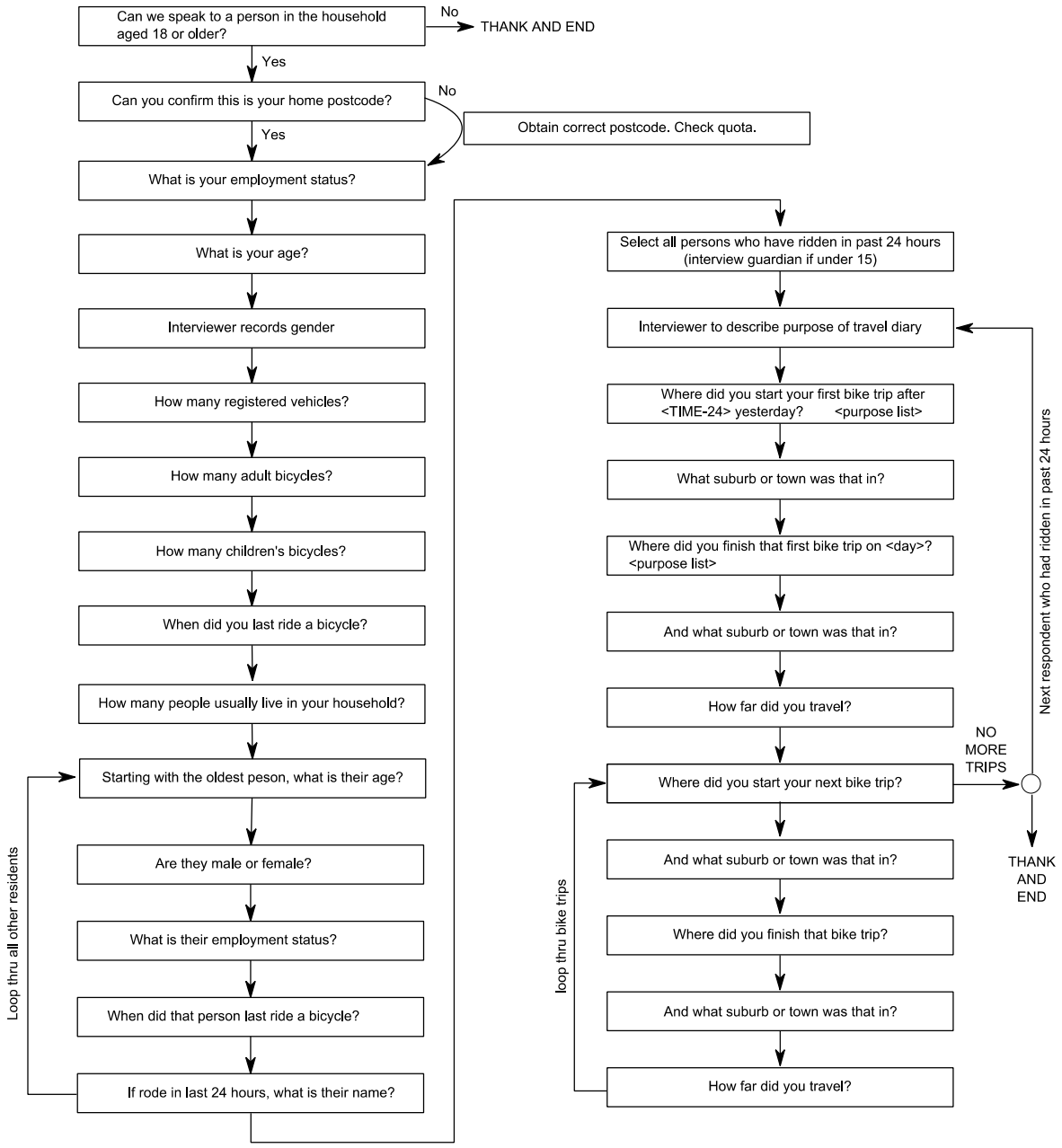
2.7 Survey instrument

The survey instrument is provided as Appendix A. The instrument consistent of the following sections:

- identify an individual in the household who is aged 18 or older and speak to that person,
- screener to ensure respondent is in the correct SSD quota,
- identify demographic characteristics (gender, age, employment status) of that primary individual,
- identify household characteristics (vehicle and bicycle ownership, number of residents),
- identify demographic characteristics (gender, age, employment status) of **all** other household members,
- identify **all** household members who rode a bicycle **yesterday** (defined as midnight to midnight),
- interview the selected individuals to identify their cycling travel yesterday
    - if under 15, ask a proxy to report travel on their behalf
    - if not currently home (or unavailable), ask for another household member who is available to respond on their behalf.

A flowchart illustrating the interview structure is given in Figure 2.1.

■ **Figure 2.1: Survey flowchart**



2.7.1 Cycling trip recall

The cycling trip recall activity was intended to determine the number of trips made by bicycle, and the purpose for which these trips were made. Best practice in travel diary research recommends that respondents be identified **prior** to travel occurring, such that respondents can be asked to record all travel as it occurs. This recommendation is based on experience that suggests that trips are under-reported in recall and that respondents report what they usually do, rather than actually did over the period in question. However, constraints on the survey budget meant that

one day trip recall was the only practical means of conducting the survey. Two strategies were adopted in the survey design and implementation to attempt to redress these issues regarding recall:

- respondents were asked to think only about their cycling travel, not travel by all modes, and
- a place-based approach was taken, where respondents were asked to identify where they started and finished a trip ; this also provides a means by which to classify trip purposes.

While not the most optimum method to maximise trip enumeration, analysis of the survey responses indicated plausible responses and cycling trip rates. However, it is still possible that the number of cycling trips was underestimated by respondents to some extent, and this will have the effect of underestimating the overall cycling mode share.

2.8 Survey fieldwork

The survey was undertaken over a 21 day period from Monday 14 November to Saturday 3 December 2011. Calls were made during the evening (5 pm – 8 pm), except where a household was un-contactable during these times, in which case other times of day and days of week were attempted. The results presented in the following sections are based entirely on the results of this main fieldwork phase.

3 Survey processing

In this section we describe the basic survey statistics and response rates as well as the methods used for cleaning, weighting and expansion to match population targets and confidence intervals estimated for the population statistics. The processes used are described in this chapter.

3.1 Response rate

For the main fieldwork phase[9] a total of 46,209 telephone numbers were used, of which 14,457 (31.5%) were in-scope for the survey and 4,102 (8.9% of all numbers, and 28.2% of in-scope contacts) completed interviews (prior to data cleaning). As shown in Table 3.1, around half of the contacted numbers refused to participate in the survey.

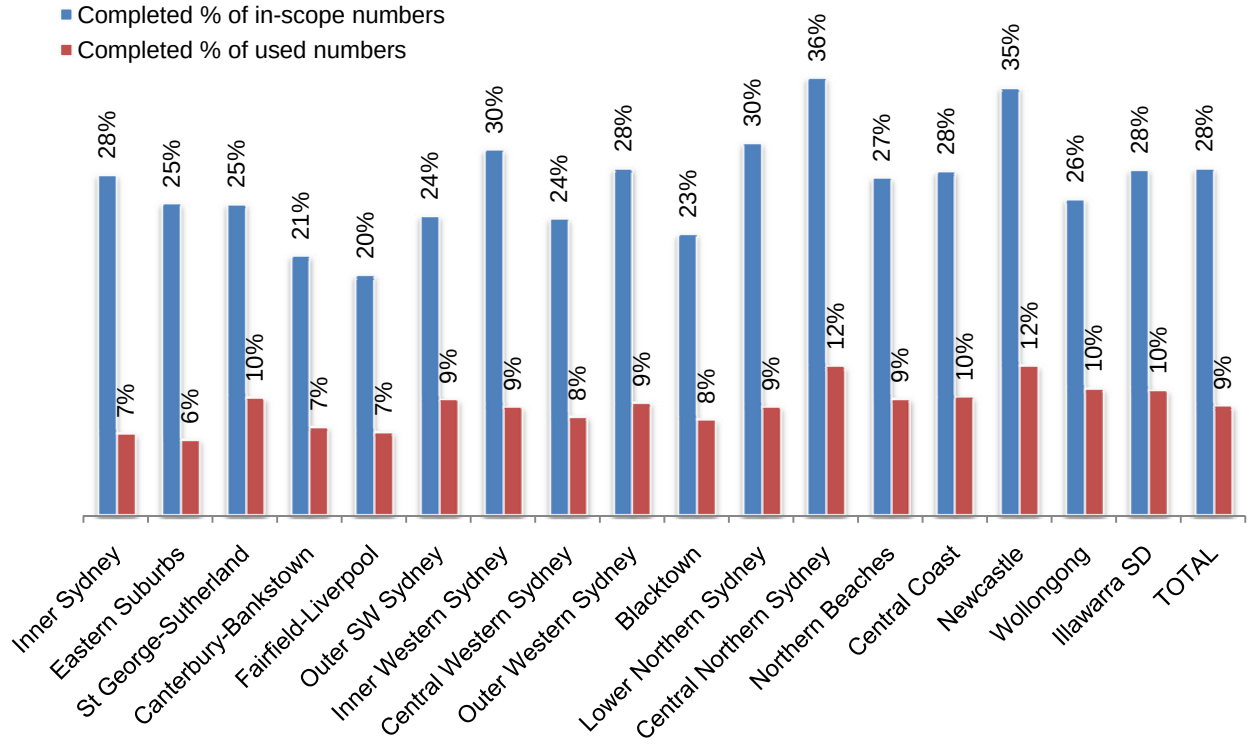
■ **Table 3.1: Response rate summary (each count represents a telephone number)**

Status	Count	% of dialled numbers	% of in-scope contacts
In-scope contacts			
Completed interviews	4,102	8.9%	28.2%
Surplus callbacks	2,285	4.9%	15.7%
Declined to participate	7,530	16.3%	51.8%
Terminated early	174	0.4%	1.2%
Communication difficulties	456	1.0%	3.1%
Total	*14,547*	*31.5%*	*100.0%*
Other contacts			
Non-qualifying respondents	371	0.8%	
Government / business number	295	0.6%	
Duplicate / over-quota	11	0.0%	
Non-contacts			
No answer (5 times)	23,122	50.0%	
Non-working number	7,863	17.0%	
Total	46,209	100.0%	

The response rate by statistical subdivision is shown in Figure 3.1. The proportion of in-scope telephone numbers that were completed varied from 20% (Fairfield-Liverpool) to 36% (Central Northern Sydney). As a proportion of all dialled numbers completions varied from 6% (Eastern Suburbs) to 12% (Central Northern Sydney and Newcastle).

[9] The first survey evening (14 November) consisted of a soft launch, for which call statistics were collated separately and are not reported here.

■ **Figure 3.1: Response rates by statistical subdivision**



3.2 Data cleaning

A number of consistency and sensibility checks were performed on the raw survey data. These checks, and the resolution, are summarised in Table 3.2. The most significant change was to split trips that started and finished in the same place into two trips – each of half the reported trip distance. For example, a significant number of trips were reported as starting and finishing at home – these are recoded as two recreation trips. This process is consistent with that used in the HTS.

■ **Table 3.2: Checks and coding changes summary**

Issue	Resolution
Missing demographic parameters (age)	Dropped 12 individuals for whom age was refused or unknown.
Age and employment status consistency check	All responses appeared plausible – no changes made
Cycling trip distances plausible	Interviewers appeared to confuse metres and kilometres in some instances (6 cases). Where the intended value was clear this was corrected, otherwise distances were removed (4 cases).
Cycling trips with same origin-destination are reported as two trips.	Where a cycling trip with the same origin and destination suburb **and** same origin and destination purpose is coded as one trip, it was divided into two trips, each of half the reported travel distance.

3.3 Summary statistics

The summary statistics for the unweighted data are as follows:

- 4,153 households containing 11,281 individuals
- 1,632 individuals (15.1%) had ridden in the past week, of which 321 (2.8% of all individuals) had ridden a bicycle yesterday in a public place (a further 115 (1.0%) had ridden only in the backyard, giving a total of 3.8% who had ridden in the previous day).
- Of these 321 individuals making bicycle trips yesterday, 105 (33%) were interviewed for the cycling travel recall activity. A further 208 individuals (66%) were interviewed by proxy, and the remaining eight were unavailable for interview and no other household member was available to report on their behalf.
- There were a total of 658 recorded bicycle trips made on the previous day, or an average of 2.0 bicycle trip legs per cycling individual.
- Of these 658 trips, 574 (87%) were 10 km or less in length (across 276 individuals). It is these trips that were retained in order to determine a cycling trip rate (and cycling mode share).

3.4 Day-of-week sampling

In order to obtain as representative a sample as possible the fieldwork was spread out over several weeks, with the intention of obtaining approximately the same completions on any one evening. The total number of interviews, and the weather conditions on the **previous** day are given in Table 3.3.

■ **Table 3.3: Completed interviews and weather conditions on previous day**

Date of interview	No. of Interviews	Weather on previous day		
		Max Temp. (°C)	Rainfall (mm)	Sun (hrs)
Mon 14 Nov	53	26.2	0.0	2.6
Wed 16 Nov	124	24.6	0.0	11.7
Thu 17 Nov	150	22.1	0.0	1.1
Fri 18 Nov	100	21.4	12.8	0.0
Sat 19 Nov	222	23.7	1.8	9.6
Sun 20 Nov	78	27.5	0.0	12.9
Mon 21 Nov	209	28.0	0.0	7.0
Tue 22 Nov	197	22.3	2.4	0.4
Wed 23 Nov	237	21.9	4.8	0.2
Thu 24 Nov	203	18.3	38.8	0.1
Fri 25 Nov	246	18.3	14.8	0.0
Sat 26 Nov	279	20.0	7.6	0.0
Sun 27 Nov	226	26.8	22.0	5.5
Mon 28 Nov	244	29.8	6.8	12.5
Tue 29 Nov	259	26.9	0.0	12.9
Wed 30 Nov	306	26.2	0.0	8.0
Thu 1 Dec	299	31.6	0.0	2.2
Fri 2 Dec	255	21.9	1.4	8.7
Sat 3 Dec	288	21.1	1.4	8.2
Sun 4 Dec	178	22.2	0.0	11.3
Total	**4,153**	□	□	□
Average	□	**24.0**	**5.7**	**5.7**

Aggregating across the days of the week there was some variation between the days of week (Table 3.4). In this table the day represents the interview day – the period for the cycling travel diary is the day prior to the interview day.

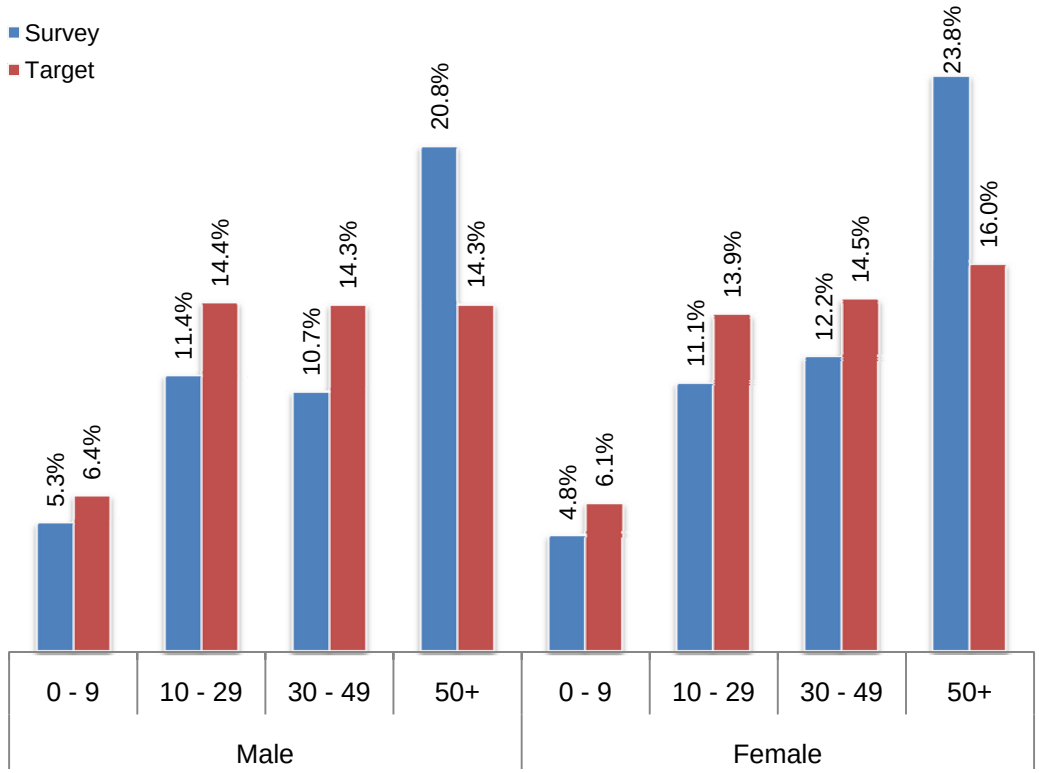
■ **Table 3.4: Interview total by day of week**

	No. of interviews	% of all interviews
Mon	506	12%
Tue	456	11%
Wed	667	16%
Thu	652	16%
Fri	601	14%
Sat	789	19%
Sun	482	12%
Total	**4,153**	**100%**

3.5 Demographic characteristics

In the weighting process discussed in Section 3.6 the sample is divided into four age bands (0 – 9, 10 -29, 30 – 49 and 50+) and the two gender categories across each of the 17 statistical subdivisions. An indication of the level of over- and under-representation of each of these age and gender categories is provided in Figure 3.2. In comparison to the HTS targets (which represent our best estimate of the population distribution) the sample has too few people aged under 50. These demographic skews are common with telephone survey research. Inferences about the population from this demographically skewed data would not be appropriate; instead it is necessary to weight the data to better represent the population.

■ **Figure 3.2: Age and gender groups for unweighted sample compared with HTS targets**



3.6 Weighting and expansion

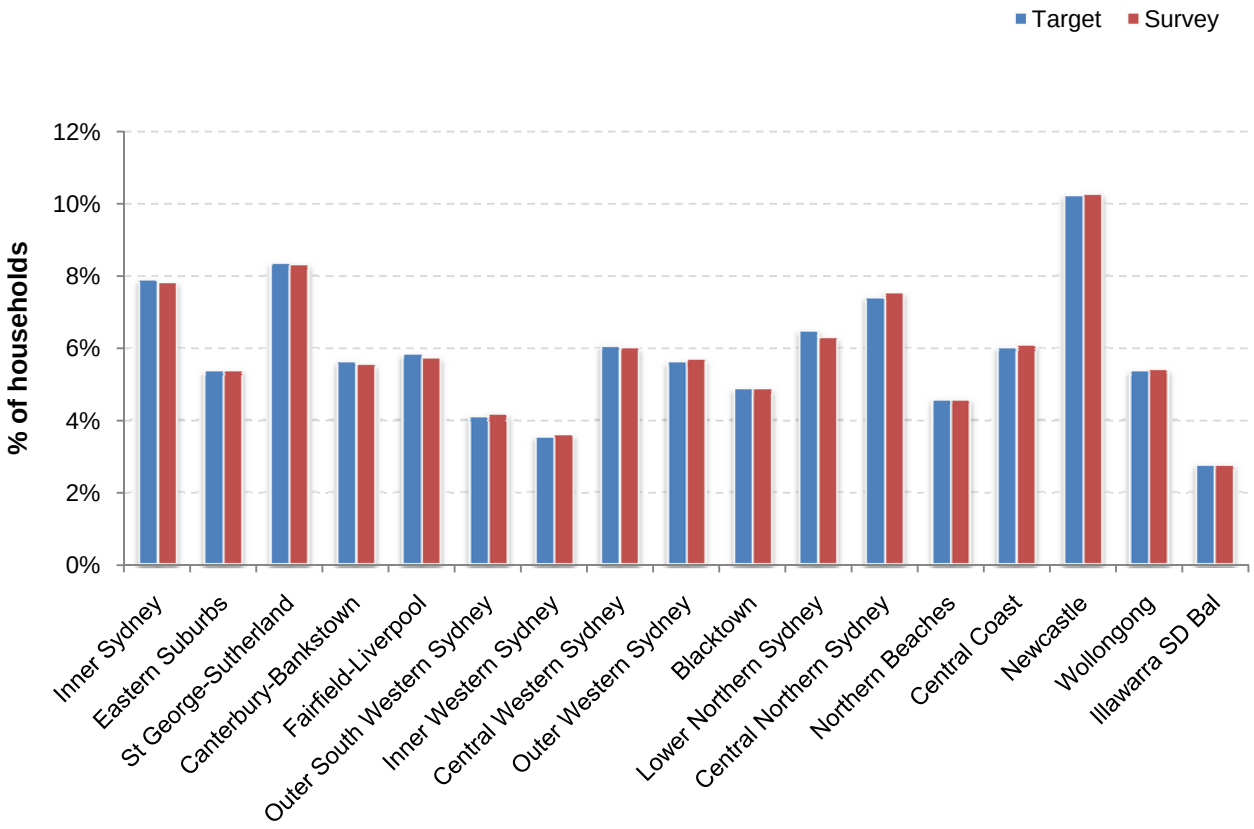
In a manner consistent with the HTS, targets for estimated residential population (ERP) produced by the ABS for 2010 adjusted for those living in private dwellings only were used to expand the sample. These benchmarks were provided at the household and person level. As the age bands in the SCS differed somewhat from those used in the HTS expansion process it was necessary to aggregate the ERP person targets and apply a correction factor (0.9628 on all cells) as used in the BTS process. The targets were based on three variables:

- At the **household** level:
  - statistical subdivision (17)
- At the **person** level:
  - Statistical subdivision (17)
  - Gender
  - Age band (0 – 9, 10 – 29, 30 – 49, 50+).

The result was weighting and expansion targets consisting of 17 targets at the household level and 136 at the person level.

The distribution of the households across the GMA accorded almost precisely with the target sampling fractions, as shown in Figure 3.3. This is as would be expected, given the stratification used in the sampling. The number of households in each statistical subdivision in the sample is shown in Table 3.5; the subdivision with the least households was Illawarra (115) and the most was Newcastle (427).

■ **Figure 3.3: Household target proportions and achieved survey proportions by statistical subdivision**



■ **Table 3.5: Sampled households and persons by statistical subdivision**

	Households		Persons	
Statistical Subdivision	**No.**	**Proportion**	**No.**	**Proportion**
Inner Sydney	325	7.8%	835	7.4%
Eastern Sydney	223	5.4%	579	5.1%
St George-Sutherland	345	8.3%	971	8.6%
Canterbury-Bankstown	230	5.5%	664	5.9%
Fairfield-Liverpool	238	5.7%	761	6.8%
Outer South Western Sydney	173	4.2%	498	4.4%
Inner Western Sydney	149	3.6%	393	3.5%
Central Western Sydney	249	6.0%	694	6.2%
Outer Western Sydney	236	5.7%	657	5.8%
Blacktown	202	4.9%	639	5.6%
Lower Northern Sydney	261	6.3%	674	6.0%
Central Northern Sydney	313	7.5%	855	7.6%
Northern Beaches	190	4.6%	526	4.7%
Central Coast	253	6.1%	610	5.4%
Newcastle	427	10.3%	1,095	9.7%
Wollongong	224	5.4%	590	5.2%
Illawarra SD (Balance)	115	2.8%	240	2.1%
Total	*4,153*	*100.0%*	*11,281*	*100.0%*

The smallest cell at the person level contained 4 observations (Illawarra SD males 0-9) and the largest 292 observations (Newcastle females 50+), with a median of 75 observations for all cells.

Checks were performed on descriptive statistics with and without weighting, and with and without the weight truncation, to check the sensitivity of the descriptive statistics to the weighting process. These tests, not reported here, found generally minor changes to variables of interest. More substantial changes were observed with some variables – such as cycling participation, which increased from 15.1% to 18.0% after weighting. These changes are plausible, and may be explained by the over-representation of a group with a lower cycling participation (namely, those aged over 50).

3.7 Confidence intervals

Any population statistic that is based on a sample of the population will be subject to statistical uncertainty that is attributable entirely to the (nominally) random sampling of the population[10]. This uncertainty can be represented by confidence intervals, which are bounds within which we can have a specified level of confidence that the true value most likely falls. The exact analytical methods first described by Kish[11] are used to determine the confidence intervals for the weighted data.

3.8 Weather and seasonal variation

Cycling, particularly for non-utilitarian travel such as recreation and sport, will vary depending on the weather. Data from permanent bicycle counters, as well as manual observations, suggest that commuter cycling drops by around 30% in winter months in temperate climates such as Sydney, while recreational cycling can drop by 50% or more depending on the weather.

The present survey was conducted over a two week period in November and early December, when weather conditions are typically not too different to the annual average (Table 3.6). However, in 2011 higher than average rainfall was experienced over the period; it rained on 11 of the 20 survey days (55%) compared with 100 days per annum on average (27%). As such, we would expect the cycling participation rate and cycling mode share estimates to be **under-estimates** in comparison to the annual average.

■ **Table 3.6: Comparison of weather during survey period with the long run average**

	Survey period	Long run average	Variation
Max temp. (°C)	24.04	22.86	+1.18
Rainfall (mm)	5.73	2.47	+3.26
Sunshine (hrs)	5.75	7.28	-1.53

[10] Issues of respondent and interview bias are different, and not accounted for in this procedure. These other biases are almost always handled only in qualitative terms, and often their magnitude can only be speculated upon.

[11] Kish, L. (1965) *Survey Sampling*, New York. John Wiley.

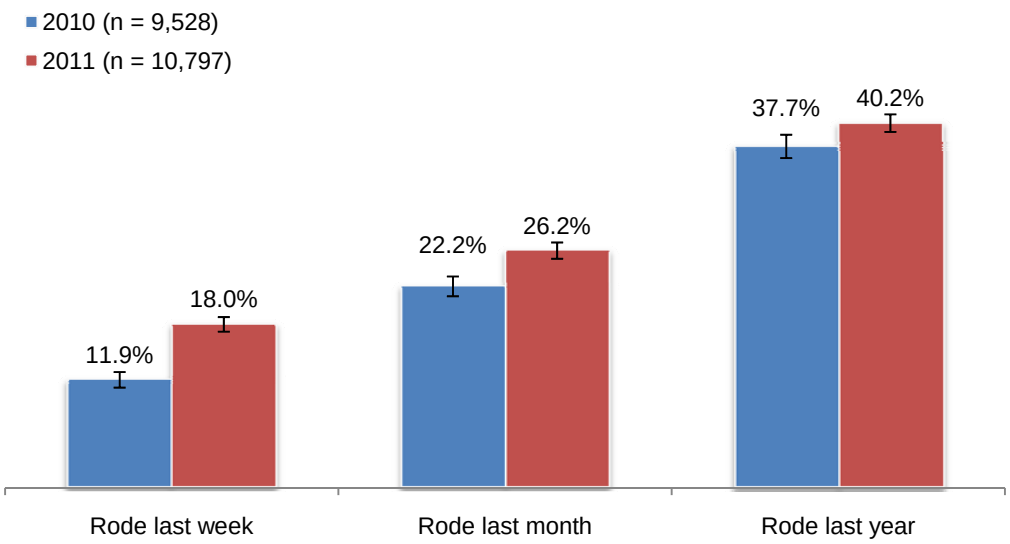
4 Results

In this section we present results using the cleaned, weighted and expanded data.

4.1 Cycling participation

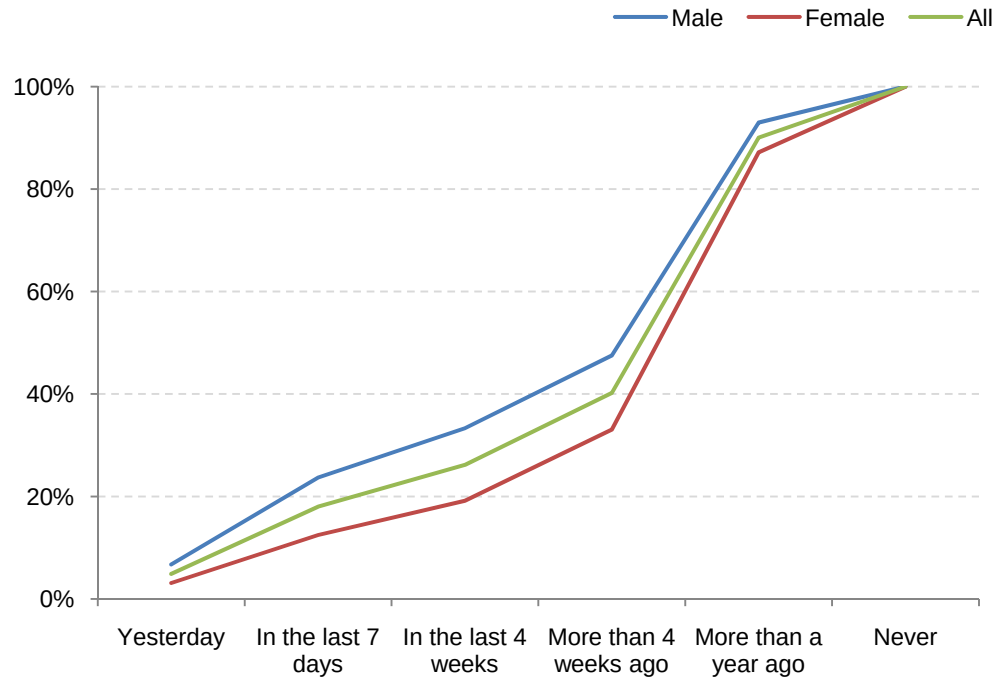
Of the 11,281 individuals in the sample the cycling participation information was obtained for 10,797 (95.7%) individuals. Based on the weighted records, we estimate that 18.0% (CI: 17.2%-18.8%) of the population had ridden sometime in the past week and 26.2% (CI: 25.3%-27.1%) within the past month (Figure 4.1). These proportions are significantly higher than measured in 2010; the proportion who indicated they had ridden in the past week was 11.9% (CI: 11.1% - 12.8%).

■ **Figure 4.1: When did you last ride a bicycle?**



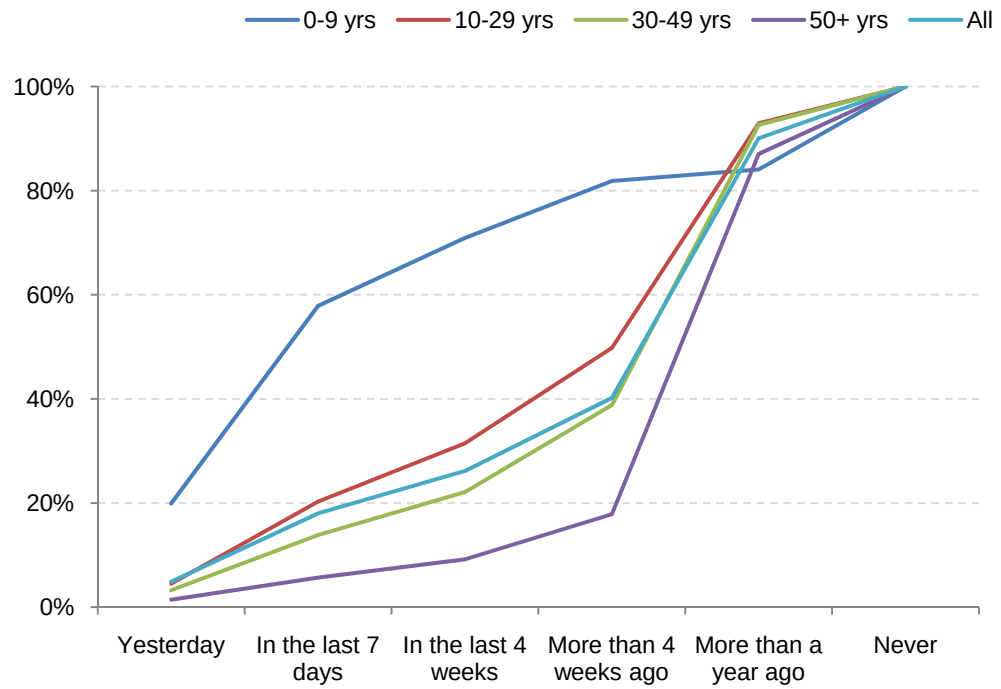
As shown in Figure 4.2, 24% of males and 13% of females rode over the previous week. This increases to 33% of males and 19% of females over the previous month. 7% of males and 13% of females have never ridden a bicycle.

■ **Figure 4.2: Cumulative cycling participation by gender**



58% of children aged under 10 have ridden in the past week, compared with 20% of those aged 10 – 29, 14% of those aged 30 – 49 and 6% of those aged over 50 (Figure 4.3). 82% of children under 10 had ridden at least once in the past year, decreasing to 50% of those aged 10 – 29, 39% of those 30 – 49 and 18% of those aged over 50.

■ **Figure 4.3: Cumulative cycling participation by age group**



4.2 Cycling trips

Of the sample of 10,797 individuals for whom riding information was available 321 (2.8%) had ridden on the previous day on a public thoroughfare (an additional 115 had ridden only in their backyard or other private property). These 321 individuals made a total of 658 bicycle trip legs (2.0 trips/person/day for those who had ridden). Once the sample was weighted the best population estimate is that 180,000 GMA residents ride in a public area on a typical day, making around 369,000 cycling trip legs per day (of any distance).

Only those trips under 10 km and made at least partly on public land (e.g. footpaths, roads or in parks) are of relevance to the NSW 2021 monitoring. In the survey there were 276 individuals who made 574 trips under 10 km on public land. Once weighted and expanded this corresponds to an estimated 157,000 residents riding on a typical day, making around 327,000 cycling trip legs per day.

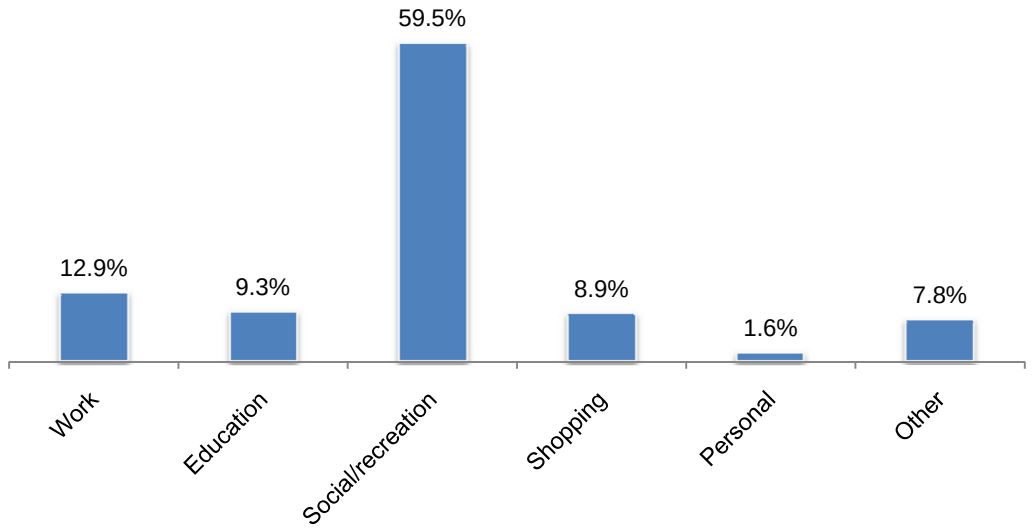
4.3 Trip purposes

The purpose for all cycling trips (including those over 10 km) was determined from the weighted survey data. Both the origin and destination trip purposes are obtained in the survey; the following rules were applied to determine a trip purpose:

1) use the destination trip purpose if the origin purpose is home (and the destination purpose is not home),
2) use the origin trip purpose if the destination is home (and the origin purpose is not home),
3) where neither the origin or destination is home then apply the following purpose hierarchy:
    - shopping
    - personal business
    - social / recreation
    - hospital / medical
    - hotel / motel
    - transport interchange
    - education
    - work
    - other private dwelling
    - other.

The trip purpose split is shown in Figure 4.4 and shows that around 60% of all trips are for social or recreation purposes and 13% are for work purposes.

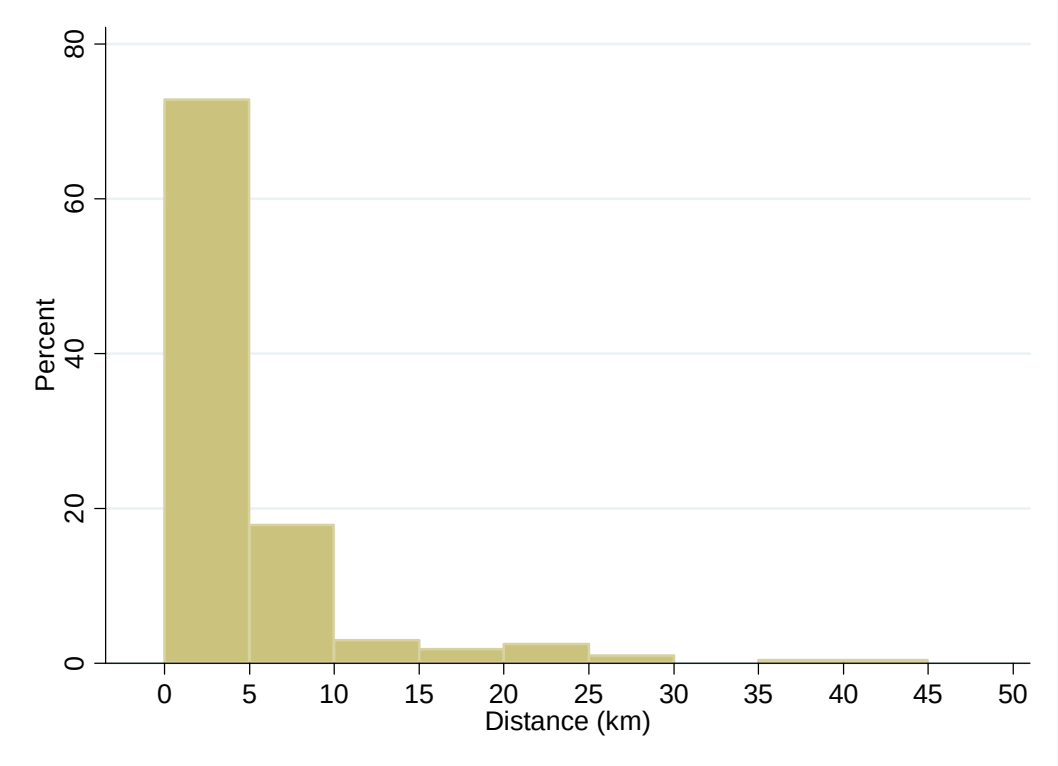
■ **Figure 4.4: Cycling trip purposes**



4.4 Trip distances

Trip distances were self-reported by respondents. These will be subject to uncertainty (and potentially, bias). However, as the primary objective of obtaining trip distances were to distinguish bicycle trips that were less than or equal to 10 km in length this approach was considered to be acceptable. 72% of all cycling trip stages were less than 5 km in length and 92% are under 10 km (Figure 4.5).

■ **Figure 4.5: Trip distance distribution (weighted data)**



Cycling trip lengths by journey purpose appear plausible, insofar as work and social travel have the longest average trip lengths, while education, shopping and personal travel have average lengths below 3 km (Table 4.1).

■ **Table 4.1: Trip length (km) by purpose (weighted data)**

Purpose	N	Average (km)	Median (km)	Min (km)	Max (km)
Work	85	10.5	7	0.5	75
Education	49	1.8	1.5	0.5	8
Social, recreation and sport	386	4.5	1	0.1	100
Shopping	66	2.5	1.5	0.25	12
Personal	14	3.0	2	1	8
Other	50	2.9	1	0.1	25
All	*650*	*4.7*	*1.5*	*0.1*	*100*

Note: distances unreported or unreliable for 326 (33%) of trips and purpose unreported for a further 6 trips.

4.4.1 Cycling trip rates

Cycling trip rates reported in this section are per person per day, and include non-cycling individuals. Of the 658 cycling trip records 574 (87%) were 10 km or less and occurred at least

partly on public land. The trip rates presented in this section correspond to only these trips, as it is these trips which are relevant to the strategy target.

The cycling trip rate estimate by person segment is given in Table 4.2. The overall trip rate estimate is 0.061 trips/person/day (CI: 0.053-0.070). Males make around 2.5 times the number of cycling trips as females, and those aged under 10 make 2.5 times more cycling trips than those aged 10 – 29.

- **Table 4.2: Cycling trip rate estimates (cycling trips under 10 km in public areas, per capita per day)**

	Age band				
Gender	**0 - 9**	**10 - 29**	**30 – 49**	**50+**	**All**
Male	0.190 (0.123-0.258)	0.102 (0.072-0.132)	0.079 (0.055-0.103)	0.039 (0.028-0.051)	0.088 (0.074-0.103)
Female	0.119 (0.072-0.166)	0.033 (0.018-0.048)	0.031 (0.015-0.048)	0.005 (0.002-0.009)	0.034 (0.026-0.043)
All	0.155 (0.113-0.197)	0.068 (0.051-0.085)	0.055 (0.041-0.069)	0.021 (0.016-0.027)	0.061 (0.053-0.070)

4.5 Cycling mode share

The principle objective of this study was to identify the cycling mode share for trips less than or equal to 10 km in length. In order to convert the cycling trip rates in Section 4.4.1 into trip mode shares, all-mode, all-purpose trip rates were obtained from 2010/11 HTS for those trips that were less than or equal to 10 km in length. These trip rates were provided by the Bureau of Transport Statistics and were segmented into gender and three age bands (0-9, 10-29, 30-49, 50+). These trip rates, on an average day, are presented in Table 4.3. The confidence interval is presented for the total trip rate based on a 99% confidence interval assuming a simple random sample.

- **Table 4.3: All-mode, all-purpose trip rates for trips under 10 km (HTS 2010/11, confidence interval is 99% SRS)**

	Age band				
Gender	**0 - 9**	**10 - 29**	**30 - 49**	**50+**	***Total***
Male	2.478	2.492	2.825	2.844	*2.694*
Female	2.529	2.829	3.443	2.643	*2.929*
Total	*2.503*	*2.650*	*3.144*	*2.738*	*2.813* (2.810-2.816)

The 2010/11 HTS estimate for trip rates (under 10 km) across all segments is 2.813/person/day. The cycling trip rates in Table 4.2 were then divided into the all-mode trip rates in Table 4.3 in order to provide estimates of mode shares.

■ **Table 4.4: Cycling mode share estimates (trips ≤ 10 km)**

	Age band				
Gender	**0 - 9**	**10 - 29**	**30 - 49**	**50+**	**All**
Male	7.67%	4.10%	2.79%	1.38%	3.29%
Female	4.70%	1.16%	0.91%	0.21%	2.09%
All	6.21%	2.57%	1.75%	0.78%	2.17% (1.87%-2.47%)

The implied cycling mode share across the population is 2.17% (CI: 1.87%-2.47%[12]). By comparison, the HTS cycling mode share estimate is 0.85% (CI: 0.70%-1.00%)[13]. These shares are compared graphically in Figure 4.6. The SCS mode share estimates in both 2010 and 2011 are more than twice those of HTS. However, the confidence intervals are also wider in the present survey (as would be expected given the much smaller sample size). There is no statistically significant difference in the cycling mode share estimates between the two years of the SCS (2010 and 2011).

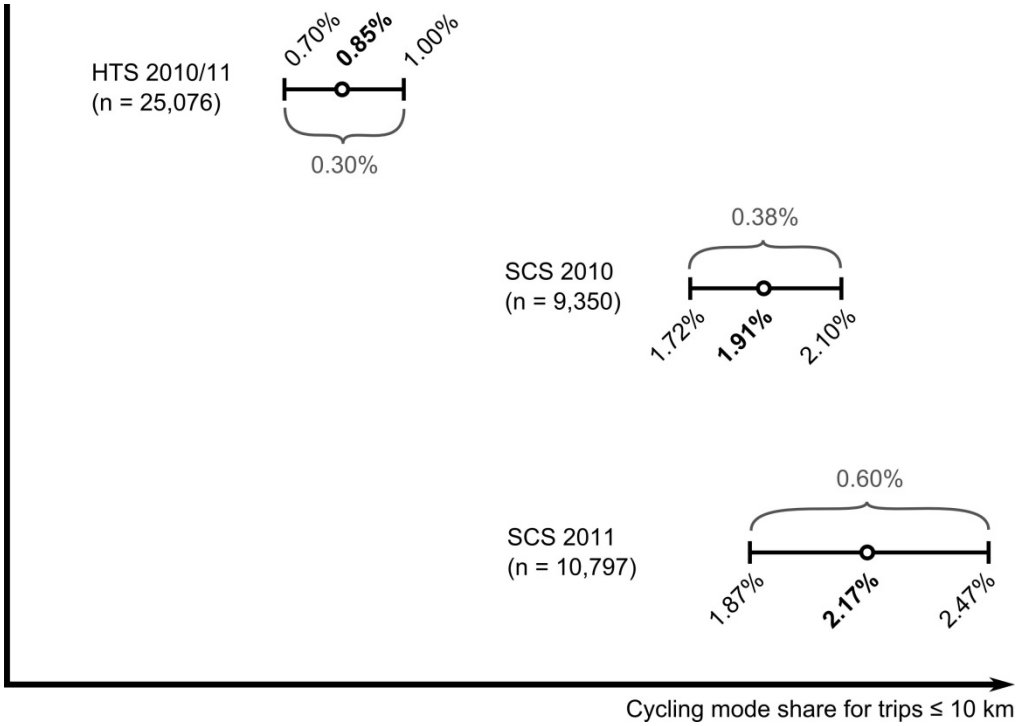
[12] The standard error of the ratio of cycling trips to all-mode trips (i.e. cycling mode share) was determined using the Delta method:

$$Var\left(\frac{Y}{X}\right) = \left(\frac{\mu_y^2}{\mu_x^4}\right) Var(\mu_x) + \left(\frac{1}{\mu_x^2}\right) Var(\mu_y)$$

It is assumed that both samples are independent; that is, there is no covariance between the cycling trip rate and all-mode trip rate.

[13] By way of comparison the HTS 2009/10 reports a cycling mode share for trips under 10 km of 0.92%.

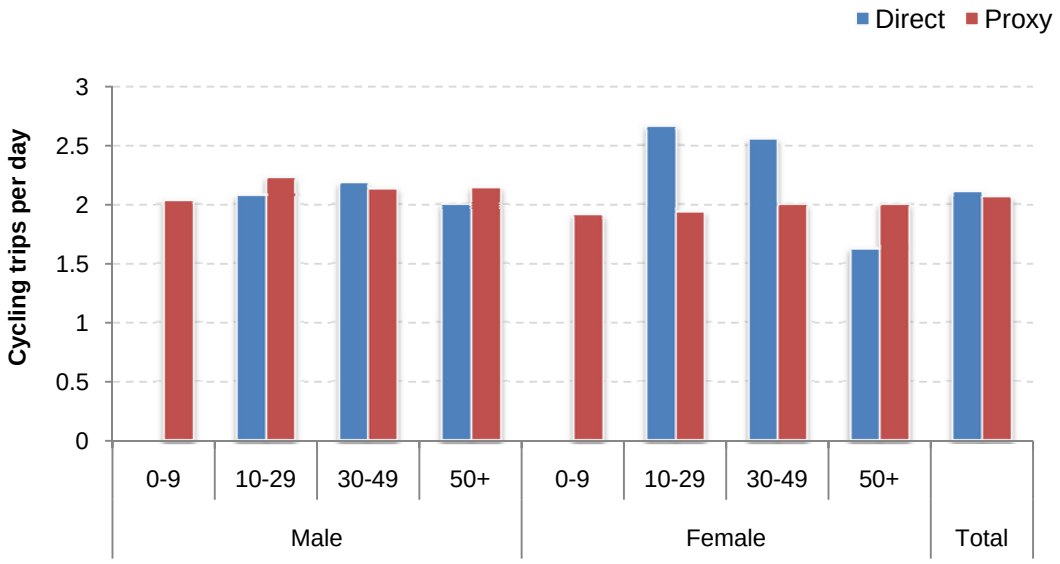
■ **Figure 4.6: Cycling mode share estimates and confidence intervals (n = number of persons)**



4.6 Proxy reporting

Of the 321 individuals who rode on the previous day, 33% reported their cycling travel directly while the remainder reported their travel via proxy. Proxy reporting of travel is not recommended given the potential for misreporting. To determine what effect proxy reporting may have on the estimates presented in this report the unweighted trip rates by demographic segment for the direct responses and the proxy responses are compared in Figure 4.7. The overall trip rates do not differ greatly between the samples – for directly reported travel the average trip rate is 2.10 trips/day and for proxy reporting is 2.07 trips/day. There are no significant differences in the trip rates for males between direct and proxy reporting, although there is a tendency for proxy reporting by females aged 10 – 49 to be around 25% lower than the direct reports. However, the number of observations in these categories can be low (for example, there are eight direct reports by females aged 10 to 29 and 16 proxy reports by females aged 30 to 49). We conclude from this analysis that proxy reporting is not unduly biasing the estimated cycling travel.

■ **Figure 4.7: Cycling trip rates by direct and proxy reporting (cycling trips under 10 km only, unweighted)**



Appendix A: Survey instrument

Good morning/afternoon/evening, my name is … and I'm calling from *Market Solutions* the market and social research company on behalf of Transport for NSW. We're interested in improving our understanding of people's travel in your area.

AGE CHECK (if unsure of age): We would like to speak to a person in your household aged 18 or older. Is an adult available to talk to us?

If refused THANK & CLOSE – RECORD RESPONSE

If different person {

Good morning/afternoon/evening, my name is … and I'm calling from *Market Solutions* the market and social research company on behalf of Transport for NSW. We're interested in improving our understanding of people's travel in your area. We'll be using the information from this survey to develop transport policies in your area. Your answers will be completely anonymous.**}**

Would you be able to spend a few minutes describing to us the travel you have undertaken recently?

SCREENERS

Q1. We are interested in speaking to people living in postcode …. Can you confirm this is your home postcode?
Yes
No (enter correct postcode) **ANALYST NOTE – AUTOFILL POSTCODE FROM SAMPLE – CHECK TO SEE POSTCODE IS IN SSD QUOTA LIST – IF NOT TERMINATE**

ABOUT YOU

Short option: Firstly, we would like to understand a little more about you and your household.

Long option: In order to ensure we speak to/interview a representative part of the population we would like to know a little more about you and your household.

Q2. Which of the following categories apply to you at the moment?
(multi-response)
Student: Full-time
Part-time
Work: Full-time (*35 hours per week or more)*
Part-time (*less than 35 hours per week)*
Casual
Unpaid voluntary work
Unemployed and looking for work

Keeping house
Aged pensioner
Other pensioner
Retired
Other **PLEASE SPECIFY:**_____

Q3. What is your age?
<numeric 0 – 199>

Q4. CATI: Interviewer record gender
Male/Female

Q5. How many **registered** vehicles used by your household are usually parked at your household overnight, whether private or company owned?
This may include cars, trucks and motorcycles, as long as they are registered.
<numeric 0 – 99>

We would now like to ask you a little about cycling.

Q6. How many adult bicycles in working order are in your household?
Exclude any registered vehicles such as mopeds. These should appear in Q5.
<enter number 0 - 99>

Q7. How many children's bicycles in working order are in your household?
If queried, these are bicycles (two wheels) that are ONLY used by children 14 years or less. This should exclude tricycles but may include children's bicycles with trainer wheels.
<enter number 0 - 99>

Q8. When did you last ride a bicycle? **READ OUT**
If today, probe for whether they rode yesterday. If not, code as 'Sometime in the last 7 days'.
Never
More than a year ago
More than a month ago
In the last 4 weeks
Sometime in the last 7 days
Yesterday – but only very short trips such as riding around the backyard
Yesterday – including travel on a road, footpath or in a public park

Q9. How many people usually live in your household, including you?
A person who usually lives in the household is someone who has, or will, live in the household for at least 3 months.
<numeric 1 – 99>

IF Q9>1 THEN REPEAT FOR Q10-1 ITERATIONS (i.e. cover all other household members) {{

We would now like to understand a little about the other people who usually live in your household. Starting with the oldest person in the household other than yourself and working down, could you tell us...

OR

We would now like to understand a little about the other person who usually lives in your household.

Q10. What is their age?
<numeric 0 – 199>

Q11. Are they male or female?
Male/Female

Q12. Which of the following categories apply to that person at the moment?
(multi-response)
Not yet at school
Student: Full-time
Part-time
Work: Full-time (*35 hours per week or more)*
Part-time (*less than 35 hours per week)*
Casual
Unpaid voluntary work
Unemployed and looking for work
Keeping house
Aged pensioner
Other pensioner
Retired
Other **PLEASE SPECIFY:**_____

Q13. When did that person last ride a bicycle?
If today, probe for whether they rode yesterday. If not, code as 'Sometime in the last 7 days'.
Never
More than a year ago
More than a month ago
In the last 4 weeks
Sometime in the last 7 days
Yesterday – but only very short trips such as riding around the backyard
Yesterday – including travel on a road, footpath or in a public park
Not sure

Q14. **IF Q13="Sometime in the last 7 days"** Did that person ride a bicycle yesterday?
Yes
No

Q15. **IF Q9>2 AND (Q14="Yes") THEN** Later in the survey we'd like to refer back to this person. To make this easier, could we ask for their first name? (if refusal Person A, B etc is acceptable)

}}

IF INITIAL RESPONDENT AND NO HH MEMBERS HAVE RIDDEN YESTERDAY, THEN SKIP TO THE END OF THE SURVEY AND FILE AS COMPLETE

CYCLING TRAVEL DIARY

Q16. So that means the people who have ridden a bike yesterday are:
List first names including self if applicable
Yes
No

IF NO, AMEND NAMES

Q17. **IF "Yesterday" to Error! Reference source not found. (self) only AND no one in Q14:**
We would like to speak to you about your bike trips. **GO TO Q22**.

Q18. **IF "Yesterday" to 2 people TOTAL (Error! Reference source not found. (self) AND one in Q14 (others))**
We would like to speak to you about your bike trips and then to the other person. **GO TO Q22**

Q19. **IF "Yesterday" to people NOT INCLUDING SELF (Q14)** We would like to speak to that person/these people. Would that person/these people be available to speak to us?
IF PERSON IS UNDER 15 THEN ASK GUARDIAN
Yes –**GO TO Q23 intro**
No – **GO TO Q20**

Q20. Would you be able to tell us a little about that persons bike trips yesterday?
Yes –GO TO Q23 intro
No – GO TO Q19

REPEAT ALL BELOW FOR ALL OTHER INDIVIDUALS (i.e. those that have ridden in past 24 hours)

IF NEW RESPONDENT THEN {

Q23 **intro:** Good morning/afternoon/evening, my name is … and I'm calling from *Market Solutions* the market and social research company on behalf of Transport for NSW. We're interested in improving our understanding of people's travel in your area. I understand that you rode a bicycle yesterday. **}**

We would like you to describe a little about each time you used a bicycle yesterday. We are interested in any kind of bike trip from the shortest trip to the corner or round the block to a longer recreational ride or to work or shops.

Q21. Interviewer code proxy response
Yes
No

Q22. Where did you start the first bike trip yesterday?
(see accompanying description manual for assistance)
Home
Work
School/University/other educational institution
Shopping
Personal business/services
Social/recreation location
Hospital/medical
Hotel/motel
Transport interchange
Other private dwelling
Other **PLEASE SPECIFY:**_____

Q23. What suburb or town was that in?
<free text>

Q24. Where did you finish that bike trip? Did you make any stops on the way? *Interviewer note: for longer trips probe to ensure there was no break in the trip – for example, a stop on the way to work at the shops or a stop at a café during a training ride.*
Home
Work
School/University/other educational institution
Social/recreation location
Shopping
Personal business/services
Hospital/medical
Hotel/motel
Transport interchange
Other private dwelling
Other **PLEASE SPECIFY:**_____

Q25. And what suburb or town was that in?
<free text>

Q26. How far did you travel?
<numeric less than 300 km> km
<numeric> m

Q27. Where did you start your next bike trip?
(see accompanying description manual for assistance)
Home
Work
School/University/other educational institution
Social/recreation location
Shopping
Personal business/services
Hospital/medical
Hotel/motel
Transport interchange
Other private dwelling
Other **PLEASE SPECIFY:**_____
I did not make another bike trip - **THANK AND GO TO NEXT PERSON WHO MADE BIKE TRIP YESTERDAY.**

Q28. And what suburb or town was that in?
<free text>

Q29. Where did you finish that bike trip? Did you make any stops on the way?
(see accompanying description manual for assistance)
Home
Work
School/University/other educational institution
Social/recreation location
Shopping
Personal business/services
Hospital/medical
Hotel/motel
Transport interchange
Other private dwelling
Other **PLEASE SPECIFY:**_____

Q30. And what suburb or town was that in?
<free text>

Q31. How far did you travel?
<numeric less than 300 km> km
<numeric> m

GO TO Q27

Q32. **IF FIRST ITERATION AND TOTAL (Q8="Yesterday" + TOTAL(Q14))>=2 THEN** We would now like to speak to the other person who has ridden a bicycle in the last week. Is that person aged 15 or older and available to talk to us?
Yes – **GO TO Q22**
No – **GO TO Q20**

End of survey