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Title: Characteristics of utility cyclists in Queensland, Australia: an examination of the associations between individual, social and environmental factors and utility cycling

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Abstract

Background: Initiatives to promote utility cycling in countries like Australia and the US, which have low rates of utility cycling, may be more effective if they first target recreational cyclists. This study aimed to describe patterns of utility cycling and examine its correlates, among cyclists in Queensland, Australia. *Methods*: An online survey was administered to adult members of a state-based cycling community and advocacy group (n=1813). The survey asked about demographic characteristics and cycling behavior, motivators and constraints. Utility cycling patterns were described, and logistic regression modeling was used to examine associations between utility cycling and other variables. *Results:* Forty-seven percent of respondents reported utility cycling: most did so to commute (86%). Most journeys (83%) were >5 km. Being male, younger, employed full-time, or university-educated increased the likelihood of utility cycling ($p<0.05$). Perceiving cycling to be a cheap or a convenient form of transport were associated with utility cycling ($p<0.05$). *Conclusions*: The moderate rate of utility cycling among recreational cyclists highlights a potential to promote utility cycling among this group. To increase utility cycling, strategies should target female and older recreational cyclists and focus on making cycling a cheap and convenient mode of transport.

Active modes of transport, namely walking and cycling, offer considerable health and environmental benefits. Active travel provides a way to incorporate frequent and regular health-enhancing physical activity (PA) into daily life. Active commuting (travel to and from work) in particular has been associated with reductions in all-cause and cardiovascular mortality,[1] overweight and obesity,[2, 3] and other cardiovascular risk factors.[3] Switching from motor vehicle use to active travel also reduces traffic congestion, noise pollution, carbon emissions and fossil fuel consumption.[4]

Compared with cycling, walking may be regarded as an easier, more accessible form of active travel as it does not require special skills or equipment; cycling, however, is a potentially more practical travel mode as a destination can be reached in a shorter time. Moreover, the health benefits of cycling may be greater, with a reduced risk of all-cause and cardiovascular mortality and of overweight and obesity observed more frequently in commuter cyclists than walkers.[5-7]

Whereas cycling for recreation is the fourth most commonly-reported physical activity (PA) among Australian adults,[8] cycling for transport is under-utilized. On Census Day in 2006, only 1.2% of trips to work in Australia were reported to be by bicycle only.[9] Data from the state of Queensland indicate that 64% of cyclists ride a bicycle for recreation or social purposes, but only 12% and 11% ride a bicycle to travel to and from shops and work, respectively.[10] These low prevalence estimates are mirrored in the UK and the US, but not in some European countries, such as The Netherlands and Denmark, where over 25% of all journeys are made by bicycle.[11]

To inform interventions in countries with low rates of cycling for transport, an understanding of the influences on this cycling is required. To date, however, few studies

have examined the correlates of utility cycling specifically, particularly in countries with low cycling mode share. This may be because the low rates of utility cycling make population-based studies of cycling for transport difficult. In a Canadian sample, adults who were older, female, less educated, or in a higher income bracket were found to be less likely to cycle for transport.[12] In an Australian sample, a positive attitude to cycling, perceived behavioral control, living in an aesthetic-pleasing neighborhood and the presence of cycling infrastructure were associated with utility cycling in adults.[13] In countries with established cycling cultures, having a cycling partner, high self-efficacy, a strong cycling habit, an intention to cycle, recognizing the economic and environmental benefits of cycling and living close to work have shown associations with commuter cycling.[14, 15, 16]

To date, initiatives to promote utility cycling in countries with low cycle mode share have had only limited success.[17] In these countries, initiatives may be more effective if they initially target recreational cyclists. This population group has the skills and equipment, as well as the interest in cycling, and hence may be more inclined than non-cyclists to make the shift to utility cycling. Moreover, understanding the characteristics of utility cycling and the motivations for cycling may help us to better understand, and promote, cycling to the wider community. Namely, increasing the number of utility cyclists in a community may foster the development of a cycling culture. To that end, the aims of this study were to describe the utility cycling patterns of cyclists in Queensland, Australia, and to examine individual, social and environmental correlates of utility cycling among this group, in line with a social-ecological perspective.

Methods

Sampling and Study Protocol

A cross-sectional survey of adult members of Bicycle Queensland (BQ), a community and advocacy group for cyclists, was administered online in November 2009. While members of BQ are likely to cycle regularly for either recreation or utility purposes, they are not necessarily serious or competitive cyclists. The survey assessed their attitudes and behaviors towards cycling.

The study was promoted via the BQ member newsletter. BQ then sent an email letter of invitation to the 'primary member' of each household, encouraging all household members to participate. One week after the email was sent, BQ sent a reminder email to encourage completion by December 1, 2009, the survey closing date. Respondents could enter into prize drawings to win gifts from local bicycle shops. The study received ethical approval from [redacted] Human Research Ethics Committee.

Of 4469 households that were sent the invitation, 2085 responded: a 46.6% response rate, much higher than the 28% found for a similar online survey.[18] Within these households 2355 individuals responded. Those who did not complete the survey (n=187), who reported a residence outside Queensland (n=65) or who cycled less than weekly (n=290) were excluded, leaving 1813 available for these analyses.

Measures

Most questions were adapted from those used for an online survey of Bicycle Victoria members,[18] although more questions about cycling patterns were included and the list of demographic questions was expanded to better characterize the sample.

Utility cycling. Respondents were asked whether or not they cycled for transport and, if yes, to report the total number of cycling trips they took for transport, *that is to get to and from places*, in the last week. To examine differences between regular versus infrequent utility cyclists, respondents were categorized as 'utility cyclists' if they reported ≥1 trip of utility cycling, as done previously.[12, 13]

Cycling patterns. Respondents reported their cycling patterns, including the length of time (weeks, months, years) they had been cycling as an adult and the frequency of their cycling (ranging from *5–7 days per week* to *never in the last year*). Utility cyclists reported the minutes spent cycling for utility in the last week and the destinations of these trips (work; university/technical college/school; shops; recreation venues; friends/relatives). For each destination, they reported the time spent cycling to it and the distance (km) travelled, the last time they cycled there.

Demographic variables. Demographic questions included individual characteristics (age, sex, educational attainment, employment status, body mass index [BMI; kg/m^2] computed from self-reported weight and height) as well as details about their home environment, including the number of cars available for use, the number of children <18 years of age and the number of cyclists (*people [including yourself] who rode a bicycle at least once a week on average over the last 12 months*). Home postal code was asked to determine socio-economic indexes for areas (SEIFA) as a crude measure of the environment in which participants cycled. This measure uses 2006 Census variables to assess the relative socio-economic advantage of Australian geographic areas.[19] Areas are divided into deciles with higher deciles representing greater advantage. Using home

postal code respondents were also classified according to their residential location: major city; inner regional area; or outer regional, rural or very rural area.

Physical Activity. The Active Australia physical activity questions were included to determine respondents' current PA levels. Respondents reported time (minutes) spent in the last week (in ≥ 10-minute sessions) walking briskly (*for recreation or exercise or to get to and from place to place*), and in moderate- and vigorous-intensity leisure-time physical activities. A total PA score was computed following standard procedures[20] whereby the minutes spent in each PA were multiplied by an assigned metabolic equivalent value (MET): walking = 3.0 METs; moderate-intensity PA = 4.0 METs; vigorous-intensity PA = 7.5 METs, to account for differences in intensity among these types of PA. These scores were then summed to create a total MET minute score. A summary score of ≥600 MET minutes per week is equivalent to 150 minutes per week of moderate-intensity PA, the cut-off for meeting Australian and US PA guidelines (0=not meeting guidelines; 1= meeting guidelines).[21, 22] Thus those reporting ≥600 MET minutes per week were considered to be meeting guidelines.

Motivating and Constraining Factors. Questions assessing psychological, social and perceived environmental factors that were hypothesized to motivate or constrain cycling behavior were included, as done in previous research.[16] Respondents rated the importance of five factors in motivating them to cycle: *building physical activity into my busy lifestyle*; *encouragement from supervisors or employers*; *concerns about the environment*; *it is a convenient form of transport*; and *it is a cheap form of transport.* Responses were on a 4-point scale ranging from *very important* to *not at all important*.

These were dichotomized as important (*important* and *very important* = 1) or not important (*not at all* important and *slightly important* = 0).

Respondents were also asked whether certain factors made it difficult for them to cycle more. These were: *concerns about cycling in traffic*; *aggression from motorists*; *living too far away from places I would want to ride a bicycle to*; *lack of shower and changing facilities at places I would want to ride my bicycle to*; *lack of safe places to park or store my bicycle*; and *inability to put my bicycle on public transportation.* Responses were on a 4-point scale ranging from *major constraint* to *not a constraint*. These were dichotomized as a constraint (*moderate constraint* and *major constraint* = 1) or not a constraint (*minor constraint* and *not a constraint* = 0).

Statistical Analysis

Analyses were conducted with STATA/SE 10.1 (StataCorp, College Station, Texas). The survey (svy) command was used to account for clustering of respondents within households. Descriptive statistics were generated for all quantitative study variables. Medians and interquartile ranges (IQR) were computed for skewed data. A series of logistic regression models were estimated to examine possible correlates of utilitarian cycling. Correlates examined were the descriptive factors and cycling motivators and constraints. For the initial modeling, the univariate association between each factor and utility cycling was examined. Factors significantly associated with the outcome were next included in multivariable modeling. The correlation between SEIFA and residential location was computed at this point to determine whether the two variables overlapped in content. The correlation was moderate (r=-.51), indicating some overlap in content but that it was appropriate to include both in the remaining modeling.

For Model 1 of the multivariable analysis, significant descriptive factors were entered into the model. For Model 2, significant motivators were added, and for Model 3, significant constraints were added. Odds ratios and 95% confidence intervals were computed for all models, and significance was set at $p<0.05$.

Results

Characteristics of the 1813 respondents are shown in Table 1. Most respondents were male, and more than half had been cycling for >5 years. Most were meeting PA guidelines.

[Insert Table 1 about here]

Utility Cycling Patterns

Table 2 shows cycling patterns of utility cyclists. Forty-seven percent of respondents reported utility cycling in the last week. The median number of utility cycling trips they made was 8 (range: 4–10), and the median minutes spent cycling for utility in the previous week was 240 (range: 120–360).

[Insert Table 2 about here]

The most commonly-reported purpose for utility cycling was commuting: 86% of utility cyclists cycled to their place of work or study. Only 29%, 28% and 11% reported cycling to shops, to recreation facilities or to visit friends, respectively. Cyclists traveled considerable distances (>5 km), particularly to commute to their work or place of study (see Table 3).

[Insert Table 3 about here]

Correlates of Utility Cycling

Findings from the univariate analysis are presented in Table 4. All factors significantly associated with utility cycling univariately were entered into multivariable models (Table 5). In all multivariable models, men, the youngest adults, respondents with a university education, those in full-time employment and those with access to ≥2 cars were the most likely to cycle for utility. In the final two models, overweight respondents were less likely to cycle for utility than normal-weight cyclists. Being obese was not significantly associated with utility cycling; however, this may be due to the small number of participants who reported being obese. Two motivators were associated with increased likelihood of utility cycling: perceiving cycling to be a convenient or a cheap mode of transport. Likewise, two constraints were significant. Having concerns about cycling in traffic *increased* the likelihood of utility cycling, whereas reporting an inability to put a bike on public transport decreased the likelihood.

[Insert Tables 4 & 5 about here]

Discussion

This study examined the patterns and correlates of utility cycling among cyclists in Queensland, Australia. Less than half of respondents reported cycling for transport in the last week, indicating a potential to promote utility cycling to the large number of recreational cyclists who are not regularly cycling for transport. Most utility cycling trips were commuting trips; thus, even among utility cyclists, there is scope to promote cycling for non-commuting purposes.

The World Health Organization suggests that <5 km is an acceptable and feasible distance for active travel.[23] Our findings indicate that Queensland cyclists travel greater

distances, particularly for commuting. This is consistent with findings from Melbourne, Australia where the average trip length was reported to be 11.3–15.1 km, depending on the purpose.[18] In contrast, the average cycling trip in Europe is 3.5 km.[23] The greater distances in Australia may reflect the nature of its cities, which consist of low density, single land-use neighborhoods. Nonetheless, the distances reported in this study are considerable and may discourage uptake of utility cycling. Strategies to reduce distances of journeys, such as 'park and cycle' services, may be effective.

Most demographic factors were associated with utility cycling. Adults who were university-educated were most likely to report utility cycling. Previous studies have shown similar associations.[12, 24] While research consistently shows that those with lower education levels are less likely to do PA,[25] it is unclear why, among those who are physically active, utility cycling differs by education. It could be that those with a lower education are more likely to have jobs that place additional constraints on a cyclist's ability to cycle for transport (e.g., shift work, the need to transport heavy equipment to their place of work). It could also be that those who are less educated are more likely to live further away from destinations or to reside in neighborhoods with poor infrastructure for utility cycling. If this were true, however, significant associations between area-level SES (SEIFA) and/or residential location and utility cycling would be expected, but these demographic factors were not associated with utility cycling in the final modeling. Not surprisingly, employment was strongly associated with utility cycling, likely reflecting the use of utility cycling mainly for commuting. Our findings are consistent with previous research indicating that household car ownership is negatively associated with active travel.[24] Car access may be an important influence on an individual's decision to

use a particular mode. Policies that discourage car ownership or use may increase utility cycling.

In Australia and other countries with low rates of utility cycling, women are less likely to cycle than men.[26] Our research adds that among cyclists, women are less likely than men to cycle for utility. We also found that utility cycling is less likely among the oldest cyclists, than among middle-aged cyclists. The age difference may be due, in part, to the fact that older adults are more likely to be retired and therefore not commuting to work. These findings are consistent with those from Canada,[12] but not with those from a number of European countries, where men and women are equally likely to cycle for utility, as are younger and older adults.[11, 15] Women's more complicated travel patterns (e.g., taking children to school)[27, 28] and concerns about their personal appearance once arriving at a destination (unpublished abstract; Dalton, A) have been hypothesized to explain gender differences. Alternatively, this difference could be due to the greater perceived risk of cycling in countries like Australia that have comparatively poor cycling infrastructure and low rates of utility cycling.[26] Older adults may also have a similar aversion to risk, but this has not been explored.

Utility cycling is advocated as a way to increase PA participation. In our sample, PA levels did not differ between those who cycled for utility and those who did not. This finding may indicate that utility cyclists, who travelled considerable distances, used their travel intentionally for exercise. Indeed, this has been seen in Melbourne.[18] Our findings also indicate that overweight cyclists are less likely to cycle for utility than are normal-weight cyclists. This finding supports prior research showing that men who cycle to work are less likely to be overweight or obese, even after controlling for overall PA.[6] The

mechanism by which utility cycling may be negatively associated with overweight is unclear.

Our finding that respondents were motivated to cycle for utility by cost and convenience supports those from Belgium[15] that indicate that travel cost influences utility cycling participation. Policies that make cycling a convenient and low cost travel mode may be influential. Surprisingly, respondents who were concerned with cycling in traffic had an *increased* likelihood of utility cycling, which may reflect utility cyclists' heightened awareness given they may more frequently travel in traffic. A similar finding was reported in a study of Australian university students.[29] Utility cyclists also reported being constrained by an inability to put their bicycle on public transport. When distances between destinations are considerable, providing an opportunity to use public transport for part of the journey may be a useful strategy.

Limitations

The main limitation is the reliance on cross-sectional self-report data. Another limitation is that distance to work and to other destinations was not measured. Distance to destinations is one of the key influences on utility cycling;[24, 30 15] however, the influence of distance on cycling could not be examined in our dataset.

The study achieved a response rate of 47%. This response rate is higher than found from previous online surveys[18] and from recent population-based survey studies conducted in Australia.[31, 32] Nonetheless, the use of an online survey and the sampling of a cycling community group likely resulted in a sample of respondents who were not representative of Australia or Queensland cyclists. Comparisons with Australian data on

cyclists from 2010[33] indicate that our sample had fewer young adults (13.5% aged 18-34 years versus 31.8% nationally), more middle-aged adults (60.5% aged 34 to 54 years versus 50.6% nationally) and slightly fewer females cyclists (27% versus 33% nationally and 34% in Queensland), suggesting that our findings are biased towards middle-aged adults and slightly biased toward men. The age differences may partially reflect the inclusion of cyclists aged 15-17 years in the Australian data whereas our sample included adults aged 18+ years. Our sample also tended to be of relatively high socio-economic status with only 14% of respondents not educated beyond high school, 16% living in disadvantaged areas, and 6% living in outer regional or remote areas. Although data on the socio-economic status of cyclists in Australia is lacking, findings from a study in Western Australia indicate that the willingness to walk or bicycle for short trips, instead of taking a car, increases with increasing education level[34], suggesting a possible socio-economic gradient in utility cycling. Importantly, the sampling frame used was also a key strength of the study as studies of travel in general populations are typically only able to collect cycling data from relatively small proportions of people given the low number of utility cyclists in Australia.

Conclusions

The findings indicate considerable potential to increase utility cycling among cyclists. Strategies that target women, older adults, and less educated cyclists are needed. Policies that make utility cycling more convenient and cost-effective are encouraged to increase its appeal to cyclists. While the individual health impact of increasing utility cycling may be minimal (given all respondents tended to participate in sufficient PA), the promotion of utility cycling among recreational cyclists is still likely to have a public

health impact: increasing the number of utility cyclists is likely to positively influence social norms and foster the development of a cycling culture (as is seen in Europe). In turn, this could place pressure on governments to improve cycling infrastructure, thereby leading to the take-up of utility cycling among non-cyclists.

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Table 1 - Characteristics of the Study Population (n, %)

Characteristics	Total sample *N*=1813		Utility cyclists *N*=890		Non-utility cyclists *N*=923	
	n	%	*N*	%	*n*	%
Sex						
Male	1329	73.3	674	75.7	655	71.0
Female	484	26.7	216	24.3	268	29.0
Age (years)						
18-34	244	13.5	174	19.6	70	7.56
35-44	478	26.4	269	30.2	209	22.6
45-54	619	34.1	287	32.3	332	36.0
55-64	346	19.1	131	14.7	215	23.3
65+	126	7.0	29	3.3	97	10.5
Education						
No high school or senior certificate	78	4.3	23	2.6	55	6.0
High school certificate	177	9.8	53	6.0	124	13.4
Trade/apprenticeship or certificate/diploma	348	19.2	135	15.2	213	23.1
Undergraduate university degree	628	34.6	353	39.7	275	29.8
Graduate university degree	582	32.1	326	36.6	256	27.7
Employment						
Full-time paid work	1348	74.4	725	81.5	623	67.5
Part-time paid work	235	13.0	97	10.9	138	15.0
Retired or not in paid work	230	12.7	68	7.6	162	17.6
SEIFA						
Decile 10 (most advantaged)	510	28.1	283	31.8	227	24.6
Decile 9	535	29.5	290	32.6	245	26.5
Decile 8	321	17.7	149	16.7	172	18.6
Decile 7	160	8.8	71	8.0	89	9.6
Deciles 1-6 (most disadvantaged)	287	15.8	97	10.9	190	20.6
Residential location						
Major city	1521	83.8	791	88.9	731	79.5
Inner regional	181	10.0	51	5.7	130	14.1
Outer regional/ remote / very remote	110	6.1	48	5.4	62	6.7
Children aged <18yrs in household						
Yes	669	36.9	351	39.4	318	34.5

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No. of cyclists in household (including respondent)						
1	31	1.9	16	1.8	15	1.6
2	1068	36.9	511	57.4	557	60.4
3	641	46.3	333	37.4	308	33.4
4	73	15.0	30	3.4	43	4.7
No. of cars in household						
0	34	1.9	30	3.4	4	0.4
1	668	36.9	427	48.0	241	26.1
2	840	46.3	344	38.7	496	53.7
3+	271	15.0	89	10.0	182	19.7
Years cycling as an adult						
≥ 5	1167	64.4	647	72.7	520	56.3
2 - < 5	439	24.2	167	18.8	272	29.5
0 - < 2	207	11.4	76	8.5	131	14.2
BMI						
Normal weight (BMI < 25)	996	54.9	519	58.3	477	51.7
Overweight (BMI 25 – <30)	661	36.5	305	34.3	356	38.6
Obese (BMI ≥30)	156	8.6	66	7.4	90	9.8
Cycling frequency						
5-7 days/week	473	26.1	367	41.2	106	11.5
3-4 days/week	778	42.9	374	42.0	404	43.8
1-2 days/week	562	31.0	149	16.7	413	44.8
Meeting PA guidelines[a]						
No	48	2.7	28	3.2	20	2.2
Yes	1765	97.4	862	96.9	903	97.8
Motivators to utility cycling						
Building PA into my busy lifestyle	1556	85.8	776	87.2	780	84.5
Encouragement from supervisors or employers	231	12.7	126	14.2	105	11.4
Concerns about the environment	1057	58.3	636	71.5	421	45.6
It is a cheap form of transport	1170	64.6	765	86.0	405	43.9
It is a cheap form of transport	937	51.7	646	35.6	291	31.5

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Constraints on utility cycling						
Concerns about cycling in traffic	801	44.2	434	48.8	367	39.8
Aggression from motorists	1366	75.3	729	73.6	637	69.0
Living too far away from places I would want to ride my bicycle to	1473	81.2	729	73.6	744	80.6
Lack of safe places to park or store my bicycle	1247	68.9	628	70.6	619	67.1
An inability to put my bike on public transport	1227	67.7	560	62.9	667	72.3

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[a] Participating in the equivalent of ≥150 minutes of moderate-intensity physical activity in the previous week.

Table 2 - Minutes Spent Cycling to Destinations (median, IQR)

		Time (min[a])	
Destination	*n*[b]	Median	IQR
Work	732	30.0	20.0-45.0
Study	52	30.0	15.0-45.0
Shops	259	10.0	5.0-20.0
Friends	97	25.0	15.0-40.0
Recreation facilities	246	30.0	20.0-78.8

[a] Minutes spent cycling to the destination the last time cycled there.

[b] Number of respondents who reported cycling to the respective destination.

Table 3 – Distances Utility Cyclists (n=890) Cycled to Destinations (median, IQR, %)

		Distance (km)		*n* (%) of utility cyclists who cycled to destinations, by tertile		
Destination	*n*[a]	Median	IQR	<5 km	5 – 10 km	>10 km
Work	728	10.1	7.0-16.0	120 (16.5)	248 (34.1)	360 (49.5)
Study	50	6.5	3.4-10.0	20 (40.0)	19 (38.0)	11 (22.0)
Shops	206	2.5	1.5-5.0	210 (81.1)	33 (12.7)	16 (6.2)
Friends	96	6.5	4.0–10.0	41 (43.7)	32 (32.0)	23 (23.3)
Recreation facilities	55	10.0	5.0-14.0	20 (36.4)	15 (27.3)	20 (34.0)

[a] Number of utility cyclists reporting distances to these destinations. Numbers are smaller than in Table 2 because some respondents did not report distances.

Table 4 - Univariate Associations between Utility Cycling and Descriptive Factors and Cycling Motivators and Constraints

Possible correlates	Unadjusted OR	95%CI
Descriptive Characteristics		
Sex		
Male (ref)	1.00	
Female	0.78*	0.64-0.96
Age (years)		
18-34	2.88**	2.09-3.95
35-44	1.49**	1.17-1.90
45-54 (ref)	1.00	
55-64	0.70*	0.54-0.92
65+	0.35**	0.22-0.53
Education		
No high school or senior certificate	0.66	0.39-1.11
High school certificate	0.67*	0.46-0.99
Trade / apprenticeship or certificate / diploma (ref)	1.00	
Undergraduate university degree	2.02**	1.55-2.64
Postgraduate university degree	2.01**	1.53-2.63
Employment		
Full-time paid work (ref)	1.00	
Part-time paid work	0.60**	0.46-0.80
Retired or not in paid work	0.36**	0.27-0.49

SEIFA		
Decile 10 (most advantaged) (ref)	1.00	
Decile 9	0.95	0.74-1.21
Decile 8	0.69*	0.52-0.92
Decile 7	0.64*	0.45-0.92
Deciles 1-6 (most disadvantaged)	0.41**	0.30-0.55
Residential location		
Major city (ref)	1.0	
Inner regional	0.36**	0.26-0.51
Outer regional / Remote/ Very remote	0.72	0.48-1.06
Children <18yrs in household		
Yes (ref)	1.00	
No	1.24	1.02-1.50
No. of cyclists in household (including respondent)		
1 (ref)	1.00	
2	0.86	0.42-1.76
3	1.01	0.49-2.09
No. of cars in household		
1 (ref)	1.00	
2	0.24**	0.08-0.68
3	0.09**	0.03-0.26
4 or more	0.06**	0.02-0.19
Yrs cycling as an adult		
≥ 5 (ref)	1.00	
2 - < 5	0.49**	0.39-0.62
0 - < 2	0.47**	0.34-0.64
BMI		
Normal (BMI < 25)(ref)	1.00	
Overweight (BMI 25 - < 30)	0.79*	0.64-0.96
Obese (BMI ≥ 30)	0.67*	0.49-0.94
Motivators to utility cycling		
Building PA into my busy lifestyle		
Not important (ref)	1.00	
Important	0.79	0.61-1.02
Encouragement from supervisors or employers		
Not important (ref)	1.00	

Important	0.82	0.63-1.06
Concerns about the environment		
Not important (ref)	1.00	
Important	0.35*	0.29-0.43
It is a convenient form of transport		
Not important (ref)	1.00	
Important	0.09*	0.07-0.10
It is a cheap form of transport		
Not important (ref)	1.00	
Important	0.20*	0.16-0.27
Constraints on utility cycling		
Concerns about cycling in traffic		
Not a constraint (ref)	1.00	
A constraint	1.61*	1.34-.93
Aggression from motorists		
Not a constraint (ref)	1.00	
A constraint	1.19*	1.00-1.43
Living too far away from places I would want to ride my bicycle to		
Not a constraint (ref)	1.00	
A constraint	1.20	0.99-1.46
Lack of safe places to park or store my bicycle		
Not a constraint (ref)	1.00	
A constraint	1.04	0.87-1.25
An inability to put my bike on public transport		
Not a constraint (ref)	1.00	
A constraint	0.67*	0.55-0.81
Lack of shower and changing facilities		
Not a constraint (ref)	1.0	
A constraint	1.20	0.99 – 1.46

1 OR = odds ratio. 95% CI = 95% confidence interval. Ref=referent group.

2 *p<0.05, **p<0.01.

Table 5 - Multivariable Associations between Utility Cycling and Descriptive Factors and Cycling Motivators and Constraints

Factors	Model 1[a] Descriptive factors OR	95%CI	Model 2[b] Motivators added OR	95%CI	Model 3[c] Constraints added OR	95%CI
Descriptive characteristics						
Sex						
Male	1.00		1.00		1.00	
Female	0.67**	0.51-0.87	0.55**	0.40-0.74	0.56**	0.41-0.77
Age (years)						
18-34	2.61**	1.80-3.79	1.92**	1.22-3.02	1.86**	1.17-2.93
35-44	1.23	0.92-1.64	1.15	0.83-1.60	1.14	0.81-1.59
45-54 (ref)	1.00		1.00		1.00	
55-64	0.79	0.57-1.10	0.78	0.54-1.13	0.78	0.53-1.14
65+	0.36**	0.21-0.52	0.32**	0.17-0.60	0.30**	0.16-0.58
Education						
No high school or senior certificate	1.04	0.58-1.89	1.09	0.58-204	1.14	0.60-2.15
High school certificate	0.62*	0.39-0.99	0.71	0.42-1.21	0.72	0.42-1.21
Trade/apprenticeship or certificate/diploma (ref)	1.00		1.00		1.00	
Undergraduate university degree	1.49**	1.10-2.03	2.06**	1.41-3.01	2.07**	1.40-3.06
Postgraduate university degree	1.52**	1.15-2.08	1.71**	1.17-2.50	1.70*	1.15-2.50
Employment						
Full-time paid work	1.00		1.00		1.00	
Part-time paid work	0.71*	0.50-1.00	0.56**	0.38-0.82	0.56**	0.38-0.84
Retired or not in paid work	0.58**	0.40-0.85	0.55**	0.36-0.84	0.53**	0.34-0.82
SEIFA						
Decile 10 (most advantaged)	1.00		1.00		1.00	
Decile 9	0.89	0.67-1.19	0.89	0.64-1.24	0.89	0.64-1.25
Decile 8	0.77	0.55-1.07	0.82	0.55-1.22	0.81	0.54-1.22
Decile 7	0.96	0.61-1.52	0.84	0.48-1.48	0.80	0.45-1.17
Deciles 1-6 (most disadvantaged)	0.71	0.47-1.07	0.78	0.47-01.28	0.71	0.43-1.17
Residential location						
Major city	1.0		1.0		1.0	1.0
Inner regional	0.60*	0.39-0.92	0.61	0.36-1.05	0.65	0.37-1.12
Outer regional / Remote / Very remote	1.11	0.67-1.81	1.08	0.61-1.89	1.06	0.59-1.89
Children under 18 living at home						
Yes	1.00		1.00		1.00	
No	1.12	0.87-1.45	1.06	0.79-1.42	1.03	0.76-1.39
BMI						
Normal (BMI < 25)	1.00		1.00		1.00	
Overweight (BMI 25 - <30)	0.80	0.63-1.07	0.67*	0.50-0.90	0.67*	0.50-0.90

Obese (BMI ≥ 30)	0.78	0.63-1.03	0.77	0.48-1.23	0.78	0.48-1.24
No. of cars in household						
0	1.00		1.00		1.00	
1	0.21**	0.06-0.70	0.37	0.12-1.17	0.43	0.13-1.39
2	0.09**	0.03-0.29	0.22*	0.07-0.70	0.25*	0.08-0.80
3 or more	0.06**	0.02-0.21	0.16**	0.05-0.51	0.19*	0.06-0.63
Years cycling as an adult						
≥ 5	1.00		1.00		1.00	
2 - < 5	0.43**	0.33-0.56	0.49**	0.36-0.70	0.51*	0.38-0.70
0 - < 2	0.37**	0.26-0.54	0.60*	0.39-0.93	0.69	0.44-1.08
Motivators for cycling						
Concerns about the environment						
Not important			1.00		1.00	
Important			1.10	0.81-1.50	1.18	0.86-1.63
Convenient form of transport						
Not important			1.00		1.00	
Important			8.72**	5.94-12.81	8.93*	6.02-13.26
Cheap form of transport						
Not important			1.00		1.00	
Important			1.51*	1.07-2.14	1.50*	1.04-2.15
Constraints on cycling						
Concerns about cycling in traffic						
Not a constraint					1.00	
A constraint					1.57**	1.17-2.10
Aggression from motorists						
Not a constraint					1.00	
A constraint					1.26	0.94-1.69
Inability to put my bicycle on public transport						
Not a constraint					1.00	
A constraint					0.73*	0.55-0.98

OR = odds ratio. 95% CI = 95% confidence interval. First category is reference category unless noted

*p<0.05, **p<0.01.

[a] Model 1 adjusted for all descriptive factors listed in the table.

[b] Model 2 adjusted for all descriptive factors and motivators listed in the table.

[c] Model 3 adjusted for all factors listed in the table.