

Women's Cycling Survey: Analysis of Results

Anna Sibley, MPH Candidate, UNC-Greensboro

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I. Overview

The Association of Pedestrian and Bicycle Professionals (APBP) is a non-profit organization committed to increasing bicycling and walking as modes of transportation in the United States. In the spring of 2010, APBP conducted an online questionnaire via Survey Monkey to investigate the factors that would induce women to bicycle more for transportation. The survey was advertised through various bicycling sites online, and included 37 questions pertaining to demographics, cycling behavior, safety/infrastructure concerns, and open-ended inquiries. The survey received a very strong response, with over 13,000 participants. When the survey closed in May, APBP partnered with the Department of Health Education at the University of North Carolina-Greensboro Department to analyze the results.

Data Analysis

Survey results were analyzed using PASW Statistics, Version 17. Frequency counts were compiled for each question. Independent and dependent variables were then selected for cross-tabulation, and the significance of the relationship was evaluated using the chi-square test. For prevalence ratios and odds ratios were also computed for one cross tabulation.

Definitions: Independent and Dependent Variable, Cross Tabulations, Chi-Square Test, Prevalence and Odds Ratio.

Independent variables exist outside of any influencing factors, while the outcome of dependent variables is determined in relation to the independent variable (ie, influencing factor). A Cross-tabulation illustrates the respondent's behavior (dependent variable) with respect to an influencing factor (independent variable). This is usually expressed as a count or percentage. The chi-square is a test of significance between the sample populations and the total population in the survey. The relationship is significant if the *P* (probability) value is less than .05—indicating that more than a 95% chance that the observations expressed in the cross tabulation did not occur by chance and can therefore be replicated.

Prevalence ratios state the degree to which a trend or behavior exists when comparing one subgroup (the referent, set at 1.0) to the others. Odds ratios state the likelihood of a trend or behavior occurring for all subgroups when compared to the referent.

Response Trends

The two independent variables selected in this survey are size of community and age. These variables were then cross-tabulated with the following dependent variables: daily bicycle use, distance bicycled during a good weather week in spring, the degree to which respondents viewed distracted driving as a safety concern, the degree to which respondents affirmed that adding bike lanes would cause them to start/ increase their cycling, and helmet use. In all, twelve cross-tabulations were run. Chi-square tests for all of these cross-tabulations indicated significance ($P < .05$), though it must be noted that due to the large sample size, the cross-tabulations were more likely to be significant than if the sample size were smaller.

II. Special Notes about Survey

Filtering for Country and Gender

As stated in the overview, more than 13,000 individuals took part in the questionnaire. However, as can be seen from the table below, not all respondents were women. In addition, analysis from PASW Statistics indicated that not all respondents were living in the United States.

Are you male or female?

Answer Options	Response Percent	Response Count
Male	1.5%	201
Female	98.5%	13085
<i>answered question</i>		13286
<i>skipped question</i>		0

After filtering out males and respondents living outside the United States, the total response count was 11,453. This frequency count was the basis for all the analysis conducted. In addition, it must be noted that not all 11,453 respondents answered every question.

Cross Tabulation Tables

Because cross-tabulations include only the respondents answering both the independent and dependent variable under examination, the total response count in all cross-tabulations was below the total frequency count for the entire survey. In addition, “respondents affirming” denotes a *Yes* response to the question under analysis.

Sample Population

As stated, 11,453 women were counted for analysis. However, despite this large number, this sample size was not fully representative of all women living in the United States. As shown in the frequency table below, which was compiled from the survey question, *What is your age group?* Women under age 20 and ages 70 and older were not largely represented in the survey and do not reflect the population distribution of women living in the United States.

What is your age group?

Answer Options	Response Percent	Response Count
Under 20	0.7%	77
20-30	27.2%	3116
31-40	23.0%	2636
41-50	19.2%	2198
51-60	16.4%	1873
61-70	4.6%	523
70 and over	0.7%	78
	<i>answered question</i>	10501
	<i>skipped question</i>	952

In addition, respondents were asked to mark the highest educational level obtained. More than 45% reported having completed graduate school, and more than 40% reported having completed college. Finally, respondents were asked to select their racial/ethnic background—more than 90%

marked *white*. The education and racial/ethnic distributions within the survey are not reflective of educational attainment or racial/ethnic demographics in the United States.

Screening Based on Daily Bicycle Use

Question 4 of the survey screened respondents based on their answer (*Yes* or *No*). This question, “Do you use your bicycle for any of your daily trips in the community?” automatically excluded those answering “No” from Questions 5-20 in the survey. In all, 4,694 respondents were excluded due to their answering *No*. Due to their absence, cross-tabulations in which the dependent variable was derived from Questions 5-20 had a much lower response count than the cross-tabulations in which respondents who answered *No* were counted. After Question 20, respondents who answered *No* were included again. For this paper, the two dependent variables in which respondents were excluded are: distance cycled during a good weather week in spring and helmet use.

III. Special Notes on Organization of Report

Due to the screening based on daily bicycle use, the cross tabulations in this report are divided by those which include respondents who answered *No* to Question 4 and those which **do not** include respondents who answered *No* to Question 4. The first cross tabulation section (Section V) includes all response. The following cross tabulation section (Section VI) does not.

IV. Selection of Independent Variables: Size of Community and Age

We selected size of community and age group as the independent variables, which were paired with the dependent variables in the analysis. Size of community was derived from the survey question, *How would you characterize the area where you live?* Respondents were given the following options: *Rural, Small Town, Suburban, Medium City, Large City*. These response categories were not defined by specific population boundaries and were entirely self-selective.

Over 71% of the respondents characterized the area where they live as some kind of city: the largest response category for this question was *Medium City* (39.5%), followed by *Large City* (31.7%).

For age group, as indicated by the table on page 4, respondents were prompted to select seven interval categories: *Under 20*, *20-30*, *31-40*, *41-50*, *51-60*, *61-70*, and *70 and older*. The largest response category was *20-30* (27.2%), followed by *31-40* (23.0%); in all, 20-40 year olds accounted for roughly 50 percent of the respondents.

V. Cross Tabulations for All Respondents: Bicycle Use, Distracted Driving, Bike Lanes, Bike Paths

Bicycle Use

A majority of respondents (59.0%) reported using a bicycle for daily trips in the community. This question was cross tabulated with the two aforementioned independent variables: size of the community and age. Chi-square tests indicated significance ($P=.000$).

Do you use a bicycle for any of your daily trips in the community?

Answer Options	Response Percent	Response Count
Yes	59.0%	6759
No	41.0%	4694
<i>answered question</i>		11453

Bicycle Use by Size of Community

Bicycling prevalence and odds ratios were calculated using *Rural* as the referent. *Large City* had a higher prevalence rate and odds ratio, indicating that women in large cities cycle at higher rates than women from other communities and are more likely to use their bicycle for daily trips. Findings suggest that women from both medium and large cities are more likely to use their bicycles for daily trips in the community than respondents from rural and suburban areas: note that the bicycling rate for *Rural* is nearly half the rate for *Large City*.

Size of Community-- Do you use your bicycle for any of your daily trips in the community?

		Respondents affirming		Total	Odds Ratio (95% CI)	Prevalence Ratio
		Count	Percent			
Size of Community	Medium City	2912	64.4%	4524	3.31	1.82
	Large City	2383	65.5%	3636	3.48	1.86
	Rural	213	35.3%	603	1.0	1.0
	Suburban	570	41.1%	1386	1.28	1.16
	Small Town	676	52.3%	1293	2.01	1.48
Total		6754	59.0%	11442		

Bicycle Use by Age

The percentages in bold highlight findings that are either above or below the overall percentage given on the bottom row. Findings suggest that women 20-30 years of age use their bicycles more than the total percentage, while women 70 and older tend to use their bicycles for daily trips less than the total percentage.

Age Group—Do you use your bicycle for any of your daily trips in the community?

		Respondents Affirming		Total
		Count	Percent	
Age Group	Under 20	46	59.7%	77
	20-30	2141	68.7%	3116
	31-40	1596	60.5%	2636
	41-50	1231	56.0%	2198
	51-60	992	53.0%	1873
	61-70	245	46.8%	523
	70 and older	31	39.7%	78
Total		6282	59.8%	10501

Distracted Driving

In evaluating safety concerns of women cyclists, the survey prompted respondents to mark all applicable categories in the question, “What are your safety concerns about bicycling?”

A range of choices was provided, including dangerous behavior from drivers and pedestrians. As can be seen from the frequency chart, a majority of were concerned with behavior from drivers: the top four response categories were distracted driving, speed of cars, vehicles turning in front, and parked cars opening doors. Nearly three-quarters of the respondents were concerned with distracted driving (the largest response category, at 73.0%).

What are your safety concerns about bicycling? (check all that apply)

Answer Options	Response Percent	Response Count
Distracted driving	73.0%	8365
Speed of cars	63.6%	7282
Vehicles turning right in front of me when I'm going straight	56.6%	6482
Parked cars opening doors	50.1%	5742
Volume of cars	49.2%	5638
Motorists who run red lights and stop signs	47.7%	5463
Moving trucks and buses	34.5%	3955
Someone stealing my bike while it's parked	33.6%	3846
Vehicles hitting me from behind when I am cycling	32.8%	3753
Pedestrians stepping out in front of me without looking	26.9%	3080
Moving cars	25.8%	2959
Crossing at intersections	25.1%	2874
Stranger attacks	13.1%	1503
Other cyclists running into me	8.1%	933
Other (please specify)	7.1%	813
None of the above	3.2%	371

Because distracted driving received the highest response rate, this variable was selected for cross tabulation with size of community and age. Chi-square tests for the following cross tabulations were significant ($P < .05$).

Distracted Driving by Size of Community

The overall percentage for this sample, 73.1%, affirmed that distracted driving is a safety concern. However, women from rural areas are well below this percentage, at 64.5%. Findings suggest that women from rural communities are less concerned about distracted driving than women from other areas.

Size of Community--Is Distracted Driving a Safety Concern of Yours?

		Respondents affirming		Total
		Count	Percent	
Size of Community	Medium City	3346	74.0%	4524
	Large City	2719	74.8%	3636
	Rural	389	64.5%	603
	Suburban	1003	72.4%	1386
	Small Town	904	69.9%	1293
Total		8361	73.1%	11442

Distracted Driving with Age

Findings suggest that concern about distracted driving tends to increase up to age 50, with the exception of women under 20. Findings also suggest that women ages 31-40 and 41-50 are more concerned about distracted driving than the overall percentage of 84.3%.

Age Group—Is Distracted Driving a Safety Concern of Yours?

		Respondents affirming		Total
		Count	Percent	
Age Group	Under 20	52	78.8%	77
	20-30	2472	86.5%	3116
	31-40	2114	88.6%	2636
	41-50	1747	89.2%	2198
	51-60	1446	88.4%	1873
	61-70	379	87.1%	523
	70 and older	44	86.3%	78
	Total	2247	87.9%	10501

Bike Lanes

In evaluating factors that influenced bicycle use, respondents were asked to mark all applicable categories in the question, “What would cause you to start or increase your cycling?” (Question 27). Response categories included a range of options related to infrastructure, services, and social factors. As the following frequency chart demonstrates, more than 40% of respondents selected *More bike lanes*, *Completely separated off-road cycling paths*, *Wider lanes on the roads*, , and *Better connectivity/more direct routes*. A majority (62.4%) selected *More bike lanes*, and the second-highest response category was *Completely separated off-road cycling paths*; therefore, these responses were selected for cross tabulation with size of community and age. Chi-square tests for these cross tabulations were significant ($P<.05$).

What would cause you to start or increase your cycling (check all that apply)?

Answer Options	Response Percent	Response Count
More bike lanes	62.4%	7144
Completely separated off-road cycling paths	46.7%	5354
Better connectivity/more direct routes	44.7%	5122
Wider lanes on the roads	44.5%	5092
Tax breaks/financial incentives	38.0%	4353
More bike racks everywhere	36.1%	4133
Secure bike parking	33.9%	3882
Reduced traffic speeds/cars	30.8%	3529
More security and safety for cyclists	27.5%	3154
Showers and lockers at destination	25.7%	2941
Good local bike maps or websites so I could check out and plan my routes	23.3%	2663
Better lighting along routes	23.2%	2659
More people cycling	22.7%	2602
Bike repair class	19.8%	2273
Ability to bring bike on train or bus	18.2%	2083
Work-place encouragement	16.7%	1915
Cycling with a buddy more often	16.0%	1837
Organized social cycling events	11.8%	1353
Other (please specify)	10.7%	1225
Increased levels of other women cycling	10.7%	1220
Easy-to-read information explaining about bike parts and the cycling rules	9.6%	1097
Friendlier bike shop employees	9.2%	1053
More bike racks at my transit station	6.7%	765
Incentives from my school	6.3%	727
Ladies-only cycling class	6.0%	688
More encouragement from my friends and family	5.2%	590
Starting-up cycling classes	4.6%	531
More fashionable	3.9%	446

More Bike Lanes with Size of Community

Findings suggest that women living in large cities are more likely to increase their cycling with the addition of bike lanes than women living in other areas, particularly rural communities. However, the level of interest for installing more bike lanes was very high for all community types.

Size of Community—Would More Bike Lanes Cause You to Start/Increase Your Cycling?

		Respondents affirming		Total
		Count	Percent	
Size of Community	Medium City	2755	60.9%	4524
	Large City	2413	66.4%	3636
	Rural	326	54.1%	603
	Suburban	863	62.3%	1386
	Small Town	781	60.4%	1293
Total		7138	62.4%	11442

More Bike Lanes with Age

Though the response rate was over 50% for all age groups, findings suggest that women under 30 years of age are more likely to increase their cycling with additional bike lanes than women from other age groups. Indeed, almost three quarters of all 20 to 30 year-olds indicated that providing more bike lanes would cause them to start or increase their cycling.

Age Group—Would More Bike Lanes Cause You to Start/Increase Your Cycling?

		Respondents affirming		Total
		Count	Percent	
Age Group	Under 20	54	70.1%	77
	20-30	2307	74.0%	3116
	31-40	1721	65.3%	2636
	41-50	1406	64.0%	2198
	51-60	1198	64.0%	1873
	61-70	322	61.6%	523
	70 and older	41	52.6%	78
	Total	7049	67.1%	10501

Off-Road Bike Paths

Size of Community with Off-Road Paths

Of women living in large cities, 50.2% affirmed that the addition of off-road bike paths would cause them to start/increase their cycling. Findings suggest that women living in large cities are slightly more inclined to increase their cycling with the addition of separated off-road paths than respondents from other areas.

Size of Community—Would Separated Off-Road Paths Cause You to Start/Increase Your Cycling?

		Respondents affirming		Total
		Count	Percent	
Size of Community	Medium City	2035	45.0%	4524
	Large City	1825	50.2%	3636
	Rural	253	42.0%	603
	Suburban	643	46.4%	1386
	Small Town	594	45.9%	1293
Total		5350	46.8%	11442

Age Group with Off-Road Paths

For women under 20, 54.5% affirmed that off-road paths would cause them to start/increase their cycling; this percentage was nearly matched by women 20-30 years of age (54.2%). Percentages then decline with age; therefore, findings suggest that women under age 30 are more inclined to start/increase their cycling than women over age 30.

Age Group—Would Separated Off-Road Paths Cause You to Start/Increase Your Cycling?

		Respondents affirming		Total
		Count	Percent	
Age Group	Under 20	42	54.5%	77
	20-30	1690	54.2%	3116
	31-40	1337	50.7%	2636
	41-50	1022	46.5%	2198
	51-60	884	47.2%	1873
	61-70	273	52.2%	523
	70 and older	38	48.7%	78
Total	Count	5286	50.3%	10501

VI. Bicycling Behavior Cross tabulations After Screening: Helmet Use By, Distance Bicycled by Good Weather Week in Spring

Helmet Use

After screening for daily bike use (Question 4), the 4,694 respondents who answered *No* to this question were excluded from Questions 5-20 in the survey. As a result, the response count is lower (under 7,000) for Question 15, “How often do you use a helmet?” For this question, respondents selected *Always*, *Sometimes*, or *Never*. Independent variables are size of community and age. Chi-square tests demonstrated significance ($P<.05$) for both crosstabs.

Helmet Use with Size of Community

Although the response rate was high (above 77%) for all groups, findings suggest that women from rural and suburban areas are slightly more likely to always use their helmets than women from other community types, particularly women from small towns.

Size of Community—Do You Wear a Helmet when You Ride?

		Respondents who marked <i>Always</i>		Total
		Count	Percent	
Size of Community	Medium City	2247	80.9%	2778
	Large City	1834	81.3%	2255
	Rural	172	85.1%	202
	Suburban	471	85.6%	550
	Small Town	494	77.2%	640
Total		5218	81.2%	6425

Helmet Use with Age

In all age groups, a majority of respondents reported always wearing a helmet. Findings suggest that helmet use increases dramatically up to age 70. The drop in helmet use over age 70 may be attributed to the small sample size of this age group.

Age Group—Do You Wear a Helmet when You Ride?

		Respondents who marked <i>Always</i>		Total
		Count	Percent	
Age group	Under 20	27	58.7%	46
	20-30	1562	73.2%	2134
	31-40	1319	82.9%	1592
	41-50	1066	87.4%	1220
	51-60	868	87.8%	989
	61-70	232	95.1%	244
	70 and older	25	83.3%	30
Total		5099	81.5%	6255

Distance Cycled by Good Weather Week in Spring

The question, “How many miles do you bike during a good weather week in spring?” included only the respondents answering *Yes* to Question 4 (“Do you use your bike for daily trips in the community?”). Distance bicycled was selected as the dependent variable, and size of community and age were selected as the independent variables.

Cycling Distance with Size of Community

Findings suggest that women living in the suburbs and rural areas tend to bike longer distances (more than 60 miles per week), while women living in medium cities tend to bike shorter distances (20-40 miles), and women living in small towns are more likely to bicycle 10 miles and under. Chi-square testing indicated significance ($P=.000$).

Size of Community—How Many Miles do You Ride During a Good Weather Week in Spring?

Distance		10 miles and under		10-20 miles		20-40 miles		40-60 miles		More than 60 miles		Total
		Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	
Size of Community	Medium City	504	18.2%	544	19.7%	748	27.0%	469	16.9%	502	18.1%	2767
	Large City	340	15.2%	430	19.2%	572	25.5%	399	17.8%	501	22.4%	2242
	Rural	34	17.0%	39	19.5%	38	19.0%	34	17.0%	55	27.5%	200
	Suburban	89	16.2%	93	16.9%	133	24.2%	89	16.2%	146	26.5%	550
	Small Town	147	23.2%	129	20.3%	155	24.4%	102	16.1%	101	15.9%	634
Total		1114	17.4%	1235	19.3%	1646	25.7%	1093	17.1%	1305	20.4%	6393

Cycling Distance with Age

Findings suggest that women ages 31-40 are more likely than women in other age categories to ride between 20-40 miles during a good weather week in spring, while women ages 51-60 and 70 and older are more likely to ride more than 40-60 miles. Finally, women 61-70 are more likely to ride more than 60 miles than women in other age groups. Chi-square testing indicated significance ($P=.000$).

Age Group-- How Many Miles Do You Ride During a Good Weather Week in Spring?

Distance	10 miles and under		10-20 miles		20-40 miles		40-60 miles		More than 60 miles		Total
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	
Age Group Under 20	15	34.1%	12	27.3%	9	20.5%	4	9.1%	4	9.1%	44
20-30	402	18.9%	453	21.3%	552	26.0%	353	16.6%	363	17.1%	2123
31-40	295	18.6%	298	18.8%	433	27.3%	248	15.6%	312	19.7%	1586
41-50	191	15.7%	227	18.6%	283	23.2%	237	19.4%	283	23.2%	1221
51-60	139	14.2%	103	10.5%	256	26.0%	176	17.9%	233	23.6%	984
61-70	42	17.5%	24	10.0%	57	23.7%	47	19.5%	62	25.8%	241
70 and older	8	28.6%	7	25.0%	7	25.0%	6	21.4%	5	17.8%	28
Total	1092	17.5%	1597	25.6%	1597	25.6%	1071	17.2%	1262	20.3%	6227

VII: Implications for Future Research/Interventions

Cycling behavior appears to be influenced by size of community. While women from the suburbs and rural areas were less likely to use their bicycles for daily trips, they cycled longer distances (over 60 miles) than women from other communities. Rural and suburban women also constituted the highest percentage of respondents to report “always” wearing a helmet. Finally, women from large cities were most receptive to the addition of bike lanes as a means to start/increase their cycling. As a result, interventions to increase women’s cycling must take into account the areas in which women live.

Despite the difference in cycling behaviors due to community size, safety and infrastructure concerns were prevalent in nearly all subgroups. The operation of motorized vehicles, (especially distracted driving) dominate women’s safety concerns about cycling. Furthermore, infrastructure change, particularly the addition of more bike lanes, appears to be a primary factor for increasing women’s cycling. Though these findings warrant additional qualitative research, it is likely that intervention planning to promote cycling as a form of daily transportation needs to address the issues of distracted driving and the addition of more bike lanes.

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