Helmet Wearing Among Users of a Public Bicycle-Sharing Program in the District of Columbia and Comparable Riders on Personal Bicycles

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Bicycle-sharing programs are increasingly popular and have the potential to increase physical activity and decrease air pollution, but anecdotal evidence suggests helmet use is lower among users of bicycle-sharing programs than cyclists on private bicycles. We conducted a cross-sectional study to assess helmet use among users of a bicycle-sharing program in Washington, DC. Helmet use was significantly lower among cyclists on shared bicycles than private bicycles, highlighting a need for targeted helmet promotion activities. (*Am J Public Health.* 2012;102:e23–e25. doi:10.2105/AJPH.2012.300794)

One of the largest bicycle-sharing programs in the United States is the Washington, DC, metropolitan area's Capital Bikeshare. With its rapid expansion[1] and the anticipated debuts and expansions of large-scale bicycle sharing programs in New York City[2] and Chicago[3] in summer 2012, cyclist safety is paramount.

Bicycle sharing sits at the intersections of physical activity, environmental health, and injury prevention. The health benefits of cycling are well documented,[4–6] as are the environmental benefits of active modes of transportation in urban areas.[7] A mathematical model of the health impacts of the bicycle-sharing program in Barcelona, Spain, suggests that expanding bicycle sharing will extend longevity, with health benefits from physical activity and reduced air pollution outweighing a small increase in crash deaths.[8]

However, these benefits depend on the use of safety precautions. It is unclear whether persons using bicycle-sharing programs are at a greater or lesser risk of injury than other cyclists. The bicycles used by Capital Bikeshare and similar programs have design features to reduce the risk of crashes, including built-in lights, reflectors, and a low center of gravity.[9] Crashes among users of Capital Bikeshare are reported to be lower than for other cyclists,[10] but likely underreported.

In the event of a crash, though, bicycle helmets greatly reduce the risk of injury[11] and death,[12] and anecdotal evidence suggests that Capital Bikeshare riders use helmets at a low rate.[10] To date, helmet-use rates in the Capital Bikeshare program or other bicycle-sharing programs have not been evaluated in comparison with cyclists on private bicycles.

METHODS

This study utilized a cross-sectional design. Data were collected during 25 observation sessions during a 30-day period in September and October 2011 in Washington, DC. Observation sites were chosen from a set of 37 locations used annually by the DC Department of Transportation for annual bicycle censuses to enable demographic characteristics to be compared with historical data. All sites that were within the geographic range of the Capital Bikeshare program were included, unless their peak hourly ridership in the past year's census was less than 20 cyclists.

In Washington, DC, cyclists using Capital Bikeshare for daily commutes (such as to and from work) are likely to be drawn from a different underlying population of cyclists than casual riders (those likely to be tourists taking spontaneous rides and to have different barriers to helmet use). Thus, observations were taken at locations and times designed to capture 2 daily commuters and casual riders separately. Observation sites and times were classified as favoring 1 type of user or the other based on discussion with personnel from the District of Columbia Department of Transportation and pre-existing observation data of when locations' peak ridership occurred. At sites selected for daily commuters, observations were conducted for 60 minutes during peak commuting periods: weekdays between 7:30 to 9:00 AM or 5:00 to 6:30 PM. At sites selected for casual users, observations were conducted for 2 hours on weekends between 1:30 to 4:00 PM. (Two sites were used to observe both commuters and casual users, but no site was used twice for a given group.) Data were not collected on rainy days because ridership declines substantially during inclement weather. Data from any site that did not include any Capital Bikeshare riders were excluded.

In addition to the observation site's location and the time period for collection, the following data were visually estimated for each cyclist: helmet status, whether the cyclist was on a bike-sharing bicycle (Bikeshare status), approximate age, and gender. Race and ethnicity were also collected but dropped from the analysis because of concerns about accuracy. Because of the difficulty of precisely estimating age for a moving cyclist, fairly coarse categories were used: younger than 16 (excluded), 16 to 35, and older than 35 years.

Two-person teams that received a brief training in the study's protocol conducted observation. The observation teams were situated in the middle of an assigned block. To avoid duplication of data, 1 observer counted cyclists traveling in 1 direction and the other counted cyclists going in the opposite direction. Data on all cyclists who passed the observer—whether on the road or sidewalk—were collected unless the observer was certain that the cyclist had previously been recorded during that observation session. Cyclists estimated to be younger than 16 years were excluded from analysis to prevent biasing comparisons between Bikeshare and non-Bikeshare cyclists because persons younger than 16 years are prohibited from using Capital Bikeshare and therefore subject to the District of Columbia's mandatory bicycle helmet law.

Statistical Analysis

Statistical analysis was conducted using Stata version 11.2 (Statacorp, College Station, TX). Bivariate analyses used simple logistic regression and multivariate analyses used multiple logistic regressions, both with clustered robust standard errors to account for potential nonindependence of observations at each data collection site. Because daily commuters and casual users are believed to constitute 2

TABLE 1—Characteristics of Cyclists by Whether Riding a Private Bicycle or a Shared Bicycle: Washington, DC, September–October 2011

	Commuters		Casual Riders	
	Bikeshare, No. (%)	Private Bicycle, No. (%)	Bikeshare, No. (%)	Private Bicycle, No. (%)
Gender				
Male	100 (70.4)	888 (70.1)	57 (51.8)	516 (66.6)
Female	42 (29.6)	379 (29.9)	53 (48.2)	259 (33.4)
Age, y				
≤ 35	101 (71.3)	810 (63.9)	77 (72.0)	390 (50.3)
> 35	41 (28.9)	458 (36.1)	30 (28.0)	386 (49.7)
Total observations	142 (10.1)	1268 (89.3)	110 (12.4)	777 (87.6)

separate cycling populations, all results are stratified by those categories.

RESULTS

A total of 2297 cyclists were observed and satisfied inclusion and exclusion criteria. Of these, 1410 were observed at times and locations consistent with being daily commuters and 887 with being casual riders. Bikeshare users constituted 10.1% and 12.4% of commuters and casual riders, respectively. They were more frequently younger than cyclists on private bicycles, and differences by gender were observed for Bikeshare users who were classified as commuters, but not for casual riders (Table 1).

Helmet use was significantly less common among Bikeshare users than comparable cyclists on their own bicycles. Adjusting for potential confounders, persons observed using Capital Bikeshare at times and locations consistent with being a daily commuter had one fifth the odds of helmet use (odds ratio [OR] = 0.200; 95% confidence interval [CI] = 0.110, 0.362) of those observed at the same time and locations on private bicycles. Similarly, among persons classified as casual riders, users of Capital Bikeshare had less than one tenth the odds of helmet use (OR = 0.090; 95% CI = 0.061, 0.132; Table 2).

DISCUSSION

This study shows that cyclists utilizing a bike-sharing program in Washington, DC, are much less likely to wear helmets than are their comparable counterparts riding personal bicycles. Although the bicycles used by Capital Bikeshare are designed to reduce the risk of crashes, the risk of injury increases for unhelmeted cyclists should a crash occur. Although published data do not exist on bicycle-sharing programs in other cities, it is likely that reduced helmet use is a feature common to bicycle-sharing programs across locations because riders in other jurisdictions would face similar barriers to helmet use as do riders in the District of Columbia.[13]

Although care was taken to maintain high data quality, there were some challenges that were difficult to avoid. Measurement validity was limited by the observational nature of the study. While helmet status, bike-share status, and gender could be ascertained with high confidence, error when ascertaining age was more likely. However, duplicate data were collected during 1 observation session, and interrater reliability was high. Agreement for helmet status, bike-share status, and gender were 100% ($\kappa = 1.00$) each and 84.9% ($\kappa = 0.70$) for age. Missing data were very rare, with 0.06% of data fields missing or illegible for cyclists observed during commuter collections and 0.3% for casual user collections. To assess quality of data entry, every tenth electronic record was visually inspected against the paper original, with no errors identified.

These data on helmet use among Capital Bikeshare riders are likely representative of all Bikeshare users in the Washington, DC, metropolitan area, especially for commuters. Demographic characteristics observed in this study are similar to those reported by Capital Bikeshare for its members. Data on non-Bikeshare cyclists are not representative of the bicycle riding population of the District of Columbia. Because observations exclude geographic areas with little or no Capital Bikeshare use, the non-Bikeshare riders observed in this study are likely to be disproportionately middle class or wealthier.

This research suggests that bike-sharing programs should invest effort in helmet promotion activities. Some have suggested mandatory helmet laws, and past research suggests that helmet laws would likely increase the proportion of cyclists wearing helmets,[14] but they may also impede the use of bicycle-sharing programs.[15,16] Because bicycle-sharing poses potential physical fitness and environmental benefits, localities may wish to utilize non-coercive health promotion approaches before considering legislation. In Washington, DC, free helmet give-aways have been conducted,

TABLE 2—Odds Ratios of Helmet Use for Bikeshare Users Compared with Riders of Private Bicycles: Washington, DC, September–October 2011

	Wearing Helmet, No./Total No. (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Commuters			
Private bicycle	898/1268 (70.8)	1.000 (Ref)	1.000 (Ref)
Bikeshare	47/142 (33.1)	0.204 (0.117, 0.356)	0.200 (0.110, 0.362)
Casual riders			
Private bicycle	531/776 (68.4)	1.000 (Ref)	1.000 (Ref)
Bikeshare	17/108 (15.7)	0.086 (0.057, 0.131)	0.090 (0.061, 0.132)

Note. CI = confidence interval; OR = odds ratio. Adjusted odds ratios are controlled for gender and age.

and the District of Columbia has a pilot project with selected hotels to administer a helmet loan initiative for tourists.[17] These efforts have not yet been evaluated.

Daily commuters should be prioritized for helmet interventions because they are at increased cumulative risk to potential crashes. Additionally, because use of bike sharing is less spontaneous for commuters, it is likely that interventions targeting this population would have a greater effect than those targeting casual Bikeshare users. Particular barriers to helmet use in this population should be identified to guide behavioral change communications. To the extent possible, message campaigns should avoid making cycling appear to be dangerous because dissuading bicycle use would be an undesirable outcome from a physical fitness standpoint. ■

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This article was accepted March 10, 2012.

Contributors

All authors participated in the design of the study and acquisition of data. J. D. Kraemer and J. S. Roffenbender prepared the article and L. Anderko critically reviewed it. J. D. Kraemer conducted statistical analysis.

Acknowledgments

We thank the people who helped with data collection, including Samuel Aronson, Caroline Cotto, Lauren Cournoyer, Madeline Curtis, Katherine Dunn, Jonathan Filicko, Julia Fenelon, Allison Hall, Suzanne Huszagh, Christopher Kennedy, Susan Kim, Morgan Leske, Anna Martignetti, Kelly Nose, Sasha Pulde, Chelsea Redman, Victoria Thomas, and Heather Zaccaro. We are also grateful to Chris Holben and Josh Moskowitz, bikesharing project managers at the District of Columbia Department of Transportation, for their input and suggestions.

Human Participant Protection

No institutional review board approval was required because the study—as simple observation of public behavior without intervention, interaction, or recording of private information—was not defined as human participants research.

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