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Bicycle helmet use among persons 5 years and older in the United States, 2012☆

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ABSTRACT

Introduction: In 2013, injuries to bicyclists accounted for 925 fatalities and 493,884 nonfatal, emergency department-treated injuries in the United States. Bicyclist deaths increased by 19% from 2010 to 2013. The greatest risk of death and disability to bicyclists is head injuries. The objective of this study was to provide estimates of prevalence and associated factors of bicycle riding and helmet use among children and adults in the United States. *Method:* CDC analyzed self-reported data from the 2012 *Summer ConsumerStyles* survey. Adult respondents (18 + years) were asked about bicycle riding and helmet use in the last 30 days for themselves and their children (5 to 17 years). For bicycle riders, CDC estimated the prevalence of helmet use and conducted multivariable regression analyses to identify factors associated with helmet use. *Results:* Among adults, 21% rode bicycles within the past 30 days and 29% always wore helmets. Respondents reported that, of the 61% of children who rode bicycles within the past 30 days, 42% always wore helmets. Children were more likely to always wear helmets (90%) when their adult respondents always wore helmets than when their adult respondents did not always wear helmets (38%). Children who lived in states with a child bicycle helmet law were more likely to always wear helmets (47%) than those in states without a law (39%). *Conclusions:* Despite the fact that bicycle helmets are highly effective at reducing the risk for head injuries, including severe brain injuries and death, less than half of children and adults always wore bicycle helmets while riding. *Practical application:* States and communities should consider interventions that improve the safety of riding such as policies to promote helmet use, modeling of helmet wearing by adults, and focusing on high risk groups, including Hispanic cyclists, occasional riders, adults, and children ages 10 to 14.

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1. Introduction

Although the increased physical activity-related health benefits of bicycling are well established (Mueller et al., 2015), in 2013 bicyclist injuries accounted for 925 fatalities and 493,884 nonfatal, emergency department (ED)-treated injuries in the United States (Web-based Injury Statistics Query and Reporting System, 2015). The number of fatalities from all motor vehicle crashes, including bicyclists, declined by 1% from 2010 to 2013; however, the number of bicyclist deaths increased by 19% during the same time period (National Center for Statistics and Analysis, 2015). From 2010 to 2013, bicyclist deaths accounted for approximately 2% of all motor vehicle crash-related fatalities (National Center for Statistics and Analysis, 2015; Williams, 2014) and approximately 70% of total bicycling fatalities involved motor vehicles (Web-based Injury Statistics Query and Reporting System, 2015). It is important to note that although many bicycling deaths involve motor vehicles, nearly one-third do not (Mueller et al., 2015; Web-based Injury Statistics Query and Reporting System, 2015).

Among adults in the United States, bicycling demographics are changing (National Center for Statistics and Analysis, 2015; National Household Travel Survey, 2009). From 2001 to 2009, the number of bicycling trips per person doubled among persons ≥30 years, while the number of trips per person among those younger than 30 years decreased by approximately 20% (National Center for Statistics and Analysis, 2015). Although bicycling fatalities among children have decreased for the past 4 decades (Highway Loss Data Institute, 2013), bicycling was the 6th leading cause of nonfatal, ED-treated injury for children 5–9 years and the 5th leading cause of nonfatal, ED-treated injury for children 10–14 years in 2012 (Web-based Injury Statistics Query and Reporting System, 2015).

The most common non-fatal injuries among bicyclists include soft tissue and musculoskeletal injuries, while nearly one-third are head injuries (Haileyesus, Annest, & Dellinger, 2007) and head injuries pose the greatest risk of death and disability to bicyclists (Haileyesus et al., 2007; Thompson & Rivara, 2001; Thompson, Rivara, & Thompson, 1999). Multiple studies show that bicycle helmets reduce the risk of death and are highly effective at reducing the likelihood of severe head injuries

☆ The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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(Amoros, Chiron, Martin, Thelot, & Laumon, 2012; Bambach, Mitchell, Grzebieta, & Olivier, 2013; Boufous, de Rome, Senserrick, & Ivers, 2012; Cripton, Dressler, Stuart, Dennison, & Richards, 2014; McNally & Whitehead, 2013; Persaud, Coleman, Zwolakowski, Lauwers, & Cass, 2012). The most recent reports of bicycle helmet use in the literature indicate that less than one-half of children (45%) and less than one-third of adults (28%) in 2012 (Schroeder & Wilbur, 2013) wore bicycle helmets for every ride; however, the report does not include associated factors for reported helmet use.

The objective of this study was to provide the prevalence of bicycle riding and bicycle helmet use and to identify factors associated with bicycle helmet use among children (5 to 17 years) and adults (18 + years) in the United States.

2. Methods

The Centers for Disease Control and Prevention (CDC) analyzed self-reported data from the 2012 *Summer ConsumerStyles* survey. The annual *ConsumerStyles* panel survey administered by Porter Novelli (Washington, D.C.) measures health knowledge, attitudes, and behaviors of adults in the United States. Panel members are randomly recruited by probability-based sampling (using both random-digit dial and address-based sampling methods). In 2012, all surveys were conducted online. If needed, households were provided with a laptop computer and access to the Internet. The sample was weighted based on region, household income, population density, age, race/ethnicity, socio-economic status, and household size to estimate prevalence for the U.S. population. All analyses were conducted using weighted data. *ConsumerStyles* methods are provided as Appendix A and the response rate in 2012 was 65% (Pollard, 2001).

In the summer of 2012, 4170 surveys were completed. For this study, we use the term "bicycle riders" to describe the adults and children who had ridden a bicycle at least once during the past 30 days. Respondents were asked "During the past 30 days, about how often did you ride a bicycle?" Responses include: "every day," "several times a week," "once a week," "a few times a month," "once a month," or "never" to the question. "Never" responses were considered "non-bicyclists." "During the past 30 days, how often did you wear a helmet when riding a bicycle?" Responses include: "always wore a helmet," "more than half of the time," "about half of the time," "less than half of the time," or "never wore a helmet." Adult respondents (aged 18 and older) with children (N = 1220, 29%) between the ages of 5 and 17 were asked the same two questions about bicycle riding and helmet use for the youngest child.

Prevalence of bicycle riding (daily, once/week, several times/week, once/month, or a few times/month) and helmet use (always, sometimes, or never) was reported by age group and, for children, whether the respondent resided in a state with a child helmet law.

Multivariable analysis was conducted to determine the factors associated with always wearing a helmet among adults and children. The multivariable analysis model for adults included annual household income (less than $40,000, $40,000 to $84,999, or $85,000 +), education (≤high school graduate or ≥some college), employment (working or not working [retired, disabled, temporarily unemployed, or looking for work]), metropolitan statistical area (MSA) or non-metropolitan statistical area (non-MSA) of residence, marital status (married or not married [widowed, divorced, separated, or never married]), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, or non-Hispanic other race), gender, age group (18–29, 30–44, 45–59, or 60 + years), and ride frequency in the past 30 days (daily [rode every day], weekly [rode less than daily but at least once/week], or monthly [rode less than once/week but at least once in the past 30 days]) as independent variables to calculate Poisson adjusted prevalence ratios (aPRs) and 95% confidence intervals (95% CI) (Coutinho, 2008). The dependent variable was helmet use (always or less than always). Some categorical variables (e.g. employment, marital status, race/ethnicity, ride frequency, and helmet use) were condensed due to small cell sizes.

The multivariable analysis model for children (5 to 17 years) included respondent's annual household income, respondent's education, respondent's employment, presence of state laws requiring helmet use for children (Helmet Laws for Bicycle Riders, 2015), MSA or non-MSA of residence, respondent's marital status, respondent's race/ethnicity, respondent's gender, respondent's age group, child's age group (5–9, 10–14, or 15–17 years), child's ride frequency (daily, weekly, or monthly), and respondent's helmet use (always or less than always) as independent variables to calculate aPRs and 95% CI (Coutinho, 2008). The dependent variable was child's helmet use (always or less than always). These analyses were completed using SPSS version 21 (IBM Armonk, New York).

To supplement the self-reported behavioral data on bicycle riding and helmet use, 2012 National Vital Statistics System (NVSS) death certificate data (National Vital Statistics System, 2015) were used to calculate rates for unintentional bicyclist (e.g., riders of two-wheel, nonmotorized vehicles) and other cyclist (e.g., riders of nonmotorized vehicles such as tricycles and unicycles powered solely by pedals) (National Center for Statistics and Analysis, 2015) deaths (on and off public roads) per 100,000 population by age group. For ease of reference, we will use the term "bicyclist deaths" to refer to "bicyclist and other cyclist deaths." NVSS data were analyzed with the Web-based Injury Statistics Query and Reporting System (WISQARS). WISQARS presents national fatal and non-fatal injury data by cause of death or mechanism of injury and by intent or manner of death (Web-based Injury Statistics Query and Reporting System, 2015).

3. Results

Within the preceding 30 days, 21% of the 4170 adult respondents reported riding a bicycle. Of the 863 adult bicycle riders, 5% rode a bicycle every day, 25% rode several times per week, 15% rode once a week, 27% rode a few times per month, and 27% rode once per month. Only 29% reported always wearing a helmet while 56% reported never wearing one. The proportion of adults never wearing a helmet was 62% among those aged 18–29 years, 59% aged 30–44 years, 55% aged 45–59 years, and 66% aged 60 + years. The bicyclist death rates per 100,000 population were 0.2 among adults aged 18–29 years, 0.3 aged 30–44 years, 0.5 aged 45–59 years, and 0.4 aged 60 + years (Fig. 1).

Results of multivariable analysis of helmet use (Table 1) showed that adult helmet use was lower among Hispanics (aPR 0.89, 95% CI: 0.84, 0.95) compared with non-Hispanic Whites. No significant differences in helmet use were observed between non-Hispanic Blacks or non-Hispanic persons of other races when compared with non-Hispanic Whites. Adult respondents living in an MSA (aPR 1.09, 95% CI: 1.01, 1.17) or having household income greater than $85,000 per year (aPR 1.13, 95% CI: 1.05, 1.20) were more likely to wear helmets, as compared with non-MSA residents or those earning less than $40,000 per year, respectively. Adult helmet use was lower among monthly riders (aPR 0.89, 95% CI: 0.80, 0.99) as compared with those who reported riding daily.

Among the 1220 children aged 5 to 17 years, respondents reported that 61% rode a bicycle in the past 30 days. Among those child bicycle riders, 11% rode every day, 38% rode several times per week, 15% rode once per week, 24% rode a few times per month, and 13% rode once per month. Respondents reported that 42% of the children always wore a helmet and 31% never wore a helmet while riding a bicycle.

Multivariable analysis revealed associations with helmet use among children (Table 2). The strongest predictor of child helmet use was living with an adult who always wore a helmet (aPR 1.38, 95% CI: 1.25, 1.54). Children in MSAs were 19% more likely to wear helmets than those in non-MSAs (aPR 1.19, 95% CI: 1.03, 1.38). Other characteristics that were associated with children being less likely to wear a helmet were household income between $40,000 and $84,999 per year (aPR 0.85, 95% CI: 0.75, 0.97), Hispanic ethnicity (aPR 0.85, 95% CI: