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Teens and seat belt use: What makes them click?☆

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ABSTRACT

Problem: Motor vehicle crashes kill more adolescents in the United States than any other cause, and often the teen is not wearing a seat belt. *Methods:* Using data from the 2011 Youth Risk Behavior Surveys from 38 states, we examined teens' self-reported seat belt use while riding as a passenger and identified individual characteristics and environmental factors associated with always wearing a seat belt. *Results:* Only 51% of high school students living in 38 states reported always wearing a seat belt when riding as a passenger; prevalence varied from 32% in South Dakota to 65% in Delaware. Seat belt use was 11 percentage points lower in states with secondary enforcement seat belt laws compared to states with primary enforcement laws. Racial/ethnic minorities, teens living in states with secondary enforcement seat belt laws, and those engaged in substance use were least likely to always wear their seat belts. The likelihood of always being belted declined steadily as the number of substance use behaviors increased. *Discussion:* Seat belt use among teens in the United States remains unacceptably low. Results suggest that environmental influences can compound individual risk factors, contributing to even lower seat belt use among some subgroups. *Practical applications:* This study provides the most comprehensive state-level estimates to date of seat belt use among U.S. teens. This information can be useful when considering policy options to increase seat belt use and for targeting injury prevention interventions to high-risk teens. States can best increase teen seat belt use by making evidence-informed decisions about state policy options and prevention strategies.

1. Introduction

Learning to drive is an important milestone for most adolescents in the United States. While novice teen drivers gain experience, their crash risk is high. Motor vehicle crashes kill more adolescents in the United States than any other cause (CDC, 2015), and most of these deaths occur in crashes involving teens either driving or riding with a teen driver (Insurance Institute for Highway Safety [IIHS], 2015b). In 2013, 1725 teens aged 16–19 years died in passenger vehicle crashes; 567 of the fatally injured teens were drivers. Only 47% of fatally injured drivers and 34% of passengers were wearing a seat belt (IIHS, 2015b). Seat belts are the most effective means for reducing serious injuries and deaths in a crash (Dinh-Zarr et al., 2001). Although seat belt use has increased in the United States in recent years (Shults & Beck, 2012; National Highway Traffic Safety Administration [NHTSA], 2015a), use by teens and young adults continues to lag behind use by adults aged ≥25 years (NHTSA, 2015a,b).

Seat belt laws increase seat belt use and reduce traffic fatalities in the general population. (Dinh-Zarr et al., 2001). As of June 2015, 34 states and the District of Columbia had primary enforcement seat belt laws (primary laws), which allow law enforcement to stop drivers and issue tickets solely because someone is not belted, and 15 states had secondary enforcement seat belt laws (secondary laws), which allow tickets to be issued only after a driver has been pulled over for another reason. Some states with secondary laws have a primary enforcement provision within the law for children and youth, typically up to age 17 or 18 years (Governors Highway SafetyAssociation [GHSA], 2015a). New Hampshire, the only state without a seat belt law for adults, has a primary enforcement provision for drivers and passengers <18 years as part of their child passenger safety law (GHSA, 2015a).

To our knowledge, only two studies have estimated the effectiveness of enacting seat belt laws specifically on teen seat belt use in the United States (Carpenter & Stehr, 2008; O'Malley & Wagenaar, 2004). O'Malley and Wagenaar (2004) found a 14% post-law increase in self-reported belt use among high school seniors living in 20 states that passed secondary seat belt laws during 1986–2000. Carpenter and Stehr (2008) estimated the effects of changes in seat belt laws from 1991 to 2005. They found that, relative to states that did not pass a seat belt law, states that passed a primary law experienced a 14 percentage point reduction in students who rarely or never wore a seat belt. Similarly, cross-sectional studies that examined the association between the type of seat belt law and teen belt use have consistently reported higher use rates in states with primary seat belt laws (Durbin, Smith, Kallan, Elliott, & Winston, 2007; García-España, Winston, & Durbin, 2012; McCartt & Northrup, 2004).

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

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Community-level and regional differences in teen seat belt use are not well understood. However, observational seat belt surveys and fatal crash data indicate that persons of all ages living in rural areas have seat belt use rates slightly lower than their counterparts in urban areas (NHTSA, 2015a, 2014). One study of seat belt use among fatally injured teen drivers found lower use rates among drivers on rural roadways (McCartt & Northrup, 2004). Self-reported seat belt use among U.S. adults is substantially lower in rural areas compared with urban or suburban areas (Beck & West, 2011; Strine et al., 2010), with the lowest rates of use occurring among adults living in rural areas of states with a secondary seat belt law (Strine et al., 2010). Both observed and self-reported seat belt use varies by region, with higher rates recorded in the Western region of the United States (NHTSA, 2015a; Strine et al., 2010).

Risky driving behaviors among teens, including nonuse of seat belts, are known to co-occur with other "problem behaviors" such as alcohol and illicit drug use, cigarette smoking, and unprotected sex (Bingham, Shope, & Raghunathan, 2006; Begg & Langley, 2000; Jessor, 1987; Li, Simons-Morton, & Hingson, 2013; Pickett et al., 2002; Scott-Parker, Watson, King, & Hyde, 2013; Vassalloa et al., 2008). Yet the health risk behaviors that co-occur most often with seat belt nonuse among the U.S. teen population are still unclear, as many previous studies have been conducted with small, non-representative samples, and sometimes in countries other than the United States.

Understanding how individual risk behaviors and environmental factors may interact to influence teen seat belt use can help inform prevention efforts. To that end, we analyzed data from 38 U.S. states using the 2011 state Youth Risk Behavior Surveys (YRBSs). Individual characteristics included age, sex, race/ethnicity, and five substance use behaviors. Substance use was of interest because it often occurs when teens are together, and it may occur while traveling in a vehicle (McCabe, West, Veliz, Frank, & Boyd, 2014), potentially increasing crash risk (Voas, Torres, Romano, & Lacey, 2012). We explored whether seat belt use declined as the number of substance use behaviors increased. Environmental factors included state seat belt law, state-level adult seat belt use, geographic location (rurality and U.S. census region), and strength of state Graduated Driver Licensing (GDL) programs). GDL programs reduce crashes by requiring novice teen drivers to gain independent driving experience under safer conditions such as restricting nighttime driving and limiting teen passengers (GHSA, 2015b). State-level adult seat belt use was included because teen driver seat belt use has been shown to correlate highly with belt use for all ages (McCartt & Northrup, 2004). Lastly, we expanded on previous studies of seat belt laws and teen belt use by including a separate category for states with a secondary law that included a primary seat belt provision for youth.

2. Materials and methods

2.1. Data sources

The national and state Youth Risk Behavior Surveys are conducted biennially to monitor priority health risk behaviors among youth. The Centers for Disease Control and Prevention (CDC) conducts the national YRBS and supports state education and health agencies that conduct the state YRBSs. In 2011, each participating state used a two-stage cluster sample design to obtain a representative sample of public school students in 9th–12th grades and public and private school students in 9th–12th grades in Ohio and South Dakota. Thirty-six of the state surveys included in the study were conducted during spring 2011, and the New Mexico and Virginia surveys were conducted during fall 2011 (personal communication, Shari Shanklin, CDC, October 19, 2015). Participation in the survey was anonymous and voluntary and local parental permission procedures were used. The student sample sizes ranged from 1147 to 13,201 (median: 2170) (Eaton et al., 2012). State health and education agencies followed local Institutional Review Board policies and procedures (Brener et al., 2013). Details of the sample design and survey methodology are described elsewhere (Brener et al., 2013; Eaton et al., 2012).

We obtained the 2011 YRBSs data files from the CDC, with permission from each state's Youth Risk Behavior Surveillance System representative. We analyzed data from 38 states that included the seat belt and substance use questions and had an overall response rate of at least 60%, calculated as (number of participating schools/number of eligible sampled schools) × (number of usable questionnaires/number of eligible students sampled) (Eaton et al., 2012). Because many high school students are not old enough to drive, students were asked about seat belt use only when riding as a passenger. Therefore, seat belt use while driving or among students who drive was not available. However, the 2005 national YRBS included a question about seat belt use while driving, and results revealed that "always" wearing a seat belt when driving correlated well with "always" wearing a seat belt when riding as a passenger (Briggs, Lambert, Goldzweig, Levine, & Warren, 2008).

We obtained the 2011 YRBS national estimate of seat belt use from the 2011 YRBS Data User's Guide (CDC, 2012).

2.2. Outcome measures

We assessed seat belt use using the question, "How often do you wear a seat belt when riding in a car driven by someone else?" Response options were "always," "most of the time," "sometimes," "rarely," and "never." We dichotomized the response categories into "always" or "less than always" for bivariate and multivariate analyses.

2.3. Explanatory variables

Individual characteristics included age (≤14, 15, 16, 17, ≥18 years), sex, race/ethnicity (categorized mutually exclusively as white, black, other, Hispanic), and five substance use behaviors: driving after drinking alcohol, riding with a driver who had been drinking alcohol, smoking cigarettes, using marijuana, and binge drinking. Binge drinking was defined as consuming five or more drinks of alcohol in a row within of couple of hours. Respondents were asked how many times during the past 30 days they had participated in each substance use behavior. We dichotomized the responses into "none" or "≥1 times."

Environmental factors included type of seat belt law as of April 2011 (primary enforcement, secondary enforcement, secondary enforcement with a primary provision for youth) (GHSA, 2015a; IIHS, 2015a), the April 2011 Insurance Institute for Highway Safety (IIHS) GDL rating (good, fair, marginal) (personal communication, Michele Fields, IIHS, July 9, 2013), prevalence of state-level adult self-reported seat belt use (always wear) from the 2010 Behavioral Risk Factor Survey (BRFS) (Shults & Beck, 2012), categorized into tertiles of 60–79%, 80–85%, ≥86%), and rurality, measured as the proportion of students enrolled in public schools located in distant or remote areas (Keaton, 2012), categorized into tertiles of <10%, 10–19%, and ≥20%. Region was defined using the four U.S. Census regions (West, South, Northeast, and Midwest). Rhode Island enacted a primary seat belt law in June 2011, after the state's YRBS was conducted.

2.4. Statistical analysis

Approximately 10% of the observations had missing values for one or more of the explanatory variables. To reduce the likelihood of loss of precision and biased estimates, we imputed the missing values using fully conditional specification multiple imputation methods (Lee & Carlin, 2010; Liu & De, 2015; Van Buuren, Brand, Groothuis-Oudshoorn, & Rubin, 2006). As the descriptive and multivariate analyses were conducted, results from the imputed data set were compared to the corresponding results from the data set before the multiple imputation modeling (complete case analysis) to check that the results were similar (Lee & Carlin, 2010; Liu & De, 2015).