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Special report from the CDC

Predictors of rear seat belt use among U.S. adults, 2012☆

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ABSTRACT

Introduction: Seat belt use reduces the risk of injuries and fatalities among motor vehicle occupants in a crash, but belt use in rear seating positions is consistently lower than front seating positions. Knowledge is limited concerning factors associated with seat belt use among adult rear seat passengers. *Methods:* Data from the 2012 *ConsumerStyles* survey were used to calculate weighted percentages of self-reported rear seat belt use by demographic characteristics and type of rear seat belt use enforcement. Multivariable regression was used to calculate prevalence ratios for rear seat belt use, adjusting for person-, household- and geographic-level demographic variables as well as for type of seat belt law in place in the state. *Results:* Rear seat belt use varied by age, race, geographic region, metropolitan status, and type of enforcement. Multivariable regression showed that respondents living in states with primary (Adjusted Prevalence Ratio (APR): 1.23) and secondary (APR: 1.11) rear seat belt use enforcement laws were significantly more likely to report always wearing a seat belt in the rear seat compared with those living in a state with no rear seat belt use enforcement law. *Conclusions and practical applications:* Several factors were associated with self-reported seat belt use in rear seating positions. Evidence suggests that primary enforcement covering all seating positions is an effective intervention that can be employed to increase seat belt use and in turn prevent motor vehicle injuries to rear-seated occupants.

1. Introduction

Observational studies report that the use of seat belts in rear seating positions was at least 10 percentage points lower than front seat belt use every year from 2009 to 2012 (Pickrell, 2014). Among adult non-drivers (i.e., front-right seat passengers and rear seat passengers), those in rear seats represented 26% of deaths in 2012 (unpublished data, FARS data query 10/29/2014). Among rear seat occupants, seat belt use can reduce the risk for death by 60% (Zhu, Cummings, & Chu, 2007). Additionally, multiple studies have documented the increased risk of death (Bose, Arregui-Dalmases, Sanchez-Molina, Velazquez-Ameijide, & Crandall, 2013; Mayrose et al., 2005) or serious injury (Ichikawa, Nakahara, & Wakai, 2002) for restrained occupants when unrestrained rear seat occupants are also in the vehicle. For example, in fatal frontal crashes in the United States, the odds of driver death in the presence of unrestrained rear-seat occupants are more than double those in which rear-seat occupants are restrained (Bose et al., 2013).

Much of the existing literature on predictors of adult seat belt use focuses on seat belt wearing generally (without specifying a seating position) or relies on data sources (e.g., observational) that are limited in the breadth of individual-level data that can be collected (Beck, Shults, Mack, & Ryan, 2007; Pickrell, 2014; Strine et al., 2010). Therefore, the purpose of this study was to improve our understanding of predictors of seat belt use among adult rear seat passengers.

☆ Disclaimer: 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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2. Methods

The data used in this study came from the summer wave of Porter Novelli's[1] 2012 *ConsumerStyles* database (Summer ConsumerStyles, 2012 Survey, 2012). The *ConsumerStyles* database is built annually from a series of web-based surveys that gather information about Americans, including information about their health-related attitudes and behaviors.

The Summer *ConsumerStyles* survey was fielded from June 19–July 3, 2012 to 4754 adults (18 years or older) and a supplemental sample of 1648 adults with children aged 12–17 who previously completed the spring wave and belong to GfK's KnowledgePanel[2]. A total of 4170 surveys were returned, for a response rate of 65%.

The data were weighted to match the U.S. Current Population Survey proportions for sex, age, household income, race/ethnicity, household size, education level, census region, metropolitan status, and whether or not a respondent had internet access prior to joining the panel. Weights were then scaled back to reflect the sample size of the study (ConsumerStyles, 2012 Methodology, 2012).

The CDC licensed the results of the 2012 Summer *ConsumerStyles* survey post-collection from Porter Novelli, and analysis of these data was exempt from institutional review board approval because personal identifiers were not included in the data file.

Survey respondents were asked how often they wear seat belts when riding in the back seat of a car, truck, van, or sport utility vehicle. We combined response categories of 'nearly always,' 'sometimes,' 'seldom,' and 'never,' into a single 'less than always' category and compared with 'always' for the purposes of our analyses. Respondents who reported never riding in the back seat were excluded from all analyses ($n = 217$). For each state in 2012, we used data from the Insurance Institute for Highway Safety (IIHS) to determine whether there was a rear seat belt law for adults, and if there was a law, whether it was a primary (allows law enforcement to ticket a driver or passenger for not wearing a seat belt without any other traffic offense taking place) or secondary law (law enforcement may only ticket for not wearing a seat belt when there is another citable traffic violation).

Crude analyses examined associations between demographic characteristics and type of rear seat belt use enforcement with always wearing a seat belt when riding in the rear seat. Demographic characteristics examined included gender, age, race/ethnicity (categorized mutually exclusively as white, black, Hispanic, or other [American Indian/Alaska Native, Asian, Native Hawaiian or Pacific Islander, or multiracial]), education, marital status, household income, census region, and metropolitan status of the respondent's residence (categorized as metropolitan or non-metropolitan using the U.S. Census Bureau standards [Zients, 2013]). Type of rear seat belt use enforcement was categorized as primary law, secondary law, or no law. Weighted percentages, 95% confidence intervals (CI), and chi-square test for categorical variables or Cochran–Armitage trend test for categorical variables that had potential linear trend were calculated for seat belt use in the rear seat. Multivariable regression was performed using the log-binomial model with the Log link function to calculate the prevalence ratios and 95% CIs for always wearing a seat belt when riding in the rear seat, adjusting for demographic variables as well as type of rear seat belt use enforcement. Results with p-value < 0.05 were considered statistically significant. All analyses were completed using Statistical Analysis Software (SAS) version 9.3 (SAS Institute, Inc., Cary, North Carolina).

3. Results

In 2012, 62% of respondents reported always wearing a seat belt when riding in the rear seat (Table 1). Respondents living in the West were significantly more likely to report always wearing a seat belt (75%) compared with those living in the Northeast, Midwest, and South (52%, 58%, 60%, respectively [$p < 0.01$]). In 2012, 16 states and the District of Columbia had primary rear seat belt use enforcement, 10 states had secondary rear seat belt use enforcement, and 24 states had no rear seat belt use enforcement. Respondents living in states with a primary seat belt law covering rear seat occupants were significantly more likely to report always wearing a seat belt (71%) compared with those living in states with secondary (62%) or no law (54%) for rear seat passengers ($p < 0.01$). Respondents in secondary law states were also significantly more likely to report seat belt use compared with those living in states with no law ($p < 0.05$).

When all predictors were included in the multivariable model (Table 2), respondents aged 18–24 years were 9% more likely to report always wearing a seat belt than those aged 25–44 ($p < 0.05$) when controlling for other variables. Respondents aged 45–64 years and 65 years and over were 14% and 16% more likely, respectively, to report always wearing a seat belt in the rear seat than those aged 25–44 years. Respondents living in metropolitan areas were 11% more likely to report always wearing a seat belt in the rear seat, compared with those living in non-metropolitan areas. Respondents living in the West were 25% more likely to report always wearing a seat belt in the rear seat than those living in the Midwest or Northeast and almost 20% more likely to report always wearing a seat belt than those living in the South. Respondents in states with primary and secondary rear seat belt use laws were 23% and 11% more likely, respectively, to report always wearing a seat belt in the rear seat than those living in a state with no rear seat belt use law (Table 2).

4. Discussion

We found that only 62% of adults reported always wearing their seat belts when riding in a rear seat. Although studies have shown restraint use in both front and rear seating positions have increased over time, belt use in rear seats remains lower than in other seating positions (Boyle & Lampkin, 2008; Pickrell, 2014; Trowbridge & Kent, 2009). For example, observed front seat belt use was 86% in 2012 compared with 75% for rear seat occupants aged 8 years and older (Pickrell, 2014). The lower use may be because of perceptions that the rear seat is safer compared with other seating positions. While the rear seat was previously reported safer than the front seat in older model vehicles (Mayrose & Priya, 2008; Smith & Cummings, 2004), several vehicle safety improvements introduced since 1997 have changed the relative protection for rear versus front seating positions, making the front seat safer than the rear seat for belted occupants over 15 years of age (Bilston, Du, & Brown, 2010). However, restrained children aged 9–15 are still at lower risk for serious injury or fatality when sitting in the rear seat (Bilston et al., 2010).

This study found that primary rear seat belt use laws are strongly associated with rear seat belt use, echoing results from studies of overall seat belt use and primary law enforcement (Beck & Shults, 2009; Beck et al., 2007). In 2012, only 40% of the U.S. adult population was covered by a primary rear seat belt use enforcement law (U.S. Census Bureau). Our crude analysis showed that presence of a primary law was significantly associated with

[1] Porter Novelli Public Services is a public relations firm with offices in Washington, DC.

[2] GfK's KnowledgePanel members are randomly recruited using probability-based sampling and include respondents regardless of whether or not they have landline phones or Internet access. If needed, households are provided with a laptop computer and access to the Internet. The panel is continuously replenished and maintains approximately 50,000 panelists.

Table 1
Demographic characteristics by rear belt use, n = 3953, Summer *ConsumerStyles* survey, 2012.

Trait		Always wears a seat belt when riding in rear seat			
Level	Total Unweighted Count	Unweighted Count	Weighted %	95% CI	p-Value
Gender					
Male	1804	1122	60.0	56.9–63.1	0.17
Female	2149	1408	62.9	60.1–65.8	
Age (years)					
18–24	360	232	62.2	55.8–68.7	
25–44	1179	700	55.7	51.9–59.6	<0.01[a]
45–64	1651	1095	64.3	61.0–67.5	
65 +	763	503	67.1	62.7–71.5	
Race/ethnicity					
White	2928	1902	63.1	60.8–65.5	
Black	379	213	56.4	49.5–63.3	0.04
Hispanic	417	277	63.2	57.0–69.5	
Other	229	138	51.8	42.5–61.0	
Education					
High school or less	1250	778	60.4	56.8–64.0	
Some college	1264	819	63.5	60.0–67.0	0.46[a]
College grad or higher	1439	933	61.3	57.7–64.8	
Marital status					
Married	2361	1547	63.1	60.4–65.8	0.12
Not married	1592	983	59.8	56.5–63.0	
Household income					
Under $25 k	617	375	57.9	52.4–63.3	
$25 k to < $50 k	889	555	61.8	57.5–66.1	0.08[a]
$50 k to < $75 k	798	512	58.7	54.0–63.4	
$75 k +	1649	1088	64.6	61.5–67.7	
Census region					
Northeast	729	398	51.8	46.9–56.8	<0.01
Midwest	978	584	57.7	53.4–62.0	
South	1345	838	59.7	56.2–63.2	
West	901	710	75.2	71.1–79.2	
Metropolitan status					
Metropolitan	3362	2179	62.5	60.3–64.8	0.04
Non-metropolitan	591	351	56.5	51.1–61.8	
Rear seat law					
Primary law	1545	1135	71.0	67.8–74.2	<0.01
Secondary law	473	300	62.0	56.0–68.0	
No law	1935	1095	53.7	50.7–56.7	
Total	3953	2530	61.6	59.5–63.6	<0.01

[a] p-Values accompanied with an asterisk indicate Cochran–Armitage trend test. Otherwise, p-values indicate Chi square test.

higher rear seat belt use when compared with states that have secondary law enforcement, but the significance disappeared when we controlled for other variables.

We also saw that rear seat belt use varies by both region and metropolitan status, with occupants in the Western or metropolitan areas reporting rear seat belt use in greater proportions than all other regions or nonmetropolitan areas. The difference by region may partly be due to more Western states having primary laws. Nearly 70% of the population living in the Western states has a primary law in effect for rear seating positions; whereas, the majority of the population (68%) in states of all other regions has a secondary or no law in effect. These findings were consistent with Strine et al.'s findings related to higher general belt use in Western and metropolitan areas (Strine et al., 2010).

Although many predictors of rear seat belt use found in our study are consistent with previous research on general or front seating position seat belt use, some differences were observed. First, although males are widely reported to have lower seat belt use rates than females (Beck et al., 2007; Boyle & Lampkin, 2008), our study found no statistically significant gender difference for seat belt use among rear seat passengers, as did Pickrell (2014). Second, seat belt use is generally shown to increase with increasing age (Beck et al., 2007; Boyle & Lampkin, 2008; Pickrell, 2014). However, we found that young adults (18–24 years) have higher rates of rear seat belt use than those who are 25–44 years of age when adjusting for other variables. Reasons why young adults have higher rates of rear seat belt use needs further exploration.

Our study has limitations. First, this dataset may not be representative of the U.S. population because the sampling approaches used were not random; however, Pollard's research comparing consumer panel data with national population probability sampling data shows support for the use of a consumer panel survey such as *ConsumerStyles* in public health research because response values, trends over time, and demographic breakdowns for the two sampling types are in close agreement (Pollard, 2007). Second, seat belt use was self-reported and may be subject to social desirability bias. However, the use of self-reported data permitted the collection and analysis of important individual-level characteristics that are not otherwise available in observational studies.

Primary enforcement laws for rear seating positions had a strong statistical association with always wearing a seat belt when riding in a rear seat. These laws may also compel increased use of seat belts among demographic groups that generally report lower levels of seat belt use (Beck et al., 2007). Evidence therefore suggests that primary enforcement legislation covering all seating positions is an effective intervention that can be employed to increase seat belt use and decrease risk for motor vehicle-related injuries and fatalities to rear-seat occupants.

Table 2
Prevalence ratios and 95% CI for always wearing a seat belt when riding in the rear seat, Summer *ConsumerStyles* survey, 2012.

Trait	Crude			Adjusted[a]		
Level	Prevalence ratio	95% CI lower limit	95% CI upper limit	Adjusted prevalence ratio	95% CI Lower limit	95% CI upper limit
Gender						
Male	1.00	–	–	1.00	–	–
Female	1.05	1.00	1.10	1.04	1.00	1.09
Age (years)						
18–24	1.12	1.03	1.21	1.09	1.00	1.18
25–44	1.00	–	–	1.00	–	–
45–64	1.15	1.08	1.23	1.14	1.08	1.21
65+	1.20	1.12	1.29	1.16	1.09	1.24
Race/ethnicity						
White	1.00	–	–	1.00	–	–
Black	0.89	0.82	0.97	0.95	0.87	1.03
Hispanic	1.00	0.94	1.07	0.97	0.91	1.03
Other	0.82	0.73	0.92	0.80	0.71	0.89
Income						
Under $25 k	1.00	–	–	1.00	–	–
$25 k to <$50 k	1.07	0.98	1.16	1.01	0.94	1.10
$50 k to <$75 k	1.01	0.93	1.10	0.95	0.89	1.08
$75 k+	1.12	1.04	1.20	0.99	0.92	1.05
Education						
High school or less	1.00	–	–	1.00	–	–
Some college	1.05	0.99	1.11	1.03	0.97	1.08
College graduate or higher	1.00	0.96	1.08	0.99	0.92	1.05
Marital status						
Married	1.00	–	–	1.00	–	–
Not married	0.95	0.90	1.00	0.98	0.93	1.03
Metropolitan status						
Non-metropolitan	1.00	–	–	1.00		
Metropolitan	1.11	1.03	1.19	1.11	1.03	1.19
Region						
Northeast	0.90	0.82	0.98	0.96	0.87	1.06
Midwest	1.00	–	–	1.00	–	–
South	1.03	0.96	1.11	1.05	0.98	1.13
West	1.30	1.22	1.40	1.25	1.16	1.33
Rear seat law						
Primary law	1.32	1.25	1.39	1.23	1.16	1.30
Secondary law	1.15	1.07	1.25	1.11	1.02	1.20
No law	1.00	–	–	1.00	–	–

[a] The adjusted model controlled for all variables presented in the crude modeling.

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