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The association between states' texting regulations and the prevalence of texting while driving among U.S. high school students

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Abstract

Purpose—To determine which distracted driving laws were associated with decreased texting while driving among U.S. teenage drivers.

Methods—Data from the 2013 Youth Risk Behavior Surveillance System survey were merged with state's distracted driving legislation. The prevalence of texting while driving was assessed for different laws using log-binomial regression.

Results—Approximately 39.0% of students reported texting while driving at least once in the 30 days before survey. Compared to states with universal texting bans along with young driver all cellphone bans, the adjusted ratio of texting while driving was 0.94 (95% confidence interval [CI], 0.77–1.16) in states with no bans, 1.33 (95% CI, 1.11–1.58) for young driver bans only, 1.24 (95% CI, 1.00–1.52) in states with bans for young drivers but no young driver all cellphone bans, and 0.89 (95% CI, 0.66–1.19) in states with universal texting bans. The prevalence of texting was 28% less in states with delays of full licensure for texting offenses (prevalence ratio = 0.72; 95% CI, 0.59–0.88).

Conclusions—Universal texting bans along with young driver all cellphone bans may be more effective in reducing texting while driving. Delays of full licensure may dissuade young drivers from texting and driving.

Keywords

Automobile driving; Adolescent; Text messaging; Epidemiology

Introduction

The use of mobile technology in the U.S. has been increasing at an exponential rate [1]. Youth are receptive to these technologies and are apt to incorporate them into their daily life [2]. Technology can pose additional risks to young drivers' safety as it can serve as an additional distraction while driving [2,3]. Previous research has shown that drivers 16 to 19

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years of age experience more distractions within the vehicle resulting in motor vehicle collision compared with other age groups [4]. Research has also shown that motor vehicle fatalities due to distracted driving are steadily increasing [5], and mobile technologies are significant contributors of motor vehicle collision [6].

It is fairly established in the literature that the use of mobile technologies while driving, particularly texting, can affect driving ability and/or collision risk. Experimental studies have shown that when individuals are asked to send text messages in a simulated driving environment, they are more likely to crash [7–9]. Results from a self-reported survey of students aged 9 to 17 years demonstrated a positive association between those who accessed the Web or texted while driving and traffic collisions [10]. Unfortunately, 45% of all U.S. high school students aged 16 years and older self-reported that they sent text messages or e-mails while driving in 2011 [11].

In an effort to protect the public, numerous states have enacted legislation regulating the use of mobile technologies while driving. As of November 2014, 37 states and the District of Columbia (DC) restricted cellphone usage by teenage drivers thereby prohibiting them from talking, texting, e-mailing, or accessing the Web while driving [12]. Additionally, 44 states and DC prohibited text messaging while driving for all ages [12], and 42 states and DC have primary enforcement of these laws [12]. Primary enforcement allows law enforcement officers to stop and cite an individual for the observed offense and/or violation as opposed to secondary enforcement which only allows an officer to cite an individual if the violation was observed in conjunction with a primary offense.

Although numerous cellphone use while driving laws have been passed among states, relatively few studies have examined the effectiveness of such laws to date [13–22]. Specifically, no nationally representative studies have investigated whether state texting laws are associated with decreased texting while driving in a high school–aged population. Therefore, the purpose of this analysis is to examine the relationship between individual state's texting while driving regulations and the prevalence of texting while driving among a nationally representative group of U.S. high school students.

Material and methods

Data sources

The primary data source was the 2013 Youth Risk Behavior Surveillance System (YRBSS) survey. The YRBSS is an anonymous, voluntary, self-report survey conducted biennially by the Centers for Disease Control and Prevention which monitors behaviors that contribute to morbidity and mortality among U.S. youth [23]. It involves a nationally representative sample of 9th to 12th grade students enrolled in public and private schools [23]. The methodology of the YRBSS has been described in detail elsewhere [24]. Although the survey is nationally representative, not all states are sampled [24].

A data set of each states' distracted driving legislation in effect from January 1, 2013 to December 31, 2013 was compiled from various sources including Web searches [25], the Insurance Institute for Highway Safety [12], and the Governor's Highway Safety

Association [26]. Each piece of legislation that was purported to exist was researched and retrieved from the respective states' legislative archives, read, and coded independently by two individuals. The data set contained information on the type of bill passed, enacted and effective dates, if there was primary or secondary enforcement, amount of fines, who the law applied to (i.e., all drivers, drivers <18, bus drivers, and so forth), and whether the delay of full licensure could be imposed on drivers holding learner's permits or intermediate licenses. The data set was verified for accuracy by both coders and was merged with the 2013 YRBSS data set.

Study population

The study population included students who: (1) indicated that they had driven within the past 30 days, (2) were of the age and residence where driver cellphone regulations applied, and (3) were not currently residing in Florida or Michigan. Because these two states had legislation passed during the school year, there was no way of determining if the surveys preceded these law changes. Of the 13,583 participants, 6216 met study inclusion criteria. Because of the methodology of the YRBSS survey (i.e., it is nationally representative but not all states are sampled), this resulted in the inclusion of high school students from 24 states (i.e., AL, AR, AZ, CA, CO, CT, GA, ID, IL, IN, KS, KY, MD, MN, MO, MS, NC, NJ, NY, OH, PA, TX, VA, and WA). Although other states have texting while driving legislation, they were not included in the analysis because they were not sampled.

Variables

The question on the 2013 YRBSS survey asked, "During the past 30 days, on how many days did you text or e-mail while driving a car or other vehicle?" [23] Respondents had the option of selecting one of the following responses: they did not drive a vehicle in the past 30 days, zero days,1–2, 3–5, 6–9,10–19, 20–29, or all 30 days. For this analysis, the dependent variable was dichotomized into zero days or 1 or more days. The analysis was also performed with number of texting days categorized ordinally; because of the similarity between the two analyses, only the results from the analysis where the dependent variable was dichotomous were presented. The independent variables were age, sex, grade-level, race and/or ethnicity, the type of bans in effect, the length of time since the law enacted, amount of fines, and if delays in full licensure existed. The categorization of the demographic variables is listed in Table 1. States' texting while driving regulations in effect at time the 2013 YRBSS was conducted were categorized into five groups. The first category included states with no texting bans (n = 1). The second category included states where only a young driver all cellphone ban existed (n = 1); this meant drivers under a certain age could not use a cellphone for any purpose while driving. The third category encompassed states where texting bans were in effect for certain ages (typically 18 or 21 years of age), but no young driver all cellphone bans existed (n = 2). The fourth category comprised states with a universal texting ban for all ages (n = 3). The fifth category included states with both a universal texting ban and a young driver all cellphone ban (n = 17). A table listing each state included in the analysis and its respective texting laws are listed in the Appendix (Table A. 1). As fines are typically listed as a range in legislation, the average was taken. Because the average of the average fine was approximately $100 (i.e., $113), the variable was further

categorized into $100 or less or more than $100. These figures did not take into account administrative court fees.

Data analysis

To assess for potential differences in the population, the demographic characteristics were compared between those who sent a text message or e-mail while driving within the past 30 days to those who did not. An additional analysis was conducted to determine which individual demographic characteristics were associated with those who text and drive; the outcome measure was the prevalence ratio (PR) which was determined using logbinomial regression for complex surveys, which took into account the survey's sampling methodology (i.e., clustering, strata, and so forth). Separate models were estimated for each demographic characteristic.

To determine which types of laws and provisions were associated with texting while driving, a prevalence ratio was calculated for the type of law in effect, primary versus secondary enforcement, average state fines, and the presence of the provision to delay full licensure for drivers with intermediate or learner's permits using log-binomial regression for complex surveys. Separate models were estimated for each provision. The models for primary and secondary enforcement and average state fines were limited to states with universal texting bans, which was the most common type of ban in effect; because so few students were from states with secondary enforcement, the results were not presented. As full licensure delay is typically a provision of young driver all cellphone bans, this model was limited to states with such bans. Because the passage of a law may result in more immediate enforcement, models were adjusted for the length of time since the law or provision was enacted. Models were also adjusted for age, sex, and race and/or ethnicity. All analyses were ran in STATA, version 12, with $\alpha = 0.05$.

Sensitivity analyses

Because teenage drivers may be regulated by law for a short amount of time, a sensitivity analysis was conducted to assess for potential bias. Eighteen years is typically the age when the applicability of driving laws change for drivers, and they may be regulated by different legislation. For example, at 17 years, an individual may be regulated under a young driver ban, whereas at 18 years, they are regulated under a universal texting ban. Therefore, all analyses previously described were reran excluding drivers 18 years or older.

Results

Demographic characteristics of survey respondents are listed in Table 1. Most of the students who drove were aged 16 (32.2%) or 17 (35.0%) years at time of survey, and those who texted or e-mailed while they drove were more likely to be 17 years of age (49.3%). Most of the survey respondents were white non-Hispanic (61.4%). Most drivers lived in states where universal texting bans with young driver all cellphone bans were present (75.5%). Most of the states represented in this analysis did not have the provision for the delay of full licensure in effect (73.8%). The distributions were similar in the sensitivity analysis (data not shown).

Compared with 17 year olds, 15- and 16-year olds were 71% (PR = 0.29; 95% confidence interval [CI], 0.24–0.36) and 38% (PR = 0.62; 95% CI, 0.55, 0.71), respectively, less likely to have sent a text while driving. Compared to 11th grade drivers, students in 9th and 10th grade were 66% (PR = 0.29; 95% CI, 0.26–0.43) and 48% (PR = 0.52; 95% CI, 0.46–0.60), respectively, less likely to have sent a text while driving in the past 30 days. African-American and Latino drivers were 38% (PR = 0.62; 95% CI, 0.51–0.74) and 35% (PR = 0.65; 95% CI, 0.56–0.76), respectively, less likely to have sent a text while driving in the past 30 days compared to white non-Hispanic students. The findings of the sensitivity analysis were similar (data not shown).

The association between having sent a text while driving and individual state texting regulations is listed in Table 3. The percentage of the population where texting was lowest was in states with universal texting bans in conjunction with young driver all cellphone bans (36.8%). Compared to states with universal texting bans along with young driver all cellphone bans, the adjusted ratio of texting while driving was 0.94 (95% confidence interval [CI], 0.77–1.16) in states with no bans, 1.33 (95% CI, 1.11–1.58) for young driver bans only, 1.24 (95% CI, 1.00–1.52) in states with bans for young drivers but no young driver all cellphone bans, and 0.89 (95% CI, 0.66–1.19) in states with universal texting bans. Texting while driving was considerably lower (i.e., 28% less) in states with the delayed full licensure provision. The findings of the sensitivity analysis were similar (data not shown).

Discussion

The results of this analysis suggest that universal texting bans with or without young driver all cellphone bans may appear to be associated with markedly lower texting while driving rates among high school students who drive. These findings suggest that a clearly understandable anti-texting, whereas driving law-applicable to all drivers may decrease texting among high school students. The findings of this analysis also suggest that racial and/or ethnic differences may exist, which are worthy of further exploration.

Although the effectiveness of texting while driving legislation is largely understudied in the United States, the findings of this analysis are similar to the extant, albeit limited research. In 2006, North Carolina enacted a young driver all cellphone ban [16]. It was determined that this ban did not reduce roadside-observed cellphone use among teen drivers 5 months [16] or even 2 years after the law took effect [19]. In another study conducted in 2009, universal cellphone bans were associated with decreased self-reported talking on a cellphone while driving as opposed to those laws affecting only some drivers [17]. The findings of the current analysis are similar to these other studies in that young driver bans alone, and the laws that applied only to young drivers were not associated with lower texting.

These findings may be partly explainable drawing on previous research regarding the effectiveness of other traffic safety laws. Universal texting bans may reduce the prevalence of texting while driving among high school students simply because these laws are easier for the public to understand and for law enforcement to implement. For example, in a 2009 survey, drivers from states where universal handheld cellphone bans were in effect were more aware of existing legislation compared to drivers from states where bans applied only

to certain drivers [17]. Conversely, respondents from states where no cellphone bans were in effect were more aware that bans were not in existence [17]. Therefore, high school students may be more cognizant of the existing legislation and parents of high school students, who greatly influence their teens' driving behaviors [27, 28], may also have a clearer understanding of the legislation and ensure their children do as well.

Clearly understandable laws applicable to everyone may also aid in their enforcement. Previous research concerning Zero Tolerance laws (i.e., laws which pose automatic punishments if a person is found to have committed an act) has shown that officers are less likely to enforce laws that are difficult to understand and/or enforce. Laws regulating the use of mobile technology while driving are known to pose unique challenges to law enforcement [16]. Law enforcement may not be able to clearly assess the age of a driver if an age restriction is in place. It should be noted that the amount of enforcement in each state is currently unknown.

Previous research investigating the effectiveness of other traffic safety laws also supports the findings from this analysis regarding the effectiveness of delayed full licensure and lack of association for fines. Research has shown that teens are often aware of the changes in driving legislation [16, 29], particularly if punishments result in licensure suspension [29]. Past research involving per se laws (i.e., laws which define a person's action as illegal regardless of extrinsic proof) has demonstrated that licensure suspension is the most effective penalty because it allows the court direct control over an offender's behavior [30]. Mode of enforcement and fines are ineffective punishments for enforcing alcohol per se laws [30]. Zero Tolerance laws effectively reduce heavy episodic drinking partly because of the mandatory licensure suspension [31]. In a survey regarding the effects of driving under the influence, intense enforcement, harsh jail penalties, and licensure suspension were the biggest deterrents for drinking and driving among college students [32]. Survey respondents reported that increasing the amount of fines would not deter their driving behaviors [32]. Hence, previous research suggests that delayed full licensure may effectively dissuade teens with learner's permits or intermediate licenses from engaging in adverse behaviors, whereas the amount of fines does not.

Although the U.S. public generally holds a favorable opinion of injury prevention legislation [33], the fundamental barrier to decreasing distracted driving among U.S. teens may be existing cultural norms surrounding cellphone use [34–36]. Although most young adults understand that texting while driving is "unacceptable" [34], this does not change their behaviors; this is because using a cellphone throughout one's day is socially acceptable [35]. Current research suggests that antidistracted driving campaigns are not as effective as other traffic safety campaigns, such as antidrinking and antidriving, in changing cultural norms [34, 36]. It is also possible that the social acceptability of texting may dissuade law enforcement from apprehending drivers who text while driving. As police work is highly discretionary, research has shown that if an officer is supportive of a law, they are more likely to enforce it [29, 37]. In addition, the perceived lack of effective law enforcement is inversely related with texting frequency among young drivers [35].

More research regarding potential racial disparities in cellphone law effectiveness is also likely warranted. In this analysis, African Americans and Latinos appeared to text and drive considerably less than white non-Hispanics. Previous research has shown that African Americans and Latinos send text messages more frequently than white non-Hispanics and cellphone ownership does not vastly differ [38]. Potential reasons as to why this relationship exists are unknown.

Study limitations

This analysis possesses several limitations. First, the YRBSS data are based on self-reported texting behavior. Because texting while driving may be viewed as socially unacceptable, it is possible that individuals included in this analysis may have under-reported their texting. Second, this analysis was based on responses to one survey question, so it may not have fully measured driver behavior. Third, this analysis did not investigate how strictly these laws were enforced in each state during 2013, which is unknown. Fourth, individuals may only have been affected by a specific law for a limited time period; the sensitivity analysis sought to address this issue. Fifth, owing to the sampling methodology of the YRBSS survey, only a few states fell into each law category, which may have limited the analyses statistical power. Finally, owing to the cross-sectional nature of the study design, causality between the exposure (i.e., type of law) and outcome (i.e., texting behavior) cannot be determined; the findings of this analysis are clearly associative.

Conclusions

The findings of this analysis suggest that texting may be lower in states with both universal texting bans and young driver all cellphone bans. Provisions which delay the full licensure of drivers with intermediate licenses or learner's permits for texting violations may be an effective deterrent of behavior. Future research is also warranted to investigate potential racial and/or ethnic disparities in cellphone law effectiveness.

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Appendix

Table A.1

Texting while driving laws effective in each state sampled in the 2013 YRBSS survey

State	State texting laws in effect before Jan 1, 2013
Alabama	Universal texting ban with young driver all cellphone ban
Arkansas	Universal texting ban with young driver all cellphone ban
Arizona	No state-wide bans
California	Universal texting ban with young driver all cellphone ban
Colorado	Universal texting ban with young driver all cellphone ban
Connecticut	Universal texting ban with young driver all cellphone ban
Georgia	Universal texting ban with young driver all cellphone ban
Idaho	Universal texting ban
Illinois	Universal texting ban with young driver all cellphone ban
Indiana	Universal texting ban with young driver all cellphone ban
Kansas	Universal texting ban with young driver all cellphone ban
Kentucky	Universal texting ban with young driver all cellphone ban
Maryland	Universal texting ban with young driver all cellphone ban
Minnesota	Universal texting ban with young driver all cellphone ban
Missouri	Texting ban for young drivers but no young driver all cellphone ban
Mississippi	Texting ban for young drivers but no young driver all cellphone ban
North Carolina	Universal texting ban with young driver all cellphone ban
New Jersey	Universal texting ban with young driver all cellphone ban
New York	Universal texting ban
Ohio	Universal texting ban with young driver all cellphone ban
Pennsylvania	Universal texting ban
Texas	Young driver all cellphone ban

State	State texting laws in effect before Jan 1, 2013
Virginia	Universal texting ban with young driver all cellphone ban
Washington	Universal texting ban with young driver all cellphone ban

Table 1

Characteristics of the 2013 Youth Risk Behavior Surveillance System participants by texting status*

Characteristic	Did not text in the past 30 d (*n* = 3793) *n* (%)	Texted ≥ one time in the past 30 d (*n* = 2424) *n* (%)	Total (*n* = 6216) *n* (%)
Age (y)			
≤15	1311 (34.7)	248 (10.3)	1558 (25.2)
16	1307 (34.6)	681 (28.3)	1988 (32.2)
17	974 (25.8)	1186 (49.3)	2161 (35.0)
18	183 (4.8)	290 (12.1)	473 (7.7)
Missing			36
Sex			
Male	1946 (51.4)	1249 (51.5)	3195 (51.4)
Female	1841 (48.6)	1174 (48.5)	3015 (48.6)
Missing			6
Grade in school			
9th	997 (26.4)	202 (8.4)	1199 (19.4)
10th	1303 (34.6)	461 (19.2)	1764 (28.6)
11th	958 (25.4)	967 (40.3)	1925 (31.2)
12th	513 (13.6)	768 (32.0)	1281 (20.8)
Missing			47
Race/ethnicity			
White	2124 (57.3)	1609 (67.7)	3733 (61.4)
African American	526 (14.2)	190 (8.0)	716 (11.8)
Latino	432 (11.7)	169 (7.1)	601 (9.9)
Asian	96 (2.6)	54 (2.3)	150 (2.5)
Other	528 (14.2)	356 (15.0)	884 (14.5)
Missing			132
Types of state texting bans			
No texting ban	83 (2.2)	63 (2.6)	145 (2.3)
Young driver all cellphone ban only	155 (4.1)	149 (6.2)	304 (4.9)
Texting ban for young drivers but no young driver all cellphone ban	235 (6.2)	231 (9.6)	466 (7.5)
Universal texting ban	234 (6.1)	223 (9.3)	457 (7.4)
Universal texting ban in conjunction with a young driver all cellphone ban	3062 (81.2)	1738 (72.3)	4800 (77.7)
Length of time since law has been enacted			
No law	83 (2.2)	63 (2.6)	145 (2.3)
<1 y	378 (10.0)	298 (12.4)	676 (11.0)
1–2 y	432 (11.5)	371 (15.4)	803 (13.0)
≥2 y	2877 (76.3)	1672 (69.6)	4549 (73.7)
Average state fine			
≤$100	2550 (69.2)	1620 (69.2)	4170 (69.2)
>$100	1136 (30.8)	721 (30.8)	1857 (30.8)

Characteristic	Did not text in the past 30 d (*n* = 3793) *n* (%)	Texted ≥ one time in the past 30 d (*n* = 2424) *n* (%)	Total (*n* = 6216) *n* (%)
Licensure delay for texting offenses			
Present	1049 (27.8)	429 (17.8)	1478 (23.9)
Absent	2721 (72.2)	1975 (82.2)	4696 (76.1)

* Percentages may not add up to 100% due to rounding.

Table 2

Texting while driving among demographic subgroups of 2013 National Youth Risk Behavior Surveillance System participants

Characteristic	Total, *n*	Percent of population sub-group who texted in the past 30 days	Prevalence ratio* (95% confidence limit)
Age (y)			
≤15	1558	15.9	0.29 (0.24–0.36)
16	1988	34.3	0.62 (0.55–0.71)
17	2161	54.9	1.00 (referent)
18	473	61.3	1.12 (0.98–1.28)
Sex			
Male	3195	39.1	1.00 (referent)
Female	3015	38.9	1.00 (0.90–1.10)
Grade			
9th	1199	16.8	0.34 (0.26–0.43)
10th	1764	26.1	0.52 (0.46–0.60)
11th	1925	50.2	1.00 (referent)
12th	1281	60.0	1.19 (1.05–1.36)
Race/ethnicity			
White	3733	43.1	1.00 (referent)
African American	716	26.5	0.62 (0.51–0.74)
Latino	601	28.1	0.65 (0.56–0.76)
Asian	150	36.0	0.84 (0.69–1.02)
Other	884	40.3	0.93 (0.83–1.05)

*Prevalence ratios were calculated using log-binomial regression for complex surveys.

Table 3

The association between texting behaviors of the 2013 Youth Risk Behavior Surveillance System participants and state legislation

Characteristic	Total, *n*	Percent of population subgroup who texted in the past 30 d	Crude prevalence ratio (95% confidence limit)*	Adjusted prevalence ratio (95% confidence limit)*
Types of provisions				
No texting ban	145	43.4	1.19 (1.04–1.36)	0.94 (0.74–1.21)
Young driver all cellphone ban only	304	49.0	1.35 (1.09–1.68)	1.34 (1.11–1.63)
Texting ban for young drivers but no young driver all cellphone ban	466	49.6	1.37 (1.11–1.69)	1.21 (0.98–1.49)
Universal texting ban only	457	48.8	1.35 (1.15–1.57)	1.06 (0.85–1.32)
Universal texting ban along with young driver all cellphone ban	4800	36.2	1.00 (referent)	1.00 (referent)
Average state fines†				
≤$100	4170	38.8	1.00 (referent)	1.00 (referent)
>$100	1857	38.8	1.00 (0.81–1.22)	0.96 (0.80–1.16)
Licensure delay for texting violations‡				
Absent	4696	42.1	1.00 (referent)	1.00 (referent)
Present	1478	29.0	0.73 (0.61–0.88)	0.71 (0.59–0.86)

*All crude and adjusted prevalence ratios were calculated using log-binomial regression for complex surveys; adjusted models were adjusted for age, sex, race and/or ethnicity and the length of time since the ban has been enacted.

†Model limited to states that had universal texting bans.

‡Model limited to states with young driver all cellphone bans.