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Cellphone Legislation and Self-Reported Behaviors Among Subgroups of Adolescent U.S. Drivers

Toni M. Rudisill, Ph.D.[a], **Gordon Smith, M.D.**[b], **Haitao Chu, M.D., Ph.D.**[c], and **Motao Zhu, M.D., Ph.D.**[d,e,f,*]

[a]Injury Control Research Center, West Virginia University, Morgantown, West Virginia

[b]Department of Epidemiology, School of Public Health, West Virginia University, Morgantown, West Virginia

[c]School of Public Health, University of Minnesota Twin Cities, Minneapolis, Minnesota

[d]The Center for Injury Research and Policy, The Research Institute at Nationwide Children's Hospital, Columbus, Ohio

[e]Department of Pediatrics, College of Medicine, Ohio State University, Columbus, Ohio

[f]Division of Epidemiology, College of Public Health, Ohio State University, Columbus, Ohio

Abstract

Purpose—The relationship between cellphone use while driving legislation and self-reported adolescent driver behavior is poorly understood, especially across demographic subgroups. This study investigated the relationship between statewide cellphone legislation and cellphone use behaviors across adolescent driver subgroups, including age (16/17 vs. 18), sex, race/ethnicity (white non-Hispanic and others), and rurality (urban or rural).

Methods—Data from the 2011–2014 Traffic Safety Culture Index Surveys were combined with state legislation. The outcomes were self-reported texting and handheld cellphone conversations. The exposure was the presence of a texting or handheld cellphone ban applicable to all drivers (i.e., universal) in the drivers' state of residence. A multilevel, modified Poisson regression model was used to estimate the risk of engaging in these behaviors.

Results—Approximately 34% of respondents reported to have driven while conversing, and 37% texted and drove in the 30 days before the survey. Universal handheld calling bans were associated with lower occurrences of cellphone conversations across all groups except rural drivers. Overall, handheld cellphone bans were associated with 55% lower (adjusted risk ratio .45, 95% confidence interval .32–.63) occurrences of cellphone conversations. However, universal texting bans were not associated with fewer texting behaviors in any subgroup.

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*Address correspondence to: Motao Zhu, M.D., M.S., Ph.D., The Center for Injury Research and Policy, The Research Institute at Nationwide Children's Hospital, 700 Children's Drive, Columbus, OH, 43205. motao.zhu@nationwidechildrens.org.

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Supplementary Data

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Conclusions—Universal handheld calling bans may discourage adolescents from engaging in handheld phone conversations, whereas universal texting bans may not fully discourage texting behaviors. More interventional or educational work is necessary, particularly addressing texting while driving.

It is well established in the literature that motor vehicle collisions pose formidable public health challenges to adolescent health (i.e., those ≤18 years of age). Motor vehicle collision rates are highest among teenage drivers relative to other ages, which are attributed to both youth and inexperience [1–3]. In 2015, the Centers for Disease Control and Prevention identified motor vehicle collisions as the leading cause of death among 14–19 year olds [4].

Although the collision rate among adolescent drivers is high, cellphone-related distracted driving could exacerbate this situation. Mobile technology has become an integral component of U.S. culture, particularly among adolescents [5]. Research has shown that these technologies enable complex social interactions [6]. Therefore, adolescents are highly dependent on these technologies and use them habitually [5,7,8]. In a 2011 national survey, the median number of text messages sent by 14–17 year olds was 100 per day, and 26% of all teens surveyed reported making daily cellular phone calls [7]. Thus, it is not surprising that younger drivers reported the highest level of cellphone-related crashes and near crashes compared with older groups [9].

Previous research has shown that behaviors associated with cellphone use and driving (i.e., reaching for a phone and dialing) may increase collision risk [10–17]. As distracted driving has gained national attention, many states have passed legislation that limits cellphone use while driving. As of March 2017, 46 states banned text messaging for all drivers, 14 states banned all drivers from conversing with handheld cellphones, and 37 states banned all cellphone use while driving by young/novice drivers [18].

To date, few studies have investigated the relationship between cellphone use legislation and driver behavior, particularly among adolescents. To the authors' knowledge, seven studies have investigated the relationship between roadside observed cellphone use and legislation among drivers <25 years [19–23]. Studies investigating the relationship between young driver all cellphone bans and teen driver phone use in North Carolina found that the law did not overtly alter behavior [20,21]. However, studies using observational data in New York state and nationally have shown that handheld calling bans applicable to all drivers (i.e., universal) are associated with approximately 50% less handheld cellphone use/conversations among young drivers [19,22–25].

As for the relationship between self-reported driver behavior and legislation, which is the focus of this analysis, four studies have investigated this topic, but only two pertained to young drivers [26–29]. One national survey of drivers ≥18 years of age found that more drivers self-reported not talking on a cellphone or always using a hands-free device in states with handheld calling bans (44% and 22%, respectively) compared with states without such bans (30% and 13%, respectively) [26]. Another study conducted among health-care workers in Georgia reported that 32% texted less after the passage of the state's universal texting ban [27]. Two studies, which utilized similar data, investigated self-reported texting

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while driving and cellphone legislation among a nationally representative sample of high school students [28,29]. One reported that adolescent drivers were 30% less likely to text if they lived in a state where universal texting bans with primary enforcement were in effect; primary enforcement means a driver could be pulled over for that offense [28]. The other study found that the percentage of adolescent drivers who texted while driving was 36% in states with both universal texting and young driver all cellphone bans, 42% in states with only universal texting bans, and 43% in states with no universal texting bans [29]. Rudisill and Zhu also found that the prevalence of texting while driving was similar in males and in females, tended to increase with age, but was typically lower among African-American and Hispanic teenage drivers compared with white non-Hispanics [29].

Although it appears that cellphone legislation may be associated with lower frequencies of self-reported driver behavior, there are extant gaps in the literature. The studies that applied to young drivers were limited to 1 year of data and mainly applied to texting; also, driving exposure time was unknown [28,29]. None of these studies investigated the relationship between cellphone conversations and universal handheld calling bans in adolescent drivers. Considering these previous studies, there is an indication that important subgroup differences may exist by demographics, but these were not fully explored [29]. Based on other traffic safety research, it is known that driver behavior can vary by age, race, sex, and rurality [30–35]. Therefore, the purpose of this analysis was to investigate the relationship between cellphone legislation and self-reported driver behaviors, including texting and handheld phone conversations, by population subgroups of adolescent drivers across multiple data years.

Methods

Data sources

The data for this analysis were obtained from the 2011–2014 Traffic Safety Culture Index surveys. The Traffic Safety Culture Index, which is administered by the AAA Foundation for Traffic Safety, is an annual survey conducted in June or September that assess individuals' self-reported behaviors and beliefs regarding traffic safety. Survey participants are randomly selected from a panel of ~58,000 individuals. This panel is nationally representative of all U.S. households, which are reachable by phone or mail. Survey respondents are ≥16 years of age. In some years, participants <19 years may be recruited through parents/guardians who are panel members; the survey is weighted to account for this and nonresponse. Because respondents may or may not currently drive, the survey may not be representative of all U.S. drivers. Approximately 3,000 individuals participate annually [36].

Additionally, a dataset of state legislation pertaining to cellphone use while driving was compiled by the study authors. The authors conducted numerous Internet searches of government and traffic safety organizations' Web sites to discern which states had cellphone legislation in effect between January 1, 2011, and December 31, 2014. The states' legislative archives were then consulted and each individual law was retrieved and independently coded by two individuals for accuracy. The resulting dataset contained variables including type of law, who it applied to, and effective dates. These laws are included in Appendix Table S1.

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Study population

The study population was limited to individuals 16–18 years of age at the time of the survey, which indicated they were a current driver.

Variables

The primary exposures were the presence/absence of universal handheld calling bans or texting bans in the respondents' state at the time of the survey; these variables were dichotomized for each exposure. Other covariates of interest were drivers' ages, sex, race/ethnicity, and rurality of primary residence, driving time per week (in minutes), and the presence of a young driver all cellphone ban in the respondents' state. The categorization of these variables is presented in Table 1. Rurality of primary residence was based on whether the respondent lived in a metropolitan statistical area, which is a geographic area with an urban core of ≥50,000 residents determined by the U.S. Census Bureau. Those living in metropolitan statistical areas were classified as urban and all others were classified as rural. The mean driving time for the week was calculated for each subgroup to compare driving exposures. Because young driver all cellphone bans may confound the relationship between the bans of interest and driving behaviors, models were adjusted for the presence/absence of this law in the respondents' state at the time of the survey. Racial and ethnic categories were not broken down further because of small sample sizes for some groups, such as black non-Hispanics and Asians.

The two outcomes were self-reported texting and handheld cellphone calls while driving. There were two questions pertaining to texting while driving. The first question asked, "In the past 30 days, how often have you read a text message or email while you were driving?" The second question asked, "In the past 30 days, how often have you typed or sent a text message or email while you were driving?" The response options to both questions were *regularly*, *fairly often*, *rarely*, *just once*, and *never*. The response options for both questions were dichotomized into a response of "never" versus all other categories. The responses to both questions were combined to form an overall texting indicator. If a respondent answered "never" to both questions, the overall text messaging indicator was zero. If a respondent answered *regularly*, *fairly often*, *rarely*, or *just once* to either question, the overall text messaging indicator was one. Two questions were asked regarding handheld cellphone conversations while driving. The first question asked, "In the past 30 days, how often have you talked on a cellphone while you were driving (count any type of phone including Bluetooth, speaker phone, etc.)?" The response options to this question were identical to those for texting. For respondents who answered the first question, a follow-up question asked, "When you talk on your cellphone while driving, do you usually hold the phone in your hand or do you use a hands-free device?" The response options to this question were *I always hold the phone in my hand*, *I usually hold the phone in my hand*, *I hold the phone in my hand about half the time and use a hands-free device about half the time*, *I usually use a hands-free device*, and *I always use a hands-free device*. The responses to both questions were combined to form a handheld indicator. If respondents answered "never" to the first question or indicated that they usually or always use a hands-free device in the second question, they were deemed to not use a cellphone while driving. Those indicating that they always or usually hold the phone or use hands-free devices 50% of the time were considered

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to engage in handheld cellphone use. Because the questions on the 2011 survey regarding handheld phone use were different from those in other years, those responses were not included in the analysis.

Statistical analysis

This analysis sought to determine if universal texting bans were associated with lower texting while driving and if universal handheld calling bans were associated with lower occurrences of handheld phone conversations. In addition to frequencies and percentages, risk ratios were estimated using a multilevel model (i.e., modified Poisson regression with robust standard errors accounting for correlation within states) [37]. An autoregressive correlation matrix was used for the random effects of state. Four separate models were run for each subgroup and for both outcomes. The first three models were stratified analyses. Model 1 contained only the legislation of interest. Model 2 had indicators for survey year, universal texting ban, universal handheld calling bans, and young driver all cellphone bans. Model 3 contained variables from Model 2 and additionally controlled for age, sex, and race/ethnicity. A fourth model, which contained the variables of Model 2, along with the driver characteristic and an interaction term between the ban and driver characteristics, was run to formally test for subgroup differences. All models accounted for survey weighting. All analyses were conducted using SAS/STAT software version 9.4 (Cary, NC) with a two-sided significance level of .05.

Sensitivity analysis

In most states, 18 is typically the age when some cellphone laws, such as young driver all cellphone bans, become inapplicable to the driver. Therefore, all analyses previously described (except those pertaining to age) were rerun without 18 year olds to check the robustness of the results.

Results

The majority of respondents were 16–17 years of age (71%) and of white non-Hispanic race/ethnicity (65%) (Table 1). Respondents typically resided in urbanized areas (85%) and lived in states where universal texting bans (76%) and young driver all cellphone bans (74%) were in effect. The mean driving time was slightly higher in 18 year olds, males, and rural drivers.

Overall, 37% of respondents reported to have read or typed a text message or e-mail in the 30 days before the survey (Table 2). Older teens (47%), males (39%), and rural drivers (41%) tended to text more than others. In all groups, the proportion of individuals engaging in texting was lower if a universal texting ban was present versus absent (Table 2). However, in fully adjusted models, the presence of universal texting bans was not statistically significantly associated with lower texting behaviors across any demographic group (Table 3). The results of the sensitivity analysis were similar to those of the main analysis (data not shown). Although not the focus of this analysis, the presence of young driver all cellphone bans was associated with more texting overall and among 16–17 year olds, females, and white non-Hispanic drivers (Table 3).

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Nearly 34% of respondents self-reported engaging in handheld phone conversations while driving in the 30 days before the survey (Table 4). Handheld phone conversations occurred more frequently among 18 year olds (44%), white non-Hispanics (37%), and rural drivers (46%). Universal handheld calling bans were associated with lower frequencies of cellphone conversations in all groups (Table 4). Overall, when universal handheld calling bans were in effect, they were associated with 55% lower occurrences of handheld phone conversations compared with periods without bans (adjusted risk ratio = .45, 95% confidence interval .32–.63; Table 5, line 1). This relationship was seen across most groups, except for rural respondents (Table 5). The results of the sensitivity analysis were similar to those of the main analysis (data not shown).

Discussion

Commonalities and distinctions were shared between the findings of this analysis and those conducted previously. A prior study conducted among adults revealed that the frequency of self-reported handheld phone conversations was lower among drivers in states with universal handheld calling bans compared with that in states without bans [26]. Observational studies of drivers have also shown that universal handheld calling bans were associated with ~50% lower occurrences of handheld conversations [19,22–25], which corroborates with the findings of the present study, which also found the occurrence of self-reported conversations to be 55% lower overall when universal handheld calling bans were present. Although most subgroups shared similar associations, the presence of a universal handheld calling ban was not associated with lower occurrences of handheld conversations among rural drivers. However, this finding may be due to the fact that this group had the smallest sample size; statistical significance may not have been achieved because of insufficient statistical power.

In regard to the findings concerning texting, previous studies reported that the prevalence of self-reported texting while driving at least once in the 30 days before the survey was ~39% among 16-to 18-year-old drivers [29], which is similar to the present analysis (i.e., ~ 37%). Previous studies using the 2013 National Youth Risk Behavior Surveillance Survey also found that the proportion of self-reported texting while driving was similar among sexes, increased with driver age, and was more frequent among white non-Hispanic adolescents [28,29], which was akin to the present analysis. However, a fundamental difference between studies was that universal texting bans were associated with 30% less texting overall in one study [28], but not in the present analysis in fully adjusted models. There are potential reasons for the differences between studies. Besides using different data sources, multiple years of data were incorporated into the present analysis; importantly, from 2011 to 2014, 30 different pieces of cellphone legislation became effective among states. Also, the questions and response options regarding driver behavior were completely different between studies. Although nationally representative, not all states were sampled in the previous analyses, whereas all states were represented in the present analysis. Also, one of the prior studies focused on states with primary enforcement [28]. The present analysis did not focus on enforcement type as most states had primary enforced laws.

Nonetheless, the findings of this analysis pose numerous implications. First, there appears to be differences between laws and their relationship with the respective self-reported

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behaviors. Mainly, universal handheld calling bans were associated with lower occurrences of cellphone conversations, whereas universal texting bans did not appear to be greatly associated with lower texting, even after controlling for young driver all cellphone bans, which limits both behaviors. Although young driver all cellphone bans were not the focus of this analysis, they were generally not associated with fewer handheld phone conversations, but were associated with increased texting in some groups. Another study similarly showed that young driver cellphone bans were associated with increased texting [29], and other studies have shown that young driver all cellphone bans may not greatly alter adolescent driver behavior [20,21]. Although the causes for the differences in legislation and behavior are unknown, these relationships may be attributed to actual or perceived enforcement of these laws. For example, it may be easier for police to enforce universal handheld calling bans. Officers may be able to identify drivers holding a phone to their ear from a distance easier than those manipulating a device in their lap. Moreover, drivers may also feel that they are more identifiable to police if they are talking on a cellphone versus sending or reading a text/e-mail. Previous research has shown that perceptions of enforcement often influence driver behavior [38]. Enforcement may also explain the finding concerning young driver all cellphone bans; this law may be difficult to enforce because officers may not be able to accurately assess a driver's age from afar. However, to the authors' knowledge, no studies have actually consulted law enforcements' ability to enforce laws on cellphone use while driving. It is also possible that states with universal handheld calling bans are fundamentally different from the states that do not have this law. States with handheld calling bans may be more actively enforcing these laws or educating drivers more frequently about the hazards of cellphone use while driving, but this is unknown.

Despite the legislation in effect, the findings of this analysis showed that numerous adolescent drivers, regardless of demographics, engaged in texting or handheld phone conversations while driving in the 30 days before the survey. Although enacting and enforcing legislation is one method to curtail these behaviors, it may not be the only solution because cellphone use while driving is a complex social phenomenon, especially for adolescents. Evaluated and effective behavior change programs, education, and/or interventions pertaining to cellphone use while driving are greatly lacking in the extant literature for all drivers, including adolescents [39,40]. Therefore, "best practices" for preventing cellphone-related driving injuries are currently unknown, but greatly needed.

Strengths and limitations

Although the present study utilized data from a national survey that sampled all states across multiple years when cellphone legislation was actively being passed by states and drivers' exposure time was known, there are several limitations. The primary limitation is the self-reported nature of the data. Traffic safety research often indicates discrepancies between self-reported and actual driving activities [34]. Just because drivers indicated that they texted or called infrequently does not mean they actually did. Because most people disagree with cellphone use while driving [34], respondents may have provided more socially acceptable answers. Some may have inaccurately recalled their behavior. Because of the cross-sectional study design, this analysis could not prove that legislation actually affected/changed drivers' behavior; the findings are associative. Also, participants were not sampled in a manner to

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make subgroups representative of their respective populations. Additionally, the findings could also be caused by baseline differences between states; however, all analyses controlled for state correlation. Also, the present study did not adjust for enforcement activities as this was unknown. Rurality was based on whether the driver lived in a metropolitan statistical area. This finding may not reflect the drivers' typical driving environment as they may live in a rural environment but drive more in urbanized areas. Also, young driver cellphone bans are either age- or license-based, meaning they apply to drivers of certain ages or license types. Because licensure status was unclear, this was not investigated. Also, some states, such as Missouri and Mississippi, had a texting legislation that was not universal and applied to drivers of certain ages (i.e., <21) or licensing status (intermediate or learner's permit holders); because few drivers were affected by this law, it was not adjusted for in the analysis. Lastly, this analysis focused on state legislation. Some cities/jurisdictions within states also have legislation. A complete list of these jurisdictions was unknown.

Drivers in states with universal handheld cellphone bans reported less occurrences of handheld phone conversations compared with drivers in states without these bans. However, whereas texting behaviors were slightly less among drivers in states with universal texting bans compared with states without these laws, texting behaviors were not statistically different in states with or without these laws in fully adjusted models. As adolescents are heavily reliant on mobile technologies, public health education or intervention is necessary to mitigate these behaviors, especially texting while driving, among this population of drivers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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IMPLICATIONS AND CONTRIBUTION

Studies of the relationship between legislation and self-reported cellphone use while driving, such as talking and texting, are limited for adolescents. This study investigated these relationships by sex, age, race/ethnicity, and rurality in a national sample of adolescent drivers across multiple data years.

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Table 1

Demographic characteristics of drivers 16–18 years of age included in the 2011–2014 Traffic Safety Culture Index Surveys, United States (N = 2,569)

Characteristics	N[a]	%[b]	Driving time Mean (SE)[c]
Age			
16–17	1,824	71	224.2 (7.3)
18	745	29	301.7 (18.2)
Sex			
Male	1,280	50	262.6 (11.9)
Female	1,289	50	232.0 (9.2)
Race/ethnicity			
White, non-Hispanic	1,674	65	247.5 (8.7)
Other	895	35	247.2 (13.9)
Location			
Urban	2,177	85	243.9 (8.4)
Rural	392	15	262.8 (17.4)
Universal texting ban			
Present	1,944	76	247.8 (8.4)
Absent	625	24	246.2 (16.8)
Universal handheld calling ban			
Present	697	27	219.9 (11.6)
Absent	1,872	73	257.9 (9.5)
Young driver all cellphone ban			
Present	1,894	74	251.4 (8.7)
Absent	675	26	236.5 (15.5)

SE = standard error.

[a] Actual, nonweighted, total counts.

[b] May not add to 100% because of rounding.

[c] Mean driving time per week in minutes with standard error in parentheses was calculated for each subgroup; the average driving time overall was 247.3 (7.6) minutes.

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Table 2

Proportion of adolescent drivers who read or typed a text message or e-mail while driving at least once in the 30 days before survey by the presence of state universal texting ban

Characteristic	Presence of universal texting ban	Total[a] N	Engaged in behavior[b]	
			N	Percent
Entire sample	Present	1,738	609	35
	Absent	554	234	42
	Overall	2,292	843	37
Age (y)				
16–17	Present	1,255	390	31
	Absent	381	147	39
	Overall	1,636	537	33
18	Present	483	219	45
	Absent	173	87	50
	Overall	656	306	47
Sex				
Male	Present	838	303	36
	Absent	292	134	46
	Overall	1,130	437	39
Female	Present	900	306	34
	Absent	262	100	38
	Overall	1,162	406	35
Race/ethnicity				
White, non-Hispanic	Present	1,244	447	36
	Absent	303	133	44
	Overall	1,547	580	38
Other	Present	494	162	33
	Absent	251	101	40
	Overall	745	263	35
Location				
Urban	Present	1,464	498	34
	Absent	476	200	42
	Overall	1,940	698	36
Rural	Present	274	111	41
	Absent	78	34	44
	Overall	352	145	41

[a] This number is the total number (N) of respondents who answered the study questions by the presence or the absence of a universal texting ban in their state at the time of survey. The term “overall” implies the total number of respondents in the subgroup regardless of ban status.

[b] This is the number and percentage of respondents who reported to engage texting behaviors out of the total number of respondents to the questions by ban status.

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Table 3

Adolescent drivers who read or typed a text message or e-mail while driving at least once in the 30 days before the survey and the association with cellphone use while driving legislation

Characteristic	Law	Model 1[a]		Model 2[a]		Model 3[a]		*p* Value[a]
		RR	95% CI	RR	95% CI	RR	95% CI	
Overall	UTB	.91	.77–1.06	.92	.80–1.07	.92	.80–1.06	
	UHB			.88	.70–1.09	.88	.71–1.10	
	YDB			1.25	1.05–1.49	1.26	1.07–1.48	
Age								.8854
16–17	UTB	.90	.72–1.12	.89	.75–1.07	.88	.73–1.07	
	UHB			.86	.66–1.13	.87	.66–1.14	
	YDB			1.34	1.06–1.69	1.37	1.09–1.73	
18	UTB	.90	.68–1.18	1.01	.77–1.33	.97	.74–1.27	
	UHB			.90	.66–1.24	.91	.67–1.26	
	YDB			1.09	.87–1.35	1.10	.88–1.37	
Sex								.6887
Male	UTB	.89	.73–1.09	.95	.76–1.17	.96	.76–1.21	
	UHB			.76	.58–.99	.76	.59–1.00	
	YDB			1.21	.94–1.56	1.20	.93–1.55	
Female	UTB	.95	.74–1.20	.92	.73–1.16	.89	.71–1.10	
	UHB			1.01	.74–1.39	.99	.70–1.40	
	YDB			1.32	1.11–1.57	1.36	1.15–1.62	
Race/ethnicity								.3421
White, non-Hispanic	UTB	.85	.68–1.06	.85	.69–1.06	.86	.70–1.05	
	UHB			.85	.62–1.16	.84	.63–1.14	
	YDB			1.23	1.03–1.46	1.23	1.06–1.44	
Other	UTB	.96	.76–1.22	.97	.76–1.24	1.01	.79–1.30	
	UHB			.95	.71–1.25	.93	.70–1.23	
	YDB			1.35	.91–1.99	1.33	.90–1.97	
Location								.8967
Urban	UTB	.90	.77–1.04	.95	.80–1.12	.95	.81–1.11	

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Characteristic	Law	Model 1[a]		Model 2[a]		Model 3[a]		*p* Value[a]
		RR	95% CI	RR	95% CI	RR	95% CI	
Rural	UHB	.94	.61–1.45	.88	.68–1.14	.88	.68–1.13	
	YDB			1.18	.95–1.47	1.19	.97–1.46	
	UTB			.82	.55–1.22	.81	.55–1.19	
	UHB			1.10	.72–1.70	1.12	.74–1.68	
	YDB			1.61	.96–2.70	1.62	.98–2.66	

CI = confidence interval; RR = estimated risk ratio; UHB = universal handheld calling ban; UTB = universal texting ban; YDB = young driver all cellphone ban.

[a]The outcome was whether or not the driver self-reported reading or typing a text message or e-mail 30 days before the survey. The exposure was the cellphone use while driving legislation. The RR presented compares drivers exposed to the ban with those who were not exposed; although the models contained several variables, only the RRs pertaining to the cellphone legislation were shown for ease of presentation. Model 1 contained variables for the presence of a texting ban (binary) only. Model 2 contained variables for the presence of a texting ban (binary), the presence of universal handheld calling ban (binary), the presence of YDB (binary), and the year of survey. Model 3 contained all terms from Model 2 and additionally controlled for sex, age, and race/ethnicity. A fourth model containing variables from Model 2 with the driver characteristic and an interaction term between the legislation and the driver characteristic were run to formally test for subgroup differences. The *p* value presented applies to the interaction term between the presence of a universal texting ban and the driver characteristic. The null hypothesis was the driver subgroups were equal.

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Table 4

Proportion of adolescent drivers who talked on a handheld device while driving at least once in the 30 days before the survey by the presence of a state universal handheld calling ban

Characteristic	Presence of a universal handheld calling ban	Total[a] N	Engaged in behavior[b]	
			N	Percent
Entire sample	Present	449	73	16.3
	Absent	1,277	505	39.5
	Overall	1,726	578	33.5
Age(y)				
16–17	Present	323	45	13.9
	Absent	943	330	35.0
	Overall	1,266	375	29.6
18	Present	126	28	22.2
	Absent	334	175	52.4
	Overall	460	203	44.1
Sex				
Male	Present	218	34	15.6
	Absent	640	265	41.4
	Overall	858	299	34.8
Female	Present	231	39	16.9
	Absent	637	240	37.7
	Overall	868	279	32.1
Race/ethnicity				
White, non-Hispanic	Present	265	37	14.0
	Absent	900	388	43.1
	Overall	1,165	425	36.5
Other	Present	184	36	19.6
	Absent	377	117	31.0
	Overall	561	153	27.3
Location				
Urban	Present	419	65	15.5
	Absent	1,044	392	37.5
	Overall	1,463	457	31.2
Rural	Present	30	8	26.7
	Absent	233	113	48.5
	Overall	263	121	46.0

[a]This number is the total number (N) of respondents who answered the study questions by the presence or the absence of a universal handheld calling ban in their state at time of survey. The term “overall” implies the total number of respondents in the subgroup regardless of ban status.

[b]This is the number and percentage of respondents who reported to engage in handheld conversations out of the total number of respondents to the questions by ban status.

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Table 5

Adolescent drivers who talked on a handheld device while driving at least once in the 30 days before the survey and the association with cellphone use while driving legislation

Characteristic	Law	Model 1[a]		Model 2[a]		Model 3[a]		*p* Value[a]
		RR	95% CI	RR	95% CI	RR	95% CI	
Overall	UHB	.46	.32–.65	.43	.30–.61	.45	.32–.63	
	UTB			1.11	.84–1.48	1.17	.86–1.57	
	YDB			.91	.72–1.15	.89	.72–1.10	
Age								.7606
16–17	UHB	.45	.32–.63	.43	.31–.61	.44	.31–.64	
	UTB			1.12	.84–1.48	1.08	.81–1.44	
	YDB			.91	.72–1.14	.94	.76–1.17	
18	UHB	.46	.26–.82	.45	.26–.77	.47	.28–.78	
	UTB			1.40	.91–2.16	1.27	.86–1.86	
	YDB			.81	.61–1.08	.83	.62–1.10	
Sex								.2301
Male	UHB	.37	.24–.57	.36	.23–.58	.36	.23–.57	
	UTB			1.13	.80–1.59	1.14	.80–1.61	
	YDB			.93	.71–1.22	.93	.72–1.21	
Female	UHB	.55	.34–.89	.51	.33–.79	.51	.32–.81	
	UTB			1.37	.86–2.19	1.22	.83–1.80	
	YDB			.79	.59–1.05	.86	.66–1.14	
Race/ethnicity								.3779
White, non-Hispanic	UHB	.39	.19–.81	.39	.19–.80	.38	.19–.74	
	UTB			1.06	.82–1.38	1.05	.82–1.34	
	YDB			.94	.78–1.13	.94	.78–1.13	
Other	UHB	.60	.41–.88	.57	.37–.89	.58	.38–.90	
	UTB			1.26	.79–2.02	1.33	.84–2.11	
	YDB			.80	.53–1.21	.83	.57–1.21	
Location								.3467
Urban	UHB	.47	.32–.67	.45	.32–.63	.45	.32–.65	

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Characteristic	Law	Model 1[a]		Model 2[a]		Model 3[a]		*p* Value[a]
		RR	95% CI	RR	95% CI	RR	95% CI	
	UTB			1.21	.88–1.65	1.18	.90–1.56	
	YDB			.82	.64–1.05	.84	.67–1.06	
Rural	UHB	.64	.34–1.20	.72	.38–1.36	.73	.38–1.38	
	UTB			1.00	.68–1.49	.91	.62–1.34	
	YDB			1.07	.72–1.59	1.11	.77–1.60	

CI = confidence interval; RR = estimated risk ratio; UHB = universal handheld calling ban; UTB = universal texting ban; YDB = young driver all cellphone ban.

[a]The outcome was whether or not the driver self-reported engaging in handheld cellphone conversations in the 30 days before the survey. The exposure was the cellphone use while driving legislation. The RR presented compares drivers exposed with the ban to those who were not exposed; although the models contained several variables, only the RRs pertaining to the main types of cellphone legislation were shown for ease of presentation. Model 1 contained variables for the presence of a handheld calling ban (binary) only. Model 2 contained variables for the presence of a handheld calling ban (binary), the presence of universal texting ban (binary), the presence of YDB (binary), and the year of survey. Model 3 contained all terms from Model 2 and additionally controlled for sex, age, and race/ethnicity. A fourth model containing variables from Model 2 with the driver characteristic and an interaction term between the legislation and the driver characteristic were run to formally test for subgroup differences. The *p* value presented applies to the interaction term between the presence of a universal handheld calling ban and the driver characteristic. The null hypothesis was the driver subgroups were equal.