

Texting Bans and Roadway Safety



Alva O. Ferdinand, DrPH, JD
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Co-authors

- Nir Menachemi, PhD, MPH
- Justin Blackburn, PhD
- Michael Morrissey, PhD
- Leonard J. Nelson III, JD, LLM
- Bisakha (Pia) Sen, PhD

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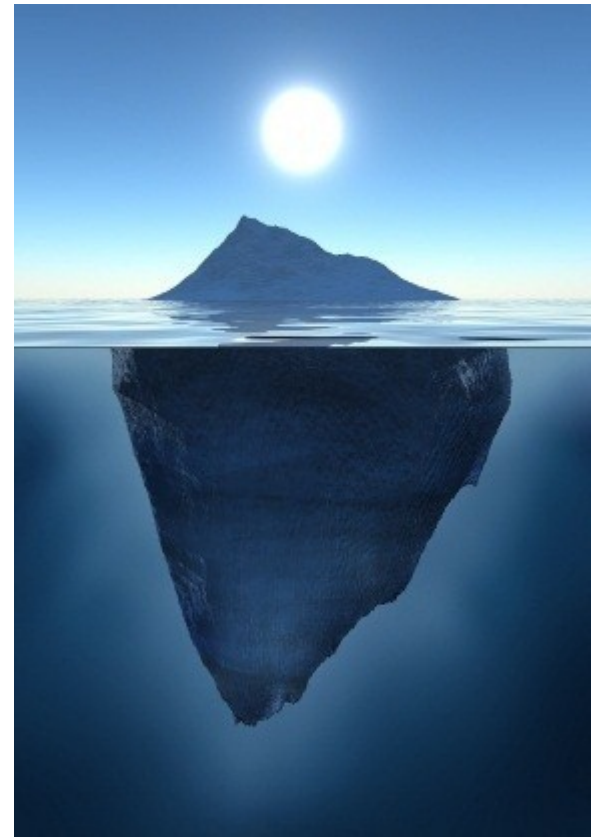
What is Distracted Driving?

- Engaging in any activity that could divert one's attention away from the primary task of driving



Potential Distracted Driving Outcomes

- Motor Vehicle Crashes
 - Death
 - Hospitalization
 - Emergency room visit
 - First aid at the scene
 - Property damage
 - Sustained injury



How Big is the Problem?

- According to the National Highway Traffic Safety Administration (NHSTA) - 2009
 - 80% of all crashes involve some type of distraction
- In 2011
 - 3,331 people were killed in crashes involving a distracted driver.
 - 387,000 people were injured in crashes involving a distracted driver.

http://www.cdc.gov/motorvehiclesafety/distracted_driving/

Examples of Secondary Tasks

- Talking to passengers
- Grooming
- Using a navigation system
- Using a cell phone to talk or text
- Eating
- Drinking
- Smoking
- Listening to music
- Reading (including maps)

Who Engages in Distracted Driving?

- Everyone
 - Teenagers (Heck & Carlos, 2008; Stutts, Reinfurt, Staplin & Rodgman 2001; Hosking, Young & Reagan, 2009)
 - Teenagers display greater performance decrements than more experienced drivers (Kass, Cole & Stanny, 2007; Hosking, Young & Reagan, 2009)
 - Middle aged individuals (Reimer, 2011)
 - Elderly less likely to engage in distracted driving
 - But when do, they exhibit significant driving performance decrements (Pohlmann & Traenkle, 1994; Reed & Green, 1999; Merat, Anttila, & Luoma, 2005)

Recent focus on Cell Phones

- CDC study (2011) data on distracted driving
 - 69% of U.S. drivers aged 18-64 reported talking on the phone in the past 30 days
 - 31% of U.S. drivers aged 18-64 reported that they had read or sent text messages in the past 30 days

CDC (2011), Distracted Driving in the U.S. and Europe
<http://www.cdc.gov/features/dsdistracteddriving/>

States' Responses to Texting While Driving

- With respect to texting while driving, states have:
 - Banned young drivers
 - Banned all drivers
 - Done nothing
- Among the states that have passed bans:
 - Primary enforcement
 - Secondary enforcement



Overview of Presentation

- 3 studies on distracted driving
 - Study 1: systematic review of empirical studies examining the relationship between driving performance and secondary tasks.
 - Study 2: quasi-experiment examining the effect of texting prohibitions on fatalities caused by motor vehicle crashes.
 - Study 3: quasi-experiment examining the effect of texting prohibitions on motor vehicle crash-related hospitalizations.

Study 1

“Associations between Driving Performance and Engaging in Secondary Tasks: A Systematic Review”

- To critically appraise the literature on distracted driving studies
 - To determine whether findings from studies utilizing more rigorous study designs differed from cross sectional studies
- To determine whether studies on cell phone use were more likely to find detrimental relationships relative to other secondary tasks
- To identify gaps in the distracted driving literature

Keyword Search

Articles published – all years
in
CINAHL Plus
EconLit
Medline
PsycINFO
Social Sciences Full-Text



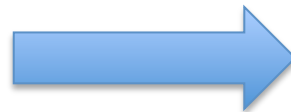
3,438 articles found based
on keyword search



809 duplicates removed



2,629 titles reviewed for
relevance



206 articles included
representing 350 analyses



Rejected if:

- Not empirical
- Examination of substance use and driving performance



537 titles selected for
abstract review

Descriptive Findings of Studies Reviewed (N=350)

Variables	Number (%)
Journal Type	
Injury/Safety/Accident	150 (42.9)
Policy/Technology	8 (2.29)
Public Health/Clinical	50 (14.3)
Transportation	47 (13.4)
Human Factors/Psychology	95 (27.1)
Study Design	
Experimental	9 (2.6)
Observational	341 (97.4)
Study Setting	
Simulated	184 (52.6)
Naturalistic	166 (47.4)
Secondary Task	
Cell phone use	165 (47.1)
Passenger	50 (14.3)
Music	31 (8.9)
In-vehicle information systems	45 (12.9)
Other	59 (16.9)
Study reported a statistically significant relationship between secondary task and driving performance outcome	
Yes	
Detrimental	280 (80.0)
Protective	36 (10.3)
No	34 (9.7)

Identification of Gaps in the Literature (Examples)

	Attention	Reaction time	Following distance	Injuries	Fatalities	Lane deviation
Mobile phone	26	19	4	2	4	18
Cigarette smoking	0	0	0	0	0	0
Passengers	3	2	3	1	6	0
Eating	0	0	0	1	0	0
Music/media	2	6	1	0	0	6
In-vehicle information systems	7	9	2	0	1	5

Note: Numbers represent the number of analyses (among 350) that examined the given secondary task and driving outcome

Predictors of “Detrimental” Relationships in Studies Examining Driving Performance and Secondary Tasks

Article Finds a Statistically Significant Detrimental Relationship		
	Odds Ratio (95% C.I.)	Marginal Effect
Journal type		
Injury/Safety/Accident	1.00	
Policy/Technology	0.09 (0.02 – 0.50)***	-50.2%
Public Health/Clinical	1.03 (0.24 – 4.33)	+0.3%
Transportation	0.41 (0.12 – 1.36)	-14.3%
Human Factors/Psychology	0.57 (0.22 – 1.49)	-8.0%
Study utilized an experimental design	0.16 (0.04 – 0.69)**	-36.9%
Secondary Tasks		
Passengers	1.00	
Cell phone	3.38 (1.36 – 8.44)***	+15.6%
Music/media	1.20 (0.39 – 3.72)	+2.2%
In-vehicle information systems	0.65 (0.22 – 1.90)	-6.1%
Study focused on teenagers	2.66 (0.37 – 19.2)	+9.5%
Driving performance outcomes		
General performance decrements	1.00	
Attention-related decrements	2.35 (0.89 – 6.16)*	+11.1%
Crashes/near misses	1.95 (0.51 – 7.45)	+7.8%
Fatalities	1.95 (0.31 – 12.24)	+7.0%

Study 1

Conclusions

- Literature is replete with simple observational studies
- Studies examining cell phone use were associated with detrimental driving outcomes in the highest frequencies
- More rigorous studies are less likely to find a detrimental association with distracted driving
 - But all such studies DID NOT represent real-world situations
- Needed: rigorous AND generalizable studies

Overview of Presentation

- 3 studies on distracted driving
 - Study 1: systematic review of empirical studies examining the relationship between driving performance and secondary tasks.
 - Study 2: quasi-experiment examining the effect of texting prohibitions on fatalities caused by motor vehicle crashes.
 - Study 3: quasi-experiment examining the effect of texting prohibitions on motor vehicle crash-related hospitalizations.

Study 2

“The Impact of Texting Laws on Motor Vehicular Fatalities in the U.S.”

- To examine, given differentially stringent bans, the effectiveness of texting laws on traffic fatalities

Methods

- Longitudinal panel analysis: 2000 – 2010
- Difference-in-difference approach
 - Treatment group: states with laws
 - Control group: states without laws
- 48 states, 12 months, 11 years = 6,336 state-month-years
- Conditional negative binomial regressions

Basic Model Specification

$$Y_{imt} = f(\text{Text}_{imt} \ L_{imt} \ Z_{imt} \ S_i \ M_m \ T_t)$$

where:

- Y_{imt} is the vehicle fatality count for state i at month m and year t
- Text_{imt} is state texting law for state i at month m and year t
- L_{imt} is a vector of legal factors affecting crash fatality risk exposure
 - hand-held bans, seatbelt laws, blood alcohol concentration (BAC) laws, administrative license revocation for DUI/DWI, Graduated Driver Licensing (GDL) programs, and speed limits)
- Z_{imt} is a vector of other time varying covariates
 - gasoline prices, state unemployment rate, per capita income, and state population estimates)
- S_i is a vector of state dummies
- M_m is a vector of month dummies
- T_t is a vector of year dummies

Data Sources

Variable	Data Source(s)
Fatality counts	Fatality Analysis Reporting System (FARS)
Texting laws	The Public Health Law & Research Program, LexisNexis
Hand-held bans	Insurance Institute for Highway Safety (IIHS)
Seatbelt laws	IIHS
Blood alcohol concentration	IIHS
Administrative license revocation – DUI	IIHS
Graduated Driver Licensing programs	IIHS
Speed limits	IIHS
Gasoline prices	U.S. Department of Energy, Energy Information Administration
State unemployment rate	U.S. Census Bureau
Population estimates	U.S. Census Bureau
Per capita income	U.S. Bureau of Labor Statistics

Examples of State Laws (2000-2010)

State	Effective date	Persons Banned	Enforcement Type
Alabama	---	---	---
California	January 1, 2009	all drivers	primary
Colorado	December 1, 2009	drivers \leq 18 yrs. old	primary
Delaware	April 14, 2005	drivers < 18 yrs. old	primary
Florida	---	---	---
Louisiana	July 1, 2008	all drivers	secondary
Maryland	October 1, 2005	drivers < 18 yrs. old	secondary
Michigan	July 1, 2010	all drivers	primary
Mississippi	July 1, 2009	Intermediate license & permit holders	primary
Missouri	August 28, 2009	drivers < 21 yrs. old	primary
Montana	---	---	---
Ohio	---	---	---
Oklahoma	November 1, 2010	Intermediate license & permit holders	primary
South Carolina	--	--	--
Texas	---	---	---
Virginia	July 1, 2009	all drivers	secondary
Wisconsin	December 1, 2010	all drivers	primary

Sources: The Public Health Law & Research Program; LexisNexis

Analyses

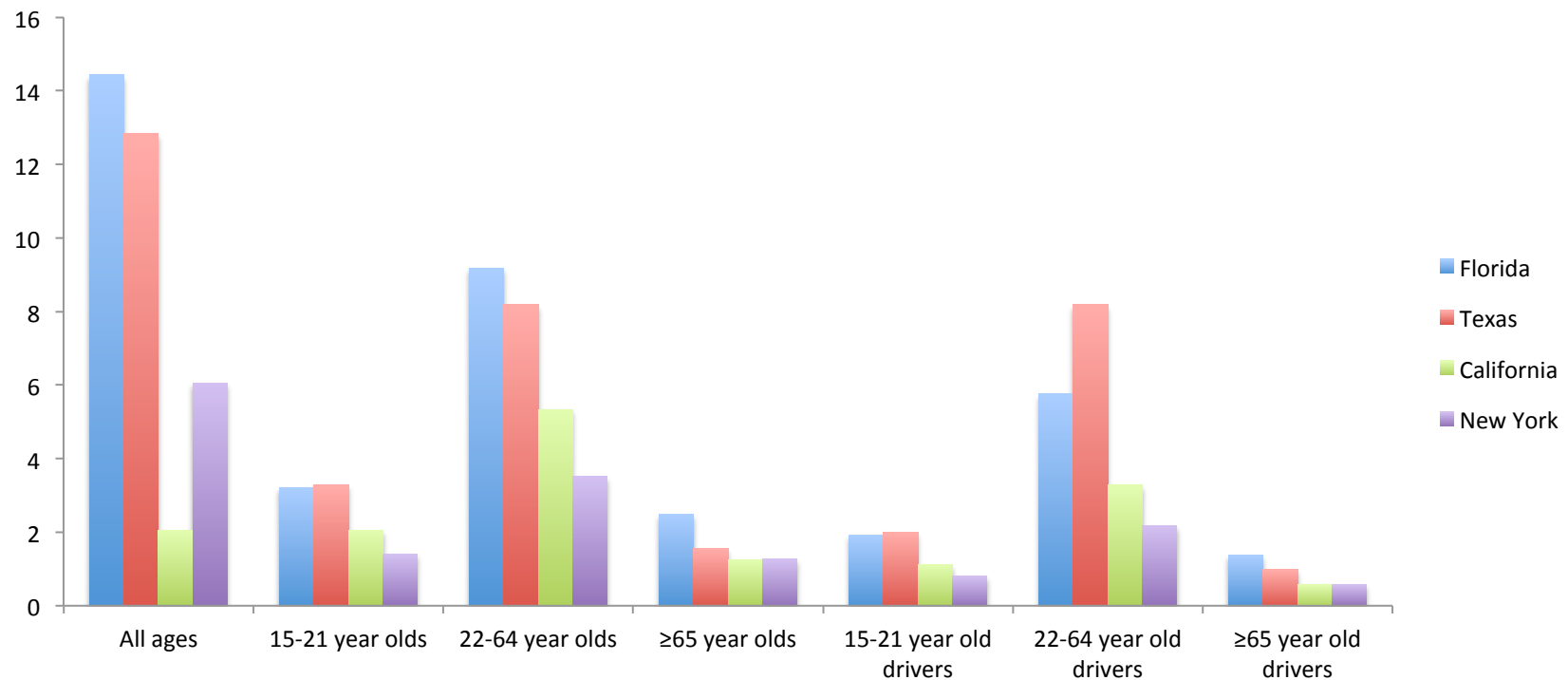
- Effect on fatalities:
 - Texting laws (regardless of stringency)
 - Primary laws banning all drivers
 - Primary laws banning young drivers only
 - Secondary laws banning all drivers
 - Secondary laws banning young drivers only
 - Texting laws on total fatalities in different age cohorts
 - Texting laws on driver fatalities in different age cohorts

Descriptive Findings

Outcome variables:	Mean (S.D.)
Traffic fatalities	69.24 (68.24)
Total novice deaths (15-21)	16.99 (17.39)
Total 22-64 year old deaths	43.40 (43.66)
Total ≥ 65 year old deaths	10.62 (10.77)
Total novice <u>driver</u> deaths (15 – 21)	10.39 (10.41)
Total 22-64 <u>driver</u> deaths	30.15 (28.71)
Total ≥ 65 <u>driver</u> deaths	6.50 (6.18)

*Each outcome variable is per state-month-year count

Monthly Motor Vehicle Fatalities per Million Residents, 2000-2010



Descriptive Findings

States with:	Percent
Texting while driving law	31/48 = 65%
Primary enforcement	27/31 = 87%
Secondary enforcement	4/31 = 13%
Bans all drivers	24/31 = 77%
Bans novice drivers only	7/31 = 23%

Control Variables

States with:	Average
Seat belt law – primary enforcement	42%
Administrative license revocation – DUI/DWI	81%
Speed limit \geq 70 MPH	25 %
Illegal per se at 0.08 BAC	80 %
Graduated driver licensing law	76 %
Hand-held bans, all drivers	3.6%
Hand-held bans, young drivers	0.4%
Gasoline prices (in 2010 cents with S.D.)	207.97 (62.47)
State per capita income (in 2010 dollars with S.D.)	38043.60 (5659.41)
State unemployment rate	5.49%

Main Findings

Variable	Model 1
Texting law	0.98 (0.96 – 0.99)**
Texting law, primary/bans all drivers	
Texting law, primary/bans novice drivers	
Texting law, secondary/bans all drivers	
Texting law, secondary/bans novice drivers	
Hand-held ban, all drivers	
Hand-held ban, young drivers	
Speed limit ≥ 70 MPH	
Administrative license revocation – DUI	
Seatbelt law, primary enforcement	
Illegal per se at 0.08 BAC	
Graduated driver licensing law	
Gasoline prices (2010 cents)	
Per capita income (2010 \$)	
State unemployment rate	

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates. Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p < .10

**p < .05

***p < .01

Main Findings

Variable	Model 1	Model 2
Texting law	0.98 (0.96 – 0.99)**	0.98 (0.96 – 1.01)
Texting law, primary/bans all drivers		
Texting law, primary/bans novice drivers		
Texting law, secondary/bans all drivers		
Texting law, secondary/bans novice drivers		
Hand-held ban, all drivers		0.96 (0.93 – 0.99)***
Hand-held ban, young drivers		1.06 (0.99 – 1.14)*
Speed limit ≥ 70 MPH		1.51 (1.25 – 1.82)***
Administrative license revocation – DUI		0.66 (0.52 – 0.82)***
Seatbelt law, primary enforcement		0.99 (0.97 – 1.00)
Illegal per se at 0.08 BAC		1.01 (0.99 – 1.03)
Graduated driver licensing law		0.97 (0.96 – 0.99)***
Gasoline prices (2010 cents)		
Per capita income (2010 \$)		
State unemployment rate		

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates. Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p <.10

**p <.05

***p <.01

Main Findings

Variable	Model 1	Model 2	Model 3
Texting law	0.98 (0.96 – 0.99)**	0.98 (0.96 – 1.01)	0.98 (0.96 – 1.01)
Texting law, primary/bans all drivers			
Texting law, primary/bans novice drivers			
Texting law, secondary/bans all drivers			
Texting law, secondary/bans novice drivers			
Hand-held ban, all drivers		0.96 (0.93 – 0.99)***	0.98 (0.95 – 1.01)
Hand-held ban, young drivers		1.06 (0.99 – 1.14)*	1.00 (0.93 – 1.07)
Speed limit ≥ 70 MPH		1.51 (1.25 – 1.82)***	1.58 (1.30 – 1.92)***
Administrative license revocation – DUI		0.66 (0.52 – 0.82)***	0.63 (0.50 – 0.80)***
Seatbelt law, primary enforcement		0.99 (0.97 – 1.00)	1.00 (0.98 – 1.02)
Illegal per se at 0.08 BAC		1.01 (0.99 – 1.03)	1.01 (1.00 – 1.03)
Graduated driver licensing law		0.97 (0.96 – 0.99)***	0.96 (0.95 – 0.98)***
Gasoline prices (2010 cents)			0.99 (0.99 – 1.00)***
Per capita income (2010 \$)			1.00 (0.99 – 1.00)***
State unemployment rate			0.99 (0.98 – 0.99)***

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates. Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p <.10

**p <.05

***p <.01

Main Findings

Variable	Model 1	Model 2	Model 3	Model 4
Texting law	0.98 (0.96 – 0.99)**	0.98 (0.96 – 1.01)	0.98 (0.96 – 1.01)	
Texting law, primary/bans all drivers				0.97 (0.95 – 1.00)*
Texting law, primary/bans novice drivers				0.95 (0.91 – 1.00)*
Texting law, secondary/bans all drivers				1.01 (0.95 – 1.07)
Texting law, secondary/bans novice drivers				1.05 (0.98 – 1.12)
Hand-held ban, all drivers		0.96 (0.93 – 0.99)***	0.98 (0.95 – 1.01)	0.98 (0.95 – 1.01)
Hand-held ban, young drivers		1.06 (0.99 – 1.14)*	1.00 (0.93 – 1.07)	0.98 (0.90 – 1.07)
Speed limit ≥ 70 MPH		1.51 (1.25 – 1.82)***	1.58 (1.30 – 1.92)***	1.57 (1.29 – 1.92)***
Administrative license revocation – DUI		0.66 (0.52 – 0.82)***	0.63 (0.50 – 0.80)***	0.63 (0.50 – 0.80)***
Seatbelt law, primary enforcement		0.99 (0.97 – 1.00)	1.00 (0.98 – 1.02)	1.00 (0.98 – 1.02)
Illegal per se at 0.08 BAC		1.01 (0.99 – 1.03)	1.01 (1.00 – 1.03)	1.01 (0.99 – 1.03)
Graduated driver licensing law		0.97 (0.96 – 0.99)***	0.96 (0.95 – 0.98)***	0.97 (0.95 – 0.98)***
Gasoline prices (2010 cents)			0.99 (0.99 – 1.00)***	0.99 (0.99 – 1.00)***
Per capita income (2010 \$)			1.00 (0.99 – 1.00)***	1.00 (1.00 – 1.00)***
State unemployment rate			0.99 (0.98 – 0.99)***	0.99 (0.98 – 0.99)***

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates. Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p <.10

**p <.05

***p <.01

Subgroup Analysis: By Age Cohorts

Variable	15-21 year olds
Texting law, primary/bans all drivers	0.95 (0.91 – 0.99)**
Texting law, primary/bans novice drivers	0.89 (0.81 – 0.98)**
Texting law, secondary/bans all drivers	0.95 (0.85 – 1.06)
Texting law, secondary/bans novice drivers	1.10 (0.98 – 1.23)
Hand-held ban, all drivers	1.01 (0.96 – 1.07)
Hand-held ban, young drivers	1.08 (0.93 – 1.24)
Speed limit ≥70 MPH	1.77 (1.23 – 2.53)***
Administrative license revocation – DUI	0.66 (0.43 – 0.99)**
Seatbelt law, primary enforcement	1.01 (0.97 – 1.04)
Illegal per se at 0.08 BAC	0.99 (0.96 – 1.01)
Graduated driver licensing law	0.94 (0.91 – 0.98)***
Gasoline prices (2010 cents)	0.99 (0.99 – 1.00)***
Per capita income (2010 \$)	1.00 (0.99 – 1.00)*
State unemployment rate	0.98 (0.97 – 0.99)***

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates.

*p < .10

**p < .05

***p < .01

Subgroup Analysis: By Age Cohorts

Variable	15-21 year olds	22-64 year olds
Texting law, primary/bans all drivers	0.95 (0.91 – 0.99)**	0.99 (0.98 – 1.02)
Texting law, primary/bans novice drivers	0.89 (0.81 – 0.98)**	0.98 (0.92 – 1.04)
Texting law, secondary/bans all drivers	0.95 (0.85 – 1.06)	1.02 (0.95 – 1.09)
Texting law, secondary/bans novice drivers	1.10 (0.98 – 1.23)	1.06 (0.99 – 1.14)
Hand-held ban, all drivers	1.01 (0.96 – 1.07)	0.96 (0.93 – 0.99)**
Hand-held ban, young drivers	1.08 (0.93 – 1.24)	0.96 (0.87 – 1.05)
Speed limit ≥70 MPH	1.77 (1.23 – 2.53)***	1.53 (1.18 – 1.99)***
Administrative license revocation – DUI	0.66 (0.43 – 0.99)**	0.62 (0.45 – 0.85)***
Seatbelt law, primary enforcement	1.01 (0.97 – 1.04)	0.99 (0.97 – 1.02)
Illegal per se at 0.08 BAC	0.99 (0.96 – 1.01)	1.01 (0.99 – 1.03)
Graduated driver licensing law	0.94 (0.91 – 0.98)***	0.98 (0.95 – 0.99)**
Gasoline prices (2010 cents)	0.99 (0.99 – 1.00)***	0.99 (0.99 – 1.00)
Per capita income (2010 \$)	1.00 (0.99 – 1.00)*	1.00 (1.00 – 1.01)***
State unemployment rate	0.98 (0.97 – 0.99)***	0.98 (0.97 – 0.98)***

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates.

*p <.10

**p <.05

***p <.01

Subgroup Analysis: By Age Cohorts

Variable	15-21 year olds	22-64 year olds	≥65 year olds
Texting law, primary/bans all drivers	0.95 (0.91 – 0.99)**	0.99 (0.98 – 1.02)	0.96 (0.90 – 1.01)*
Texting law, primary/bans novice drivers	0.89 (0.81 – 0.98)**	0.98 (0.92 – 1.04)	0.97 (0.87 – 1.07)
Texting law, secondary/bans all drivers	0.95 (0.85 – 1.06)	1.02 (0.95 – 1.09)	1.06 (0.93 – 1.22)
Texting law, secondary/bans novice drivers	1.10 (0.98 – 1.23)	1.06 (0.99 – 1.14)	0.94 (0.81 – 1.09)
Hand-held ban, all drivers	1.01 (0.96 – 1.07)	0.96 (0.93 – 0.99)**	1.03 (0.97 – 1.09)
Hand-held ban, young drivers	1.08 (0.93 – 1.24)	0.96 (0.87 – 1.05)	0.84 (0.69 – 1.03)
Speed limit ≥70 MPH	1.77 (1.23 – 2.53)***	1.53 (1.18 – 1.99)***	1.40 (0.89 – 2.22)
Administrative license revocation – DUI	0.66 (0.43 – 0.99)**	0.62 (0.45 – 0.85)***	0.54 (0.29 – 1.02)*
Seatbelt law, primary enforcement	1.01 (0.97 – 1.04)	0.99 (0.97 – 1.02)	1.00 (0.96 – 1.04)
Illegal per se at 0.08 BAC	0.99 (0.96 – 1.01)	1.01 (0.99 – 1.03)	1.06 (1.02 – 1.09)***
Graduated driver licensing law	0.94 (0.91 – 0.98)***	0.98 (0.95 – 0.99)**	0.98 (0.95 – 1.02)
Gasoline prices (2010 cents)	0.99 (0.99 – 1.00)***	0.99 (0.99 – 1.00)	0.99 (0.99 – 1.00)*
Per capita income (2010 \$)	1.00 (0.99 – 1.00)*	1.00 (1.00 – 1.01)***	1.00 (0.99 – 1.00)
State unemployment rate	0.98 (0.97 – 0.99)***	0.98 (0.97 – 0.98)***	1.00 (0.99 – 1.02)

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates.

*p < .10

**p < .05

***p < .01

Subgroup Analysis: By Driver Deaths

Variable	15-21 year olds
Texting law, primary/bans all drivers	0.95 (0.90 – 1.01)*
Texting law, primary/bans novice drivers	0.88 (0.79 – 0.98)**
Texting law, secondary/bans all drivers	0.91 (0.79 – 1.05)
Texting law, secondary/bans novice drivers	1.07 (0.94 – 1.23)
Hand-held ban, all drivers	1.03 (0.96 – 1.10)
Hand-held ban, young drivers	1.04 (0.87 – 1.24)
Speed limit ≥ 70 MPH	1.34 (0.65 – 2.79)
Administrative license revocation – DUI	0.48 (0.15 – 1.59)
Seatbelt, primary enforcement	1.00 (0.96 – 1.04)
Illegal per se at 0.08 BAC	0.98 (0.95 – 1.01)
Graduated driver licensing law	0.96 (0.92 – 0.99)**
Gasoline prices (2010 cents)	0.99 (0.99 – 1.00)***
Per capita income (2010 \$)	1.00 (1.00 – 1.00)**
State unemployment rate	0.97 (0.96 – 0.98)***

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates.

*p < .10

**p < .05

***p < .01

Subgroup Analysis: By Driver Deaths

Variable	15-21 year olds	22-64 year olds
Texting law, primary/bans all drivers	0.95 (0.90 – 1.01)*	0.97 (0.94 – 1.01)
Texting law, primary/bans novice drivers	0.88 (0.79 – 0.98)**	0.99 (0.93 – 1.05)
Texting law, secondary/bans all drivers	0.91 (0.79 – 1.05)	1.02 (0.94 – 1.10)
Texting law, secondary/bans novice drivers	1.07 (0.94 – 1.23)	1.05 (0.97 – 1.15)
Hand-held ban, all drivers	1.03 (0.96 – 1.10)	0.95 (0.91 – 0.99)***
Hand-held ban, young drivers	1.04 (0.87 – 1.24)	0.92 (0.83 – 1.02)
Speed limit ≥70 MPH	1.34 (0.65 – 2.79)	1.61 (1.11 – 2.35)***
Administrative license revocation – DUI	0.48 (0.15 – 1.59)	0.58 (0.36 – 0.92)**
Seatbelt, primary enforcement	1.00 (0.96 – 1.04)	0.99 (0.97 – 1.02)
Illegal per se at 0.08 BAC	0.98 (0.95 – 1.01)	1.01 (0.99 – 1.03)
Graduated driver licensing law	0.96 (0.92 – 0.99)**	0.97 (0.95 – 0.99)**
Gasoline prices (2010 cents)	0.99 (0.99 – 1.00)***	0.99 (0.99 – 1.00)
Per capita income (2010 \$)	1.00 (1.00 – 1.00)**	1.00 (0.99 – 1.00)**
State unemployment rate	0.97 (0.96 – 0.98)***	0.98 (0.97 – 0.99)***

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates.

*p <.10

**p <.05

***p <.01

Subgroup Analysis: By Driver Deaths

Variable	15-21 year olds	22-64 year olds	≥65 year olds
Texting law, primary/bans all drivers	0.95 (0.90 – 1.01)*	0.97 (0.94 – 1.01)	0.93 (0.87 – 0.99)**
Texting law, primary/bans novice drivers	0.88 (0.79 – 0.98)**	0.99 (0.93 – 1.05)	0.98 (0.87 – 1.10)
Texting law, secondary/bans all drivers	0.91 (0.79 – 1.05)	1.02 (0.94 – 1.10)	1.10 (0.94 – 1.28)
Texting law, secondary/bans novice drivers	1.07 (0.94 – 1.23)	1.05 (0.97 – 1.15)	0.97 (0.81 – 1.15)
Hand-held ban, all drivers	1.03 (0.96 – 1.10)	0.95 (0.91 – 0.99)***	1.05 (0.97 – 1.14)
Hand-held ban, young drivers	1.04 (0.87 – 1.24)	0.92 (0.83 – 1.02)	0.92 (0.74 – 1.15)
Speed limit ≥70 MPH	1.34 (0.65 – 2.79)	1.61 (1.11 – 2.35)***	2.70 (0.66 – 11.15)
Administrative license revocation – DUI	0.48 (0.15 – 1.59)	0.58 (0.36 – 0.92)**	0.50 (0.12 – 2.01)
Seatbelt, primary enforcement	1.00 (0.96 – 1.04)	0.99 (0.97 – 1.02)	1.01 (0.96 – 1.06)
Illegal per se at 0.08 BAC	0.98 (0.95 – 1.01)	1.01 (0.99 – 1.03)	1.06 (1.01 – 1.10)***
Graduated driver licensing law	0.96 (0.92 – 0.99)**	0.97 (0.95 – 0.99)**	0.98 (0.94 – 1.03)
Gasoline prices (2010 cents)	0.99 (0.99 – 1.00)***	0.99 (0.99 – 1.00)	0.99 (0.99 – 1.00)
Per capita income (2010 \$)	1.00 (1.00 – 1.00)**	1.00 (0.99 – 1.00)**	1.00 (0.99 – 1.00)
State unemployment rate	0.97 (0.96 – 0.98)***	0.98 (0.97 – 0.99)***	0.99 (0.97 – 1.01)

Note: Each model includes state, month, and year dummies as controls and accounts for state population estimates.

*p <.10

**p <.05

***p <.01

Study 2

Conclusions

- Texting laws –effective in reducing traffic fatalities
 - Reductions in total fatality counts of at least 2.3%
 - This equates to an average of 19 deaths prevented per year in states passing a texting law
 - Youngest drivers see greatest benefit
 - 15-21 year olds experienced 11.3% reduction in death
- Secondary laws not effective in reducing deaths

Overview of Presentation

- 3 studies on distracted driving
 - Study 1: systematic review of empirical studies examining the relationship between driving performance and secondary tasks.
 - Study 2: quasi-experiment examining the effect of texting prohibitions on fatalities caused by motor vehicle crashes.
 - Study 3: quasi-experiment examining the effect of texting prohibitions on motor vehicle crash-related hospitalizations.

Study 3

“The Impact of Texting Laws on Motor Vehicle Crash-Related Hospitalizations”

- To examine the effectiveness of texting bans on motor vehicle crash-related hospitalizations.

Methods

- Longitudinal panel analysis: 2003 – 2010
- Difference-in-difference approach
 - Treatment group: states with laws
 - Control group: states without laws
- 19 states, 12 months, 8 years = 1,824 state-month-years
- Conditional negative binomial regressions

Data Sources

Variable	Data Source(s)
Traffic-related hospitalization counts	The Nationwide Inpatient Sample (NIS)
Texting laws	The Public Health Law & Research LexisNexis
Hand-held bans	Insurance Institute for Highway Safety (IIHS)
Seatbelt laws	IIHS
Blood alcohol concentration	IIHS
Administrative license revocation – DUI	IIHS
Graduated Driver Licensing programs	IIHS
Speed limits	IIHS
Gasoline prices	U.S. Department of Energy, Energy Information Administration
State unemployment rate	U.S. Census Bureau
Population estimates	U.S. Census Bureau
Per capita income	U.S. Bureau of Labor Statistics

Inclusion Criteria

- Ecodes: E810 – E-819
 - E-code reporting: sketchy in some states
- To make it into this study states had to:
 - Participate in the NIS every year during the study period
 - Have 85% e-code completeness or higher
 - $\frac{\text{\# of records with an injury diagnosis that have a valid e-code}}{\text{\# of records with an injury diagnosis}} \times 100$
 - Have a primarily enforced texting ban or no ban at all

Included States

State	Effective date	Persons Banned	Enforcement Type
California	January 1 2009	All drivers	Primary
Colorado	December 1 2009	All drivers	Primary
Connecticut	--	--	--
Massachusetts	September 30 2010	All drivers	Primary
Michigan	July 1 2010	All drivers	Primary
Minnesota	July 1 2008	All drivers	Primary
Missouri	August 28 2009	Young drivers	Primary
Nebraska	--	--	--
New Jersey	--	--	--
New York	November 1 2009	All drivers	Primary
North Carolina	December 1 2009	All drivers	Primary
Oregon	January 1 2008	All drivers	Primary
Rhode Island	November 9 2009	All drivers	Primary
Tennessee	July 1 2009	All drivers	Primary
Texas	--	--	--
Utah	May 12 2009	All drivers	Primary
Vermont	June 1 2009	All drivers	Primary
Washington	January 1 2008	All drivers	Primary
Wisconsin	December 1 2010	All drivers	Primary

Sources: Public Health Law Research; LexisNexis

Basic Model Specification

$$Y_{imt} = f(\text{Text}_{imt} \ L_{imt} \ Z_{imt} \ S_i \ M_m \ T_t)$$

where:

- Y_{imt} is the traffic-related hospitalization count for state i at month m and year t
- Text_{imt} is state texting law for state i at month m and year t
- L_{imt} is a vector of legal factors affecting crash fatality risk exposure
 - hand-held bans, seatbelt laws, blood alcohol concentration (BAC) laws, administrative license revocation for DUI/DWI, Graduated Driver Licensing (GDL) programs, and speed limits)
- Z_{imt} is a vector of other time varying covariates
 - gasoline prices, state unemployment rate, per capita income, and state population estimates)
- S_i is a vector of state dummies
- M_m is a vector of month dummies
- T_t is a vector of year dummies

Analyses

- Effect on traffic-related hospitalizations:
 - Primarily enforced texting laws on all age groups taken together
 - Primarily enforced texting laws on traffic-related hospitalizations in different age cohorts
 - Primarily enforced texting laws on non-traffic-related hospitalization in different age counts (falsification analyses)

Descriptive Findings

States with Texting Bans:	Percent
Primary texting while driving law	15/19 = 79%
States with Hand-Held Bans: Hand-held ban, all drivers	5/19 = 26%

Descriptive Findings: Control Variables

States with:	Average
Seat belt law – primary enforcement	51%
Administrative license revocation – DUI/DWI	79%
Speed limit \geq 70 MPH	16 %
Illegal per se at 0.08 BAC	95 %
Graduated driver licensing law	89 %
Hand-held bans, all drivers	0.1%
Gasoline prices (in 2010 cents with S.D.)	234.99 (56.80)
State per capita income (in 2010 dollars with S.D.)	41153.46 (6055.42)
State unemployment rate (%)	6.19%

Descriptive Findings: Outcome Variables

Outcome variables	Mean (S.D.)
Traffic-related hospitalizations	57.30 (78.21)
Total 15-21 year old traffic-related hospitalizations	8.23 (11.04)
Total 22-64 year old traffic-related hospitalizations	36.96 (51.87)
Total ≥ 65 year old traffic-related hospitalizations	8.78 (12.37)

Note: Each outcome is per state-month-year

Main Findings – Total traffic-related hospitalizations

Variable	Model 1
Texting law, primary enforcement	0.96 (0.91 – 1.01)*
Hand-held ban, all drivers	
Hand-held ban, young drivers	
Speed limit ≥ 70 MPH	
Administrative license revocation – DUI	
Seatbelt law, primary enforcement	
Illegal per se at 0.08 BAC	
Graduated driver licensing law	
Gasoline prices (2010 cents)	
Per capita income (2010 \$)	
State unemployment rate	
State population estimates	

Note: Each model includes state, month, and year dummies as controls.
Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p < .10

**p < .05

***p < .01

Main Findings – Total traffic-related hospitalizations

Variable	Model 1	Model 2
Texting law, primary enforcement	0.96 (0.91 – 1.01)*	0.91 (0.86 – 0.96)***
Hand-held ban, all drivers		1.13 (1.06 – 1.21)***
Speed limit ≥ 70 MPH		0.81 (0.61 – 1.07)
Administrative license revocation – DUI		1.09 (0.86 – 1.37)
Seatbelt law, primary enforcement		0.82 (0.77 – 0.89)***
Illegal per se at 0.08 BAC		1.21 (1.10 – 1.33)***
Graduated driver licensing law		0.77 (0.68 – 0.87)***
Gasoline prices (2010 cents)		
Per capita income (2010 \$)		
State unemployment rate		
State population estimates		

Note: Each model includes state, month, and year dummies as controls.

Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p <.10

**p <.05

***p <.01

Main Findings – Total traffic-related hospitalizations

Variable	Model 1	Model 2	Model 3
Texting law, primary enforcement	0.96 (0.91 – 1.01)*	0.91 (0.86 – 0.96)***	0.92 (0.87 – 0.97)***
Hand-held ban, all drivers		1.12 (1.79 – 2.52)***	1.26 (1.15 – 1.39)***
Speed limit ≥ 70 MPH		0.81 (0.61 – 1.07)	1.36 (1.00 – 1.84)**
Administrative license revocation – DUI		1.09 (0.86 – 1.37)	1.49 (1.17 – 1.90)***
Seatbelt law, primary enforcement		0.82 (0.77 – 0.89)***	0.87 (0.81 – 0.93)***
Illegal per se at 0.08 BAC		1.21 (1.10 – 1.33)***	1.15 (1.04 – 1.27)***
Graduated driver licensing law		0.77 (0.68 – 0.87)***	0.79 (0.70 – 0.89)***
Gasoline prices (2010 cents)			0.99 (0.99 – 1.00)
Per capita income (2010 \$)			1.00 (0.99 – 1.00)
State unemployment rate			1.01 (0.99 – 1.03)
State population estimates			1.00 (0.99 – 1.00)***

Note: Each model includes state, month, and year dummies as controls.

Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p < .10

**p < .05

***p < .01

Subgroup Analysis: Traffic-related Hospitalizations by Age Cohorts

Variable	15 – 21 year olds
Texting law, primary enforcement	0.92 (0.84 – 1.00)*
Hand-held ban, all drivers	1.09 (0.95 – 1.24)
Speed limit ≥ 70 MPH	0.72 (0.44 – 1.15)
Administrative license revocation – DUI	1.22 (0.77 – 1.94)
Seatbelt law, primary enforcement	0.80 (0.71 – 0.90)***
Illegal per se at 0.08 BAC	1.23 (1.05 – 1.43)***
Graduated driver licensing law	0.79 (0.64 – 0.98)**
Gasoline prices (2010 cents)	1.00 (0.99 – 1.00)
Per capita income (2010 \$)	0.99 (0.99 – 1.00)
State unemployment rate	1.01 (0.98 – 1.05)
State population estimates	1.00 (1.00 – 1.00)***

Note: Each model includes state, month, and year dummies as controls.
Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p < .10

**p < .05

***p < .01

Subgroup Analysis: Traffic-related Hospitalizations by Age Cohorts

Variable	15 – 21 year olds	22-64 year olds
Texting law, primary enforcement	0.92 (0.84 – 1.00)*	0.91 (0.85 – 0.97)***
Hand-held ban, all drivers	1.09 (0.95 – 1.24)	1.31 (1.19 – 1.45)***
Speed limit ≥ 70 MPH	0.72 (0.44 – 1.15)	1.36 (0.99 – 1.87)*
Administrative license revocation – DUI	1.22 (0.77 – 1.94)	1.57 (1.21 – 2.04)***
Seatbelt law, primary enforcement	0.80 (0.71 – 0.90)***	0.88 (0.82 – 0.95)***
Illegal per se at 0.08 BAC	1.23 (1.05 – 1.43)***	1.17 (1.04 – 1.30)***
Graduated driver licensing law	0.79 (0.64 – 0.98)**	0.78 (0.68 – 0.89)***
Gasoline prices (2010 cents)	1.00 (0.99 – 1.00)	0.99 (0.99 – 1.00)
Per capita income (2010 \$)	0.99 (0.99 – 1.00)	0.99 (0.99 – 1.00)
State unemployment rate	1.01 (0.98 – 1.05)	1.01 (0.99 – 1.04)
State population estimates	1.00 (1.00 – 1.00)***	1.00 (1.00 – 1.00)***

Note: Each model includes state, month, and year dummies as controls.
Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p <.10

**p <.05

***p <.01

Subgroup Analysis: Traffic-related Hospitalizations by Age Cohorts

Variable	15 – 21 year olds	22-64 year olds	≥ 65 year olds
Texting law, primary enforcement	0.92 (0.84 – 1.00)*	0.91 (0.85 – 0.97)***	0.91 (0.85 – 0.98)**
Hand-held ban, all drivers	1.09 (0.95 – 1.24)	1.31 (1.19 – 1.45)***	1.10 (0.98 – 1.24)*
Speed limit ≥ 70 MPH	0.72 (0.44 – 1.15)	1.36 (0.99 – 1.87)*	0.72 (0.35 – 1.46)
Administrative license revocation – DUI	1.22 (0.77 – 1.94)	1.57 (1.21 – 2.04)***	0.99 (0.44 – 2.18)
Seatbelt law, primary enforcement	0.80 (0.71 – 0.90)***	0.88 (0.82 – 0.95)***	0.92 (0.83 – 1.02)
Illegal per se at 0.08 BAC	1.23 (1.05 – 1.43)***	1.17 (1.04 – 1.30)***	1.10 (0.96 – 1.27)
Graduated driver licensing law	0.79 (0.64 – 0.98)**	0.78 (0.68 – 0.89)***	0.79 (0.65 – 0.96)**
Gasoline prices (2010 cents)	1.00 (0.99 – 1.00)	0.99 (0.99 – 1.00)	0.99 (0.99 – 1.00)
Per capita income (2010 \$)	0.99 (0.99 – 1.00)	0.99 (0.99 – 1.00)	0.99 (0.99 – 1.00)
State unemployment rate	1.01 (0.98 – 1.05)	1.01 (0.99 – 1.04)	1.01 (0.98 – 1.04)
State population estimates	1.00 (1.00 – 1.00)***	1.00 (1.00 – 1.00)***	1.00 (0.99 – 1.00)***

Note: Each model includes state, month, and year dummies as controls.
Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

*p < .10

**p < .05

***p < .01

Falsification Analyses

Non MVC-Hospitalizations	Texting Law
“Other accidents:” E-codes 916-928	0.86 (0.65 – 1.19)
Diabetes	1.14 (0.79 – 1.64)
Hypertension	1.05 (0.73 – 1.45)
Influenza	1.05 (0.87 – 1.28)
Osteoarthritis	0.97 (0.72 – 1.31)

Note: Each model includes state, month, and year dummies as controls.
Numbers shown are Incidence Rate Ratio (95% Confidence Interval)

Conclusions

- Texting laws –effective in reducing traffic-related hospitalizations among sampled hospitals in states with a primary texting ban
- Reductions in total traffic-related hospitalization counts of at least 7%
 - This equates to an average of 48 traffic-related hospitalizations prevented per year among sampled hospitals in states with a primarily enforced texting ban
- Adults see greatest benefit
 - 22-64 year olds experienced 9% reduction in traffic hospitalizations among sampled hospitals in states with a texting ban

Contact Information

Alva O. Ferdinand, DrPH, JD

Assistant Professor

Department of Health Policy & Management

Texas A&M Health Science Center

School of Public Health

307 SPH Administration Building

College Station, TX 77843-1266

Phone: (979) 458 4265

Email: ferdinand@sph.tamhsc.edu

Questions?