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Epidemiology of Distracted Driving and Research into Distracted Driving among Truck Drivers

David I Swedler, MPH
PhD Candidate
Department of Health Policy and Management
Bloomberg School of Public Health

Protecting Health, Saving Lives—*Millions at a Time*

Outline

- Description of distracted driving
- Epidemiology
- Description of thesis research
  - Policy interventions
  - Distraction-related truck crashes
    - Epidemiology
    - Effects of policies
- References

Defining Distracted Driving

- A definition of distracted driving (DD) requires defining **all** tasks that a driver does
  - *Primary tasks*: direction control operations including navigation, steering and stabilization
  - *Secondary tasks*: driving-related operations not essential to keeping vehicle on-track, e.g. turning on the turn signal or checking the speedometer
  - *Tertiary tasks*: tasks not concerned with driving
- So, distracted driving is

  any secondary or tertiary task that takes the drivers eyes, hands, or concentration away from the primary task of driving

From Ablassmier M, *et al*, IEEE, 2007

Epidemiology of DD

- What is the prevalence of DD?
  - Eby *et al* (2006)- approximately 6% cell phone use while driving (CPWD) by observational study
  - Sayer *et al* (2005)- 5.3% of drivers involved in CPWD
  - Farmer *et al* (2010)- ≥7% talking on cell phones
  - Olson *et al* (2009)- truck drivers spent up to 60% of driving time on some tertiary activity
    - ≈12% of their time on some phone-related task
- What percent of drivers undertake DD?
  - 69% of American drivers talk on the phone and 31% text while driving
    - *MMWR* 3/15/2013

Epidemiology of DD

- What is the risk of DD?
- It depends how you define and measure it

Study	Method	DD definition	Odds Ratios
Redelemier (1997)	Case-crossover	"telephone calls"	4.3*
Klauer (2006)	Naturalistic	Dialing a cell phone	2.8*
	Naturalistic	Talking on a cell phone	1.3 (n.s.)
McEvoy (2007)	Case-crossover	"mobile phone use"	4.1*
Neyens (2007)	Case-control	"cell phone-related distractions"	3.4 (n.s.) 11.6*
Olson (2009) -truck drivers	Naturalistic	Dialing a cell phone	5.9*
	Naturalistic	Talking on a cell phone (hand-held and hands-free)	0.4* 1.0 (n.s.)

Epidemiology of DD

- Who is affected by DD?
  - Short answer: everyone
  - Younger males, and young risk-taking drivers are more likely to undertake CPWD
    - Neyens and Boyle (2007); Taylor *et al* (2003); Hafetz *et al* (2010)
  - Older drivers could be slower to process distraction
    - Collet *et al* (2010)
  - Workers who drive on-the-job
    - Walsh *et al* (2008); Caird and Kline (2004)

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Distracted driving in commercial truck drivers in the United States, 2000-2010

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Background

- Occupational fatalities
  - Motor vehicle-related incidents are the leading cause of occupational fatalities in the U.S.
    - Over 2,000 deaths per year
      - Per NIOSH/BLS for 2003 – 2009
  - Commercial drivers suffer 3.7 fatalities per billions vehicle miles traveled (BVMT)
    - Lyman and Braver (2003)
  - Trucking and courier services have the highest cost of occupational injuries and illnesses in the U.S.
    - Leigh *et al* (2004)

Background

Odds ratios for **safety critical events** for commercial truck drivers (Adapted from Olsen *et al* FMCSA report No.09-042)

- Text message- 23.24
- Interact with/look at dispatching device- 9.93
- Write on pad/notebook- 8.98
- Use calculator- 8.21
- Look at map- 7.02
- Dial cell phone- 5.93
- Read book/paper/other- 3.97
- Reach for electronic device- 6.72
- Personal grooming- 4.48
- Look into sleeper berth- 2.30
- Put on any glasses- 3.63
- Adjust instrument panel- 1.25
- Talk on CB radio- 0.60
- Talking on hands-free phone- 0.44
- Interact with other occupants- 0.35
- Check speedometer- 0.32

Background

- Policy interventions
  - States have banned both texting while driving and hand-held cell phone use while driving in an attempt to decrease distracted driving
  - New York banned texting in 2001
  - By 2010, 23 states (and DC) had banned texting and 6 states (and DC) had banned hand-held cell use
- HOWEVER: A 2011 analysis of the Governor's Highway Safety Association summarized the literature and concluded that none of these bans have reduced crashes
  - See also McCartt *et al* (2010)

Background

- Prior literature has hypothesized that lack of enforcement may be partially to blame for bans having no effect
  - Jacobson and Gostin (2010); Wilson and Stimpson (2010); Ibrahim *et al* (2011)
- A Lexis-Nexis search produced over 200 newspaper articles from many states describing sparse enforcement of texting bans

Federal action on DD

- In 2009, President Obama prohibits federal employees from texting-while-driving
- January 2010, FMCSA banned commercial drivers from texting and driving
  - FMCSA-2009-0370
- In December 2011, NTSB recommended a nation-wide ban on all CPWD for all drivers
- February 2012, NHTSA proposes regulation of in-vehicle technologies

Purpose

1. Quantify the number of fatalities in crashes involving a distracted truck driver
   I. Fatalities to truck drivers
   II. Fatalities to all vehicle occupants in the crash
      - The ratio of vehicle masses in a collision is predictive of increased fatality risk for occupants of the smaller vehicle
      - Evans and Frick (1993) and Evans (2001)
2. Examine the impact of state distracted driving laws, and the 2010 federal ban on texting-while-driving for commercial truck drivers.

Methods- Data Collection

- Fatal Accident Reporting System (FARS) maintained by National Highway Transportation Safety Administration (NHTSA)
  - Record of all crashes involving a fatality in the U.S. in a given year
- Identify crashes involving a distracted truck driver
  - 2000 – 2009: Wilson and Stimpson, AJPH 2010
  - 2010: distraction category was added to FARS
  - NOTE: This does not assign blame to the distracted truck driver

Methods- Data Collection

- Assemble counts of fatalities by year and by state
  - Both truck drivers and all vehicle occupants
- Exposure
  - Diesel vehicle miles traveled (VMT) by state from Highway Statistics- DOT
  - Analyzed fatality rates in billions diesel VMT (BVMT)
    - Neeley and Richardson (2009)

Methods- Data Analysis

- Descriptive analysis
  - Total fatalities and rate per BVMT
  - By state and by year
- Regression analysis
  - Multi-level, longitudinal Poisson
    - BVMT as the offset term
    - Clustering within state confirmed by ANOVA
    - Used fixed effects for independent variables
    - Excluded Washington, DC from regression
    - Stata IC v12.1

Variable	Distribution	Source
Texting ban	Binary	GHSA
Handheld cell ban	Binary	GHSA
Population density	Continuous	Census Bureau
Cell saturation	Continuous	FCC/Census
Ethanol consumption	Continuous	NIAAA report 2012
0.08 BAC law	Binary	DOT- Traffic Safety Facts
Capital expenditures	Continuous	DOT- Traffics Safety Facts
Per capita income	Continuous	Census Bureau
Unemployment rate	Continuous	Census Bureau
Primary seatbelt law	Binary	DOTHS 811 535, 2011
State truck length restrictions	Categorical	Rand McNally Motor Carrier's Road Atlas
Rural truck speed limit	Categorical	Rand McNally Motor Carrier's Road Atlas

Results

- Truck drivers killed in DD crashes: 1,007
  - Fatality rate: 0.321 per BVMT
- All vehicle occupants killed in crashes involving DD truck drivers: 3,942
  - Fatality rate: 1.101 per BVMT

Outcome	State Mean	Standard Deviation	IQR	Min	Max
Fatalities to distracted truck drivers	19.7	25.8	20	0	134
Fatalities in distracted truck driver MVCs	77.3	106.8	63	0	406

Results

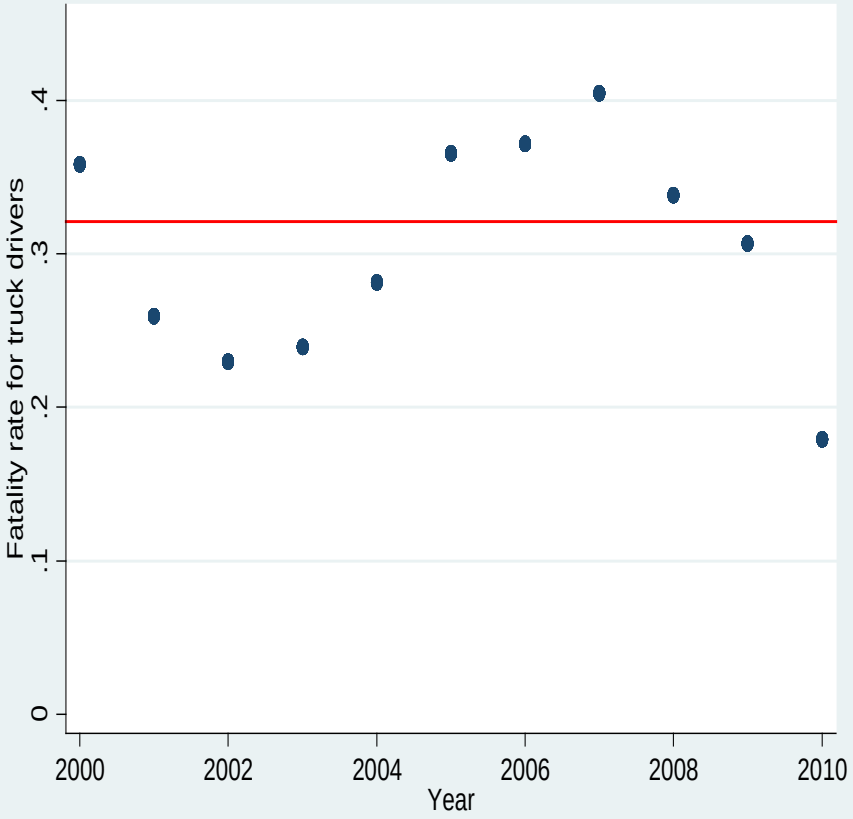
Fatalities to truck drivers							
Lowest				Highest			
State	Count	State	Rate	State	Count	State	Rate
DC	0	DC, HI, NH, UT	0.0	TX	134	MT	1.579
HI	0	OR	0.021	MO	80	NM	1.080
NH	0	GA	0.024	OK	73	OK	0.987
UT	0	AL	0.033	FL	66	KY	0.856
AK	1	IA	0.045	KY	58	MS	0.852
DE	1	MI	0.046	NM	55	MO	0.805
OR	1	CA	0.074	MS	51	KS	0.685
RI	1	SD	0.075	PA	33	NV	0.644
SD	1	MA	0.080	LA	30	ME	0.592
Six tied with 2		OH	0.090	NJ	30	CO	0.536

Results

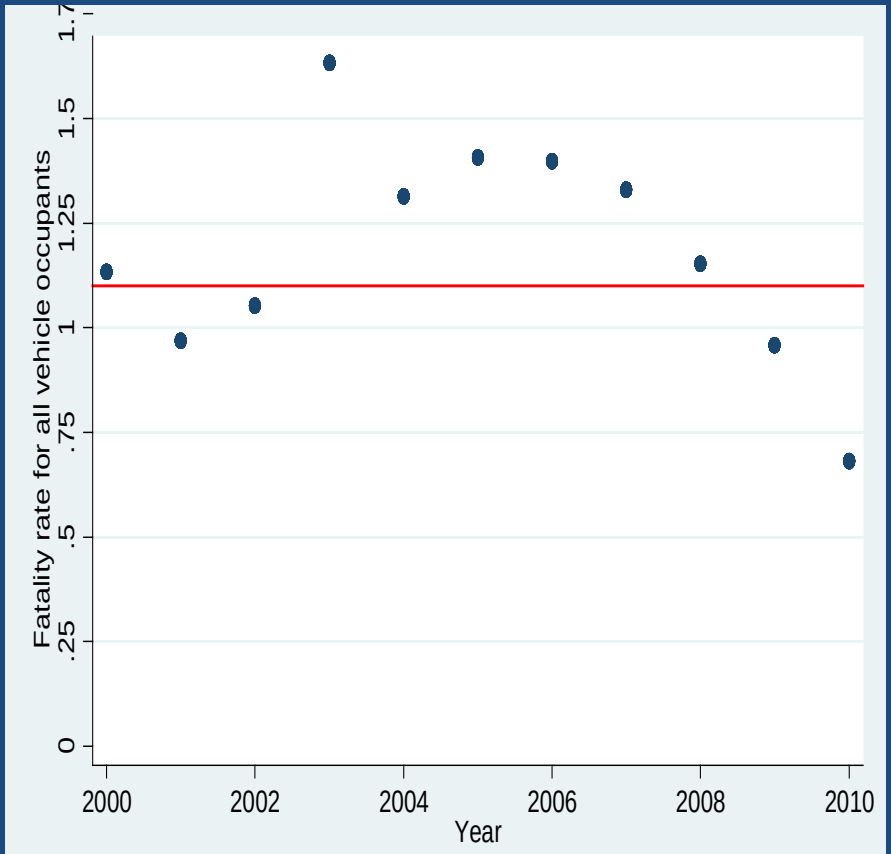
Fatalities to all vehicle occupants							
Lowest				Highest			
State	Count	State	Rate	State	Count	State	Rate
DC	0	DC	0	TX	406	OK	5.475
HI	2	UT	0.043	OK	405	PA	2.699
NH	2	GA	0.102	PA	399	MT	2.656
RI	2	MI	0.150	CA	383	MO	2.587
UT	2	OR	0.152	MO	257	NM	2.337
ND	4	AL	0.181	FL	160	KY	2.302
SD	4	NH	0.193	KY	156	KS	2.138
VT	4	OH	0.248	NM	119	MD	2.017
AR	5	ND	0.291	NC	103	ME	1.776
OR	7	SD	0.300	LA/MD	101	MS	1.555

Results

Truck driver fatality rates



Fatality rates for all vehicle occupants



Results- Truck driver fatality rate

Variable	Model 1		Model 2	
	IRR	p-value	IRR	p-value
Constant	0.10	--	0.99	--
Speed limit- 55 mph	1.00	--	1.00	--
60 mph	2.88	0.097	3.04	0.084
65 mph	2.39	0.089	2.44	0.086
70 mph	2.11	0.165	2.17	0.152
75 mph	2.51	0.108	2.67	0.088
Maximum length- 48 feet	1.00	--	1.00	--
53 feet or 53 feet 6 inches	1.03	0.957	1.04	0.955
57 feet 4 inches or 57feet 6 inches	2.04	0.186	1.95	0.226
59 feet or longer	2.18	0.056	2.16	0.063
State text ban			1.38	0.363
State handheld cell ban			0.85	0.750
Federal texting ban for truckers			0.57	0.102
Log likelihood	-350.06		-348.53	

Results- All vehicle occupants

	Model 1		Model 2	
Variable	IRR	p-value	IRR	p-value
Constant	0.94	--	1.02	--
Speed limit- 55 mph	1.00	--	1.00	--
60 mph	1.39	0.401	1.40	0.393
65 mph	1.14	0.661	1.13	0.680
70 mph	1.10	0.771	1.10	0.776
75 mph	1.73	0.138	1.72	0.145
Maximum length- 48 feet	1.00	--	1.00	--
53 feet or 53 feet 6 inches	0.69	0.499	0.71	0.539
57 feet 4 inches or 57feet 6 inches	0.77	0.593	0.77	0.598
59 feet or longer	1.61	0.247	1.62	0.244
State unemployment rate	0.98	0.574	0.97	0.292
Cell phone saturation	0.74	0.323	0.73	0.307
Federal texting ban for truckers	0.59	0.008	0.53	0.002
State texting ban			1.54	0.048
State handheld cell ban			0.80	0.512
Log likelihood	-713.34		-711.43	

Discussion

- The 2010 FMCSA rule banning texting-while-driving for truck drivers was associated with a 41 - 47% decrease in fatalities to all vehicle occupants in crashes involving distracted truck drivers
- Why has this ban been effective where other bans have failed?
- Was it just that fatality rates were already falling and the federal ban was implemented during this time?
  - Although unemployment rate was predictive of fatality rates for all vehicle occupants, we might have expected rates to turn upwards around 2010 when the recession began to turn around.

Discussion

- Penalties created by the regulation
  - Up to $2,750 fine to the driver
  - Up to $11,000 fine to the employer
  - License suspension required on multiple violations
- States are responsible for enforcement, yet have leeway on when provisions must go into effect
  - FMCSA final rule does not have explicit instructions for states on how the ban is to be enforced
- Federal ban may have prompted companies to create their own policies
  - Hickman *et al*: company policies reduce CPWD prevalence

Conclusions

- Fatalities involving distracted truck drivers have been decreasing in the U.S. since 2006
- Much variation between states in fatality rates
- State DD laws had little impact on fatality rates
- The 2010 FMCSA rule prohibiting commercial truck drivers from texting while driving reduced fatality rates to all vehicle occupants in distraction-involved truck crashes by 41 to 47%

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