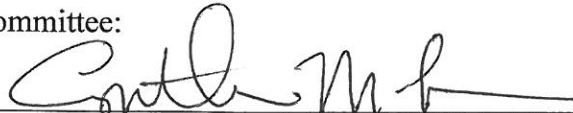


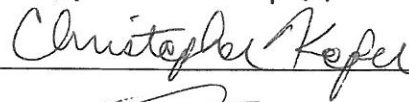
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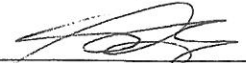
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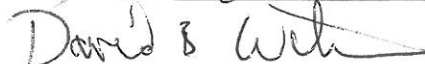
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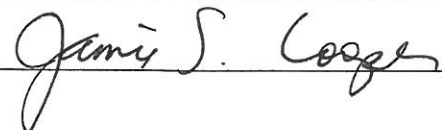
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Investigating the Deterrent Effects of Distracted Driving Laws

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Arts at George Mason University

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## ABSTRACT

### INVESTIGATING THE DETERRENT EFFECT OF DISTRACTED DRIVING LAWS

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George Mason University, 2013

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Following the growth of cell phone use nationwide in the last 20 years, driving while distracted is more common than ever. Deterrence theory implies that states with laws related to distracted driving would witness a decline in distracted driving after those laws came into force. Previous studies have shifted the focus of deterrence theory concluding that the certainty of being caught or apprehended is ultimately what deters an individual from committing a crime. This research explored the relationship between the implementation of distracted driving laws and cell phone related distracted driving accidents and fatalities. A paired samples t-test was used to explore changes in before-and-after mean scores of distracted driving accidents and fatalities in states with laws and in states without laws. Additionally, a one-way ANOVA test was used to compare changes in before-and-after mean scores between states with different levels of strictness in laws related to distracted driving. Findings show no support for a deterrent effect of distracted driving laws relating to cell phone use.



## SECTION 1: INTRODUCTION

Erica Forney was a nine-year old, fourth-grader of Fort Collins, Colorado, who was loved and admired by her friends, family, and anyone who knew her. On the afternoon of November 25, 2008, a woman was just finishing up a cell phone conversation when she accidentally and unknowingly swerved her SUV into the bicycle path striking and killing young Erica (Whaley, 2009). Earman Machado was a 13-year old resident of Taunton, Massachusetts, enjoying a sleepover at a friend's house when he was hit and killed by a 31-year old motorist who admitted texting while driving (Badhken, 2007).

The literature on distracted driving is relatively new and the research on how to stop it is nearly non-existent. This study aims to begin a foundation of analysis for distracted driving legislation so that professionals within the discipline can expand their knowledge base and identify what works, what doesn't, recommend new, innovative ideas, and identify other areas of research related to distracted driving legislation.

Distracted driving is defined in many ways but the National Highway Traffic Safety Administration's (NHTSA) campaign against distracted driving identifies three main aspects of distracted driving; visual, manual, and cognitive. Visual aspects of distracted driving are actions that remove a driver's eyes from the road. Manual aspects of distracted driving remove a driver's hands from the steering wheel. Cognitive aspects

remove a driver's mental capacity from their responsibilities as a driver (NHTSA, 2010). For purposes of this study, the use of a cell phone in any capacity that could alter a driver's visual, manual, or cognitive responsibilities as defined above will comprise the discussion of distracted driving.

A recent study performed by the International Association for the Wireless Telecommunications Industry, CTIA (formerly the Cellular Telephone Industries Association), stated that by the end of 2009, 91% of Americans used cell phones or over 285 million people (Foresman, 2010). The rise of cell phone use has brought about a "new social order" where people feel free to call anytime, anywhere – even from behind the wheel. Additionally, the new generation cell phone user as described in this "new social order" will text, play games, download music, take and send photos, use GPS, and more (Nurrullah, 2009).

Political groups, legislators, concerned parents, and celebrities have begun the laborious process of increasing our attention to distracted driving and doing what they can to improve our public safety. In May 2011, Congressman Democratic Representative Eliot Engel from New York sponsored the Distracted Driving Prevention Act of 2011 that will work with the NHTSA and the Federal Communications Commission (FCC) to increase awareness to the dangers of distracted driving at the state level and develop new wireless technologies that prevent the dangers currently associated with driving while using a cell phone (Thomas, 2011). Congresswoman Democratic Representative Carolyn McCarthy from New York sponsored the Safe Drivers Act of 2011 that will look more closely at the cognitive distractions on young, inexperienced drivers (Thomas, 2011).

Patricia Pena founded the Advocates for Cell phone Safety following the death of her two year old after a driver using a cell phone ran a stop sign and collided with her family vehicle (Glazer, 2001). Interest groups like The American Academy of Orthopedic Surgeons (AAOS) and the Orthopedic Trauma Association have joined efforts with their national print and billboard ad campaign using the words OMG (a slang term that texters use in lieu of Oh My God) bolded over a broken and bloodied windshield (Welsh, 2010). And, Oprah Winfrey began the No Phone Zone which has already received nearly half a million pledges to help end distracted driving (Winfrey, 2009).

In 2001, John Graham, the newly nominated head of the Office of Information and Regulatory Affairs (a subsidiary of the Office of Management and Budget), hailed as one of the foremost proponents of risk analysis said, "We simply do not have enough reliable information on which to base reasonable policy. Although there is evidence that using a cellular phone while driving poses risks to both the driver and others, it may be premature to enact substantial restrictions" (Adams, 2001, p. 992). According to the NHTSA, in 2001, 85% of all cell phone subscribers use cell phones while driving (Glazer, 2001). And, according to the U.S. Department of Transportation and the NHTSA, in 2009, 18% of all distracted driving related fatalities cited a cell phone as the distraction (NHTSA's, 2010).

More than ten years later, Graham's statement regarding information on which to base policy is outdated and now inaccurate. Currently, 38 states impose their own restrictions and laws that limit driver access to handheld cell phones while driving.

Deterrence theory would have scholars believe that these laws are enough to deter drivers from making the decision to drive distracted.

For purposes of this study, the research will focus on cell phone usage relative to distracted driving; a distinction between specific phone usages will not be made. Instead, texting and/or talking on the phone will all be taken into context relative to a state's laws regarding cell phone usage and driving. Furthermore, the study will examine and analyze a law's effectiveness in deterring drivers from driving while distracted. The research question being investigated asks, "What are the effects of cell phone related distracted driving laws on distracted driving accidents and fatalities throughout the United States?"

## SECTION 2: BACKGROUND & THEORY

### *Deterrence Theory*

State governments have taken steps to enact laws which combat distracted driving via legislation that prohibits this behavior. These laws may require the use of hands-free devices or may ban usage altogether. This practice of creating laws to combat social problems is based on the theory of deterrence. Deterrence theory implies that interventions in the form of laws, policies, sanctions, etc. are powerful tools that elected lawmakers have at their disposal to create a more law abiding and harmonious society.

Deterrence theory was developed by the Italian philosopher Cesare Beccaria. For Beccaria, it was far better to prevent crime than to punish criminals. Thus, the main goal of the criminal justice system would be to deter people from committing crime.

Deterrence is comprised of three key characteristics: certainty, celerity, and severity of sanctions. Certainty refers to the probability that a criminal will be caught and punished. Celerity refers to the swiftness undertaken by the criminal justice system to punish the criminal. And, severity refers to the unpleasant aspect that accompanies punishments (Miller and Tewksbury, 2008).

In his early works, Beccaria argued that some aspects of deterrence might be more powerful in deterring crime; more specifically, that certainty of punishment might be more effective than the severity or celerity of punishment. Relevant to this particular

study, laws - like those against distracted driving - are often enacted to create effects of deterrence to prevent crimes (or accidents) before they happen. The difficulty with legislation is identifying the intended effect of those laws and parsing the differences between certainty-oriented and severity-enhancing techniques. In other words, do distracted driving laws increase the certainty of being caught because no laws existed before or do they increase the severity of punishment because no law existed before? The answer is probably a little bit of both. Examples of laws that emphasize only severity-enhancing effects are easy to identify, i.e. capital punishment over life in prison or mandatory higher sentences for certain crimes. However, certainty-oriented laws always encompass some aspects of severity-enhancing effects because just getting caught brings consequences when compared to “getting away.” If Beccaria is right, then enacting specific severity-enhancing laws would not have the intended deterrent effects and, as relevant literature will show, the focus on certainty-oriented laws as deterrents represent a new emphasis in the literature in the 21<sup>st</sup> century.

In 1978, Daniel Nagin explored the relationship between crime and deterrence via sanction levels in a given locale. Nagin cited numerous studies prior to 1978 that helped pave the way for severity related deterrence studies, however, the elimination of competing, extraneous variables that may affect the causal relationship of sanctions and deterrence was unreported. Examining the probability of imprisonment and time served, Nagin concluded that the evidence was not strong enough to infer that increasing the severity of sanctions could deter crime in this particular study (Nagin, 1978). This was one of the first studies to weaken the foundation that severity was a true deterrent to

crime and, more generally, questioned whether laws that increased severity of punishment could reduce crime as hypothesized by deterrence theory.

Deterrence studies that strengthened the emphasis on certainty-oriented laws continued to develop. In the Minneapolis Domestic Violence Experiment, Sherman and Berk (1984) concluded that arresting an offender (an action related to both the certainty and severity of deterrence) had far greater deterrent effects in relation to future instances of domestic violence than either counseling or separating the parties for several hours (Sherman and Berk, 1984). Like Nagin, they found these tests of certainty-oriented sanctions (rather than just severity-enhancing) more promising in creating a deterrent effect.

Other studies would help illustrate that the severity aspect of deterrence was less effective. Loftin and McDowall (1984) examined the deterrent effects of a Florida gun law that imposed a mandatory, minimum three-year sentence on any offender who used a firearm in the commission of a crime. The authors analyzed three different Florida cities and concluded that there was little evidence to suggest that the introduction of mandatory minimum sentencing laws had any deterrent and subsequent decline in handgun use while committing crime (Loftin and McDowell, 1984). In 1997, Stolzenberg and D'Alessio examined California's mandatory sentencing laws on offenders who had already been processed twice before by the criminal justice system. Examining 10 of California's largest cities, the authors concluded that California's "three strikes" laws did not have any observable or statistically significant influence on crime rates throughout the state (Stolzenberg and D'Alessio, 1997).

In 1990, in a study more specific to certainty-oriented elements to deterrence, Lawrence Sherman completed a study related to police crackdowns and the longevity of deterrence in the neighborhoods where police enforced crackdowns. Through the examination of multiple types of police crackdowns including weekend parking enforcement in Washington D.C., raids on open-air drug markets, drunk driving checkpoints, and more, Sherman (1990) concluded that crackdowns can and do produce initial deterrent effects. However, he also identified unintended consequences like an increase in crime rates, displacement of crime, and most importantly, deterrence decay in the long-term crackdowns under review (Sherman, 1990).

In 1998, Nagin further evaluated the progression of deterrence literature over the last few decades and identified four areas for further deterrence research: the long term effects of deterrence, perceptions related to sanction policy, effects related to implementation of sanction policy, and effects of intended versus actual policy. Additionally, Nagin (1998) also discusses the complications surrounding the use of longitudinal studies that examine severity-enhancing laws and how difficult it is to pinpoint an exact cause-and-effect relationship due to possible extraneous explanations. Nagin (1998) goes on to conclude that severity-enhancing laws are worthless without the accompaniment of at least “the status quo level of certainty” (p. 9).

In 2011, Daniel Nagin and Steven Durlauf published a study related to imprisonment and crime that makes a number of conclusions regarding a paradigm shift from incarceration (severity related) to increased policing (certainty related). They too recognized that without certainty nothing else matters. “Severity alone does not deter; the



likelihood of a punishment's imposition also matters to the criminal choice (Durlauf and Nagin, 2011, p. 16). Specifically, the authors (while referencing the previously mentioned studies by Loftin and McDowall and Stolzenberg and D'Alessio) argue that the empirical research supports evidence that certainty-oriented sanctions are the most vital key to effective deterrence (Durlauf and Nagin, 2011).

The feedback and social norms of family and friends relate to the way in which an individual assesses their decision-making process. Some have argued that the inability to violate these social norms is a better indicator of deterrence than formal laws and penalties imposed by the criminal justice system. A 1967 study by Schwartz and Orleans indicated that the appeal to one's conscience was a better indicator of tax law compliance than the penalties associated with tax evasion (Wenzel, 2004). Wenzel (2004) goes on to claim that this "socially mediated deterrence" in conjunction with normal elements of deterrence (specifically severity and certainty) will create a more effective level of deterrence than just one element independent of the others. Control theories (see Hirschi, 1969) as well as shaming theory (see Braithwaite, 1989) also discuss how social bonds and attachments can help develop internal control mechanisms that can keep people from committing crime. Thus, perhaps it is not just the certainty or severity of punishments that may lead people to stop using their cell phones while driving, but also the shame associated with it if significant others found out.

#### *Deterrence & Automobile Studies*

Research that examines the deterrent effects of distracted driving laws is limited but studies pertaining to laws regarding motor vehicle use and safety do exist.

In 1989, a mandatory law was passed in Texas requiring all operators and passengers to wear a helmet while on a motorcycle. Using a pre-post longitudinal design, Lund, William, and Womack (1991) examined the impact of the law by measuring helmet use in 18 Texas cities, six times before the law took effect and twice after. The authors concluded that, as a result of the law, helmet usage increased from 41% the month before the law to 96% within two months after the law. Additionally, significant decreases were found related to drivers killed, severely injured, or injured overall; a finding the authors attributed to a decrease in head related injuries (Lund, William, and Womack, 1991).

The abovementioned study comes up short in many areas. For one, the authors claim that the mandatory seat belt law in 1989 was effective and as a result saved hundreds of lives. However, no research was included to infer that helmet use was the sole reason of saved lives. Other extraneous factors need to be controlled for that could have impacted motorcycle fatalities including public campaigning or style of implementation that may have helped spur a 50% increase in helmet use. This again, points to the problems with studies examining the deterrent effects of laws against social problems or crime. Recall Nagin (1998) which states that interrupted time series studies looking at the impact of severity-enhancing laws against crime are wrought with methodological difficulties because it's difficult to dissect and identify the actual deterrence effects of severity-enhancing techniques.

Further, the authors made no mention of the lasting effects of this law. As mentioned earlier, Sherman (1990) concludes that deterrence effects decay over time

often with effects that last mere moments (Sherman, 1990). It is unknown whether or not the helmet law was effective at all following the two-month observation period, and whether enforcement of the law was adequately carried out. And, again, Nagin (1998) called for the need for more research to show the long-term effects of deterrence.

Lastly, the article makes no attempt to address whether the helmet violation was a primary or secondary violation. A primary violation is one that a law enforcement officer can stop a vehicle for and cite the driver or occupant(s) for that violation alone. A secondary violation is one that a driver or occupant(s) can be cited for but only after they are stopped for another violation. This type of implementation is important to understand because primary enforcement of laws gives officers more discretion to stop a vehicle and possibly carries with it a heavier emphasis on certainty-oriented deterrence. When a law remains a secondary enforcement violation, drivers may realize that they must break the law in some other way, shape, or form before they can be stopped or cited.

Another study examined laws requiring the use of a seat belt while operating a vehicle and its effect on automobile fatalities. This study utilized annual, state-level data across the country to determine how effective the laws were at increasing seat belt usage and to evaluate how effective seat belts are at saving lives. Collecting data from state and national sources and controlling for variations resulting from the varying years in which states adopted their laws the authors executed a simple linear regression to estimate the effects. In the end, the authors concluded that mandatory seat belt laws reduce traffic fatalities while primary enforcement of laws increases usage (Cohen and Einav, 2003).

A number of important items from the article are worth mentioning. For one, the

authors take into account the timing related to the introduction of the laws. Because scholars have shown that deterrence decay can exist, the authors control for the period of time directly surrounding the implementation of the law. This is helpful in assessing the law's impact on the targeted activity. Second, the authors note that extraneous factors related to traffic safety could have accompanied the implementation of the law that may explain its success rate. While they did not control for such variables, they suggest that media campaigns might have influenced outcomes. Lastly, the study supports the general shift towards a certainty-oriented theory of deterrence by stressing primary enforcement of seat belt laws and their direct relationship to increased usage.

Laws related to driving while under the influence of alcohol have also been studied. Green (1989) measured socially mediated deterrence and individual perceptions with a longitudinal, cross-sectional study. Using random digit dialing, a sample of approximately 370 individuals were asked to participate in a self report regarding the possibility of future illegal activity (driving under the influence) based on questions related to the perceptions of certain punishment, severity of punishment, morals, and social approval. The same sample was then asked to participate in a second wave of questioning one year later pertaining to a self-report of actual participation in past illegal activity dating back to the previous survey. Green (1989) suggests that informal threats of sanctions have higher predictive values related to drinking and driving and concludes that formal deterrence sanctions are not successful at preventing the participation in illegal behaviors like drinking and driving.

It's important to note that Green (1989) was able to identify a specific typology of offender for which the formal and social sanctions were not an effective deterrent. These offenders were young, frequent drinkers, who were more often than not unmarried. With this demographic in mind it is not surprising that formal social institutions have little deterrent effect on drinking and driving. However, Green (1989) concludes that social aspects (i.e. stronger ties to friends, family, and employers) may have stronger implications in the world of deterrence research stating that laws should reflect a certain level of moral and societal values into the behavior it prescribes. For example, job loss is just one way that informal, social controls may better deter driving under the influence. While Green (1989) doesn't favor or make any distinctions between certainty-oriented aspects of deterrence versus severity-enhancing aspects, the demographic identified may help policy makers better mold certainty-oriented deterrent laws at target populations in the future.

Sobriety checkpoints have long served as certainty-oriented practices to defer driving while under the influence. Using a pre-post longitudinal design with comparison groups, Nunn and Newby (2011) examined the impact of 22 DUI checkpoints located in nine areas of high, alcohol-related accidents throughout Indianapolis, Indiana. Similar to the Cohen and Einav (2003) article, time scales around each independent checkpoint were observed and approximately two to three years of data surrounding the implementation of the checkpoints were collected. Using a paired sample, repeated measures t-test, Nunn and Newby (2011) concluded that the 11 non-downtown sites displayed statistically significant decreases (albeit trivial amounts) in alcohol-related

accidents following the implementation of checkpoints but saw no decrease in the *rate* of alcohol-related accidents overall. Contrary to Sherman (1990) the authors go on to conclude that limited evidence suggests that checkpoints are an effective deterrent strategy for reducing impaired driving (Nunn and Newby, 2011).

### *Cell phones & Distracted Driving*

In 1991, the American Automobile Association (AAA) Foundation for Traffic Safety published a report on the dangers of cell phone use while driving in a time when they estimated that cell phone users had grown to approximately two million. The study cites previous research that indicates that cell phone use “does not interfere significantly with the ability to control an automobile [...]” (McKnight and McKnight, 1991). In this study, scholars asked 151 participants to take part in a simulated video driving exercise under which 47 situations would arise that would require a response from the driver. Each situation would occur under one of five conditions of distraction. Researchers concluded that all the distractions led to a significant increase in reaction time and sometimes led to a failed response altogether. Furthermore, complex phone conversations and age increased reaction times but the authors maintained that no prior cell phone experience lowered risk factors and even simple phone conversations led to significant risk increases (McKnight and McKnight, 1991).

In 1997, Redelmeier and Tibshirani (1997), used a crossover analysis and paired time of collisions with cell phone records and concluded with statistical significance that cell phone use is associated with a relative risk of an automobile accident. Specifically, their investigation indicates a risk level four times higher than drivers not using their cell

phone, similar to risks experienced by drivers operating a vehicle while intoxicated (Redelmeier and Tibshirani, 1997).

In 2001, when estimated cell phone subscribers had reached 116 million, researchers more closely examined the relationship between driving and cell phone conversations stating that the conversation itself makes up the majority of multi-tasking between driving and cell phone use. In one of two experiments, a simulated driving program was used to compare reaction times to drivers conversing on the phone, conversing while using a hands free device, or just listening to the radio. The authors concluded that no significant difference existed between the hand held or hands free groups but that both groups had significant delays in responding to and significant increases in missed responses altogether (Strayer and Johnston, 2001).

In 2005, the Insurance Institute for Highway Safety (IIHS) posted a News Release on their website in regards to an independent IIHS study that assessed risk factors associated with cell phone use while driving. Their data reiterates the conclusions of the Redelmeier and Tibshirani (1997) study by stating “drivers using phones are four times as likely to get into crashes serious enough to injure themselves” (Insurance, July 2005).

In January 2010, the IIHS and the Highway Loss Data Institute (HLDI) compared insurance claims in four U.S. jurisdictions (New York, D.C., Connecticut, and California) examined the months before and after the implementation of a hand held, cell phone ban. They concluded that laws banning cell phone use while driving do not reduce crash rates (Insurance, January 2010). In a nearly identical study in September of the same year, insurance claims were compared in four U.S. jurisdictions (California, Louisiana,

Minnesota, and Washington) before and after the implementation of a texting ban. Their second study concluded that laws banning texting do not reduce crashes either (Insurance, September 2010).

The IIHS studies are most relevant to the current study due to their design and specific focus on cell phone related distracted driving (as opposed to seat belt use, DUI, etc.). Both the IIHS and current study compare before-and-after observations surrounding the implementation of a distracted driving law at the individual state level, however, the focus of the IIHS was on just four states while the current study will attempt to include all states with or without laws. Additionally, the IIHS focused on all insurance claims regardless of their association with distracted driving in an attempt to find a significant difference in accident rates. The current study will use data that specifically cites distracted driving as the cause for an accident.

Stopping individuals from committing crime (in this case, driving distracted) has its roots in deterrence theory. And, deterrence theorists have recently shifted their focus towards certainty-oriented aspects of deterrence for effective crime prevention. This study, however, looks at the effects of severity-enhancing aspects of deterrence (albeit, creating a distinction is hard to do) and will supply the field with a better outlook of what does or doesn't work relative to distracted driving. Furthermore, because the breadth of current knowledge is limited on distracted driving legislation, this study will provide a solid direction of where more research might be better served.



### *Research Question & Hypothesis*

The collective research is decisive that cell phone related distracted driving poses greater risks of automobile accidents and deterrence research related to distracted driving laws shows no deterrent effect exists. This is because current distracted driving laws only emphasize the severity aspect of deterrence that recent studies have shown to be ineffective. This study, a focus on severity-enhancing laws related to distracted driving, should exemplify why certainty-oriented distracted driving laws are necessary to enact real change. As a result, I hypothesize that states with laws pertaining to distracted driving will have no statistically significant difference in accidents or fatalities related to distracted driving than states without laws. Furthermore, states with more strict laws regarding cell phone related distracted driving will have no statistically significant differences in automobile accidents or fatalities related to distracted driving than states with less stringent laws.

### SECTION 3: METHODOLOGY

To examine whether cell phone legislation can reduce distracted driving, a pre-post non-equivalent groups, quasi-experimental design is utilized. The number of fatal distracted driving accidents and fatalities will be observed in all states and the pre-law observation and post-law observation in accidents and fatalities will be compared between states with laws to states without. Two types of statistical analysis (paired samples t-test and one-way ANOVA) are used to compare the mean observations before and mean observations after to determine if a statistically significant difference does exist. The states are not randomly assigned to "treatment" or "control" groups, but are predetermined given the existence of or lack of the law in each state.

#### *Unit of Analysis and Sample*

The unit of analysis is the U.S. state, since driving laws are enacted at the state level. The impact of laws on accidents and fatalities at more micro-level units of analysis was not used because law enforcement officials of varying local municipalities, townships, cities, etc. throughout states collect and record accident and fatality data in a myriad of different methods with no central organized record keeping. However, data at the state level is often collected by national organizations for their own recordation and analysis, and is therefore used here. The entire population of states in the US (N=50) will be used and comprises the sample.

### *Dependent Variables*

To determine the impact of state-level cell phone and driving laws, two outcome variables are measured: the number of fatal automobile accidents and automobile fatalities resulting from cell phone related distracted driving. Data pertaining to distracted driving accidents and fatalities was provided by the National Center for Statistics and Analysis (NCSA), an office within the NHTSA created to provide analytical and statistical support to the NHTSA. Furthermore, specific figures were provided by the Fatality Analysis Reporting System (FARS), a program that collects nationwide census data polled yearly to provide the NHTSA with information related to fatal motor vehicle accidents via voluntary, cooperative agreements between the NHTSA and all 50 states. Lyn Cianflocco of the Data Reporting & Information Division for the NCSA provided data in PDF format that contained 19 years of distracted driving accident and fatality statistics for all 50 states.<sup>1</sup> More specifically, two spreadsheets were provided that gave numerical data for cell phone related automobile accidents in all 50 states from 1991 – 2009 and cell phone related fatalities as a result of an automobile accident in all 50 states from 1991 – 2009.

For states with distracted driving cell phone laws, the mean number of accidents and fatalities was recorded using three years of data prior to the implementation of the

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<sup>1</sup> Repeated emails and phone calls were not returned to determine the original intent or origin of data. Concerns arise related to the reliability and validity of data which will be discussed further with other limitations of the study.

law. For example, Connecticut imposed a law banning the use of cell phones while driving in 2005, so the years 2002, 2003, and 2004, were averaged to produce one measurement of pre-law accidents or fatalities.

Unfortunately, this study could not collect three years of data after laws were implemented. Data provided by the NCSA reflects 19 years of accident and fatality data from 1990-2009 (NCSA's, 2010). Thirty-eight states have distracted driving laws in place as of 2012 but only 17 had laws in place as early as 2009. In order to achieve a post-law observation, states with laws that went into effect in 2009 or after are treated as states without a law at all (given that the NCSA data stops at 2009). This leaves just eight states to be evaluated in terms of pre and post observations (see Table 1).

Due to the recent growth in distracted driving legislation, 19 years worth of accident data is unnecessary. The information provided before 2002 will assist in creating visual aids for cell phone growth over the last two decades but only figures from 2002 – 2009 will be used to determine mean observations of cell phone related accidents and fatalities.

An important note related to the data is that the information provided by NCSA contains numbers for distracted driving accidents and fatalities for *fatal* motor vehicle traffic crashes only. While distracted driving accidents occur that do not include a fatality, this data does not include those figures. Unfortunately, this means that the data

for both accidents and fatalities are nearly identical; differences in figures only exist when more than one person died in the accident.

Table 1: Active State Cell phone Related Distracted Driving Laws by Year

<u>State</u>	<u>Year Law Active</u>
Connecticut	2005
California	2006
New Jersey	2007
Alaska, Louisiana, Minnesota, Washington, West Virginia	2008
Arkansas, Colorado, Maryland, New York, North Carolina, Rhode Island, Tennessee, Utah, Virginia	*2009
Delaware, Georgia, Idaho, Illinois, Iowa, Kentucky, Massachusetts, Michigan, Nebraska, New Hampshire, Oregon, Vermont, Wisconsin, Wyoming	*2010
Indiana, Kansas, Maine, North Dakota	*2011
Nevada, Pennsylvania	*2012
Ohio	*2013
Alabama, Arizona, Florida, Hawaii, Mississippi, Missouri, Montana, New Mexico, Oklahoma, South Carolina, South Dakota, Texas	*No Law

\*States with laws active in 2009 or after are treated as part of the control/comparison group due to limitations with data.

This data, along with the remaining data to be discussed, was inputted into Statistical Package for Social Sciences (SPSS) software for analysis. In order to better control for state populations and variations in sizes or driving population, data was later

created using state census figures to reflect distracted driving accidents and fatalities per one-hundred thousand in total population.

*Two deterrent effects measured*

Two sets of comparisons will be made to determine whether the cell phone laws have an impact on statewide fatalities and accidents. The first will compare mean accident and fatality observations between states that have and states that do not have cell phone related distracted driving laws. The second comparison will focus on the level of strictness between state laws. The National Highways Traffic Safety Administration and the U.S. Department of Transportation recognizes three types of drivers (novice drivers, bus drivers, all other drivers) and establishes between primary laws and secondary laws. The latter of the two types requires another traffic offense before an officer can make a stop or write a citation and is considered less aggressive than primary laws (NHTSA, 2010). According to the NHTSA's distracted driving website, state jurisdictions take any number of approaches relative to distracted driving. For the purposes of this study, state laws can thus be characterized as one of five categories designed to be both exhaustive and mutually exclusive. Categories are, from most lenient to most strict:

- 1) No laws exist relative to distracted driving;
- 2) One law exists that bans either texting, hand held cell phone use, or all cell phone use at the primary or secondary level;

- 3) More than one law exists that bans any combination of texting, hand held cell phone use, or all cell phone use at the primary or secondary level;
- 4) Laws exist that ban all texting, hand held cell phone use, or all cell phone use but they are not all primary offences; and
- 5) All cell phone related bans (texting, hand held, and all cell phone use) exist at the primary level.

(NHTSA, 2010)

This study will only examine laws that are applicable to all drivers. Also, given that no state enacts laws at levels four or five, only accidents and fatalities in states labeled with category 1, 2, or 3 laws will be examined.

Data related to the existence of distracted driving laws and their exact content (at the state level) was provided by the NHTSA. Furthermore, upon recommendation of Marketing Specialist Lori Millen with U.S. Department of Transportation (DOT)/NHTSA, details regarding laws and the years in which they were implemented were retrieved from the website “Hands Free Info” (Hands Free Info, 2012).

#### *Comparison Group*

States with distracted driving-cell phone laws will be compared to states without active distracted driving laws. For this study, the average year of law implementation for the eight states in the treatment group, 2007, was used as the year for which to create pre and post measurements of accidents and fatalities in the comparison states. Thus, for all

states without laws, the 2004, 2005, and 2006 statistics for accidents and fatalities were averaged to create a pre-intervention observation while 2008 data was used as the post intervention observation.

### *Method of Analysis*

The first analysis used a paired samples t-test to compare the before-and-after mean scores in states without laws and in states with laws. A paired samples test was chosen because the same (or related) population within the state provides both the pre-and-post observations. The second test used an analysis of variance (ANOVA) to examine the variance in means among three separate populations. The three populations being observed in the second analysis are divided by state strictness levels (based on the categories above) relevant to distracted driving laws.



## SECTION 4: DATA & ANALYSIS

With over 50 states in question, a quick snapshot of the data will help make sense and organize efforts of analysis. Table 2 is a descriptive table for all the variables used in this study. “Does the state have a law in place” is a reference to the dichotomous variable that determines whether or not a state possesses any distracted driving laws. There are 50 responses in which zero represents “no law” and the number one represents “the presence of a law.” The mean for this variable of 0.16 indicates a high number of “no law” responses (the answer, as we know, is 42).

Table 2: Descriptive Table for All Variables of Study

	N	Minimum	Maximum	Mean	Std. Deviation
Does the state have a law in place?	50	0	1	.16	.370
Strictness level of law for all 50 states	50	1	3	1.26	.633
Total accidents for all states, 1991-2009	50	2	1975	144.24	436.143
Total fatalities for all states, 1991-2009	50	2	2252	164.02	497.516
Total accidents for all states per 100K in population, 1991-2009	50	.11	55.79	2.3643	7.99788
Total fatalities for all states per 100K in population, 1991-2009	50	.11	65.26	2.7076	9.33731
Year that distracted driving law was implemented	50	2005	2008	2007.04	.450
Valid N (listwise)	50				

“Strictness level of law for all 50 states” is a reference to the second variable measured in this study with a 1-5 given relative to the categories discussed above. No state falls into categories four or five and Table 2 reflects 50 responses ranging from 1-3. The low mean of 1.26 would indicate a skewed proportion of responses fall into category one (no law present).

“Total accidents [...]” and “Total fatalities [...]” are the total cell phone related accidents and fatalities (respectively) for all states over the 19 years of provided data. Furthermore, “Total accidents for all states per 100K [...]” and “Total fatalities for all states per 100K [...]” are the total cell phone related accidents and fatalities (respectively) for all states over the 19 years of data per 100K in population. This should

help control for different sizes in driving populations that larger states have which could possibly skew the results. It is worth noting that total crashes, for example, over 19 years of data ranged anywhere from two to 1975 and total fatalities over the same period ranged from two to 2252. However, the wide range of responses masks the fact that only three states have data for accidents or fatalities that reach 1000. This points to outliers that could indicate some recordation differences at the state level that is further discussed in the limitations section. Lastly, and in regards to Table 2, variable “Year [...]” shows the range of years in which a law was implemented for all 50 states. The very first state to enact a law related to distracted driving came in 2005 (Connecticut) and the remainder of the states falls into range through 2008. Additionally, 2007 is the average year of implementation and was used to create the pre and post observational period for states without a law in place.

Table 3 below further explores accidents and fatalities relative to the custom measurements surrounding the year of implementation. It displays the average accident and fatality rate per 100K in population in the three years combined leading up to the implementation of a distracted driving law and the one year following. All four years in which laws were enacted in eight states between 2005 and 2008 have lower mean accident rates and lower mean fatality rates in the year directly following the implementation of the law. The last row, displaying states without an active law in place, saw an increase in mean accident rates and mean fatality rates in the year after 2007 (the average year of implementation used as a pivotal year for the comparison group).

Table 3: Accident and Fatality Averages per 100K in Population Three Years Before and One Year After Implementation of Law

		Mean accidents (per 100K in pop.) over three years prior to law	Mean accidents (per 100K in pop.) one year after law	Mean fatalities (per 100K in pop.) over three years prior to law	Mean fatalities (per 100K in pop.) one year after law
State(s) with law enacted in 2005	Mean	.1468	.0587	.1566	.0587
	N	1	1	1	1
State(s) with law enacted in 2006	Mean	1.1878	.2214	1.3226	.2568
	N	1	1	1	1
State(s) with law enacted in 2007	Mean	.0475	.0119	.0475	.0119
	N	1	1	1	1
State(s) with law enacted in 2008	Mean	.3633	.1014	.3880	.1368
	N	5	5	5	5
State(s) without an active law	Mean	.2234	.4005	.2607	.4546
	N	42	42	42	42

Table 4 further explores mean accidents and mean fatalities by examining the “window” of measurement surrounding the year of implementation relative to a state’s strictness level. Both states without any distracted driving laws and states with just one law experienced an increase in average accidents and average fatalities from the three years prior to the one-year after implementation. Only the five states with multiple laws experienced a decrease in average accidents or average fatalities from the three years prior to the one-year after the law was in effect.

Table 4: Accident and Fatality Averages per 100K in Population Three Years Before and One Year After Implementation of Law Distributed by States Level of Strictness

Strictness Level		Mean accidents (per 100K in pop.) over three years prior to law	Mean accidents (per 100K in pop.) one year after law	Mean fatalities (per 100K in pop.) over three years prior to law	Mean fatalities (per 100K in pop.) one year after law
No laws exist relative to distracted driving	Mean	.2234	.4005	.2607	.4546
	N	42	42	42	42
One law exists that bans either texting, hand held cell phone use, or all cell phone use at the primary or secondary level	Mean	.0680	.1464	.0705	.2054
	N	3	3	3	3
More than one law exists that bans either texting, hand held cell phone use, or all cell phone use at the primary or secondary level	Mean	.5989	.0720	.6511	.0791
	N	5	5	5	5

Below are 9 graphs that illustrate 19 years worth of cell phone related accident and fatality data for states with distracted driving legislation in place as well as an aggregate illustration of the 42 states which comprise the control group.

Figure 1 illustrates cell phone related accidents per 100K in population in Connecticut from 1991 – 2009. No cell phone related accidents are reported until 1998 with a peak in cell phone related accidents in 2003. There is a drop in accident rates leading up to and through the year 2005 in which a distracted driving law was implemented. but it is worth noting that those numbers rose again in 2009. The initial drop may indicate a deterrent effect while the latter increase could point to deterrence decay.

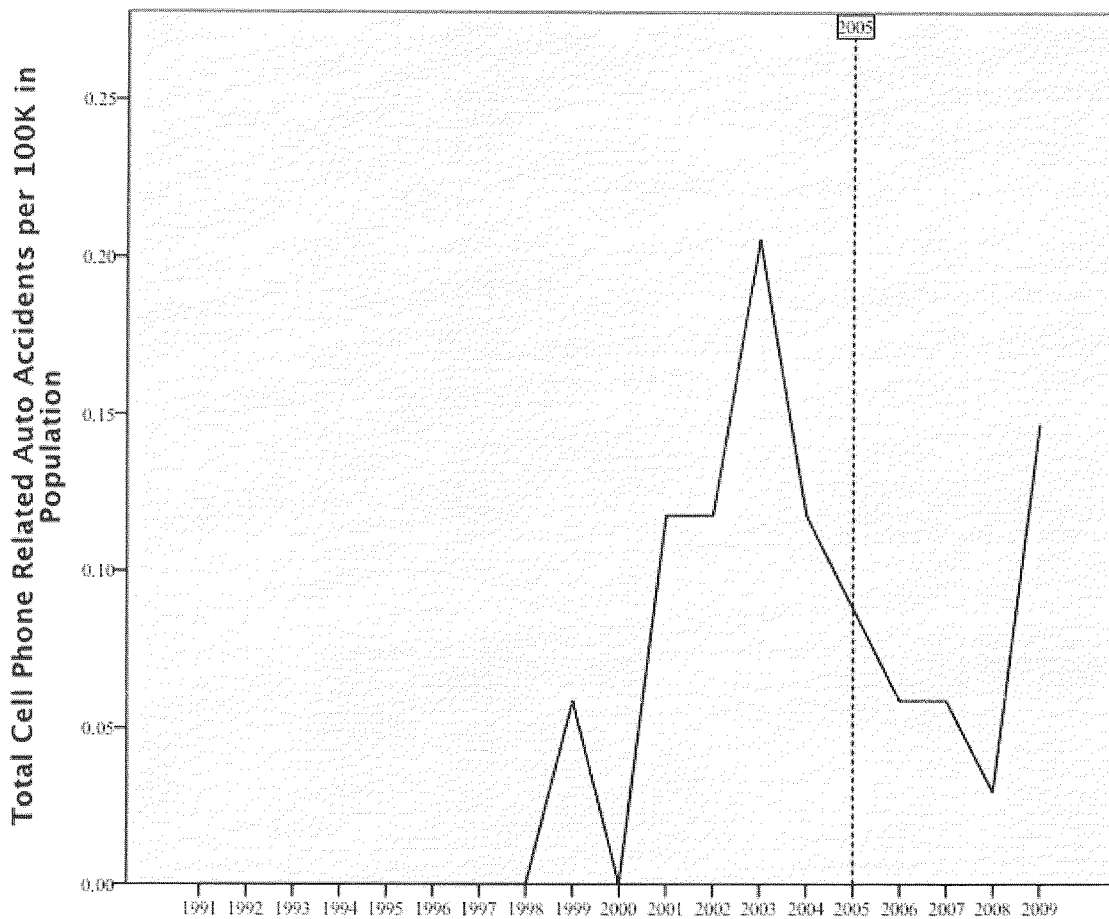


Figure 1: Cell phone Related Automobile Accidents per 100K in Population in Connecticut, 1991-2009

Illustrations related to specific state fatalities are not included because an identical trend for cell phone related fatalities exist due to the nature of the data indicated above. In short, you would not have a fatality without a fatal accident. The only fluctuations or differences that may exist between the two would indicate that one accident killed more than one vehicle occupant. As a result of the nearly identical graphs, only figures that represent cell phone related fatal accidents are including going forward. It can be safely

assumed that the figures related to fatalities represent the same conclusions.

Figure 2 illustrates cell phone related auto accidents per 100K in population in California from 1991 – 2009. The data for California represents a sampling area that is considerably larger than its counterparts even when controlling for population differences.

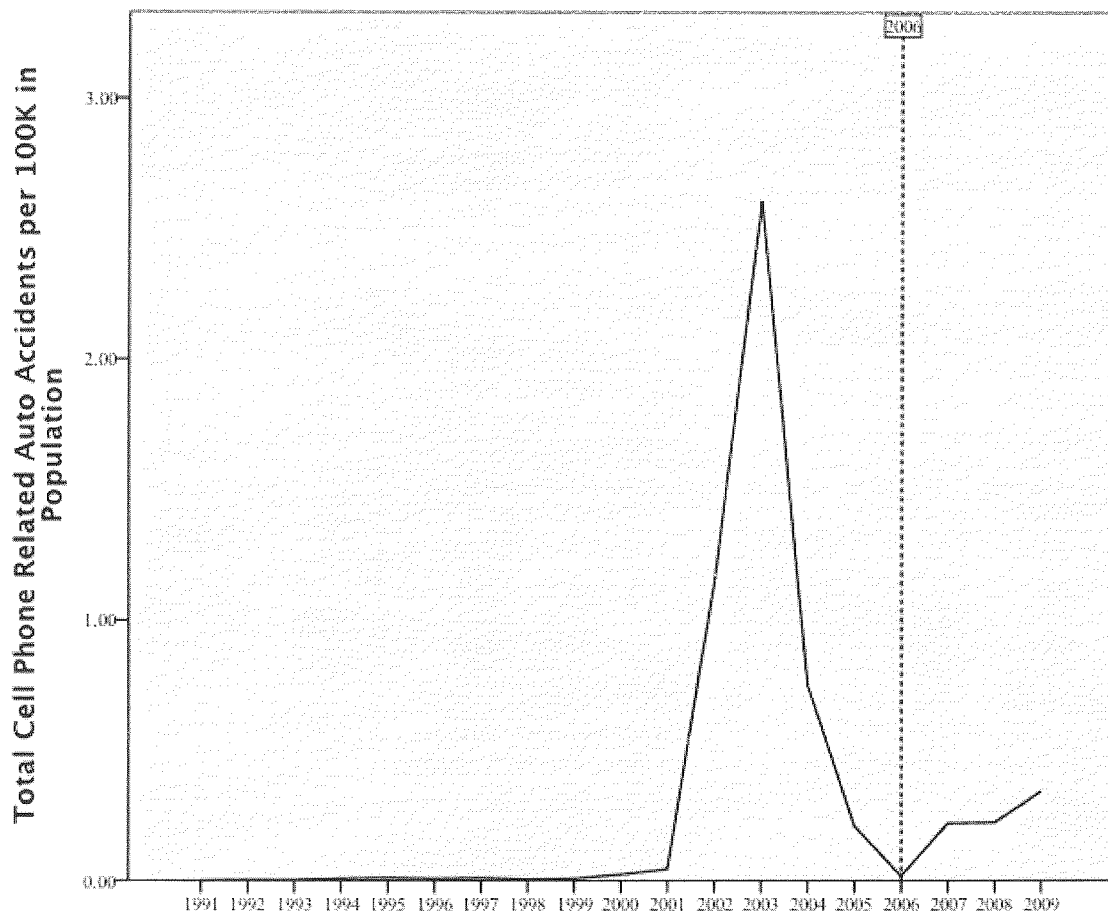


Figure 2: Cell phone Related Automobile Accidents per 100K in Population in California, 1991-2009

However, the visual aspects of the graph are similar. A peak occurs in 2003 before the accident rate begins to decline and that trend carries through the implementation of distracted driving laws in 2006. And, like earlier states, a resurgence in accidents began quickly after the suspected deterrent effect.

Figure 3 represents cell phone related accidents per 100K in population in New Jersey from 1991 – 2009. Visually, the graphs are beginning to show a trend with New Jersey not acting any different. There is, however, a recordation of cell phone related accidents as early as 1995 that may indicate better recording techniques by New Jersey law enforcement. It wasn't until 2007, however, when legislation was enacted to address those risks. And, like Connecticut and California before, a decline in cell phone related accidents occurs through the year of implementation with an increase in accidents in the years immediately following.



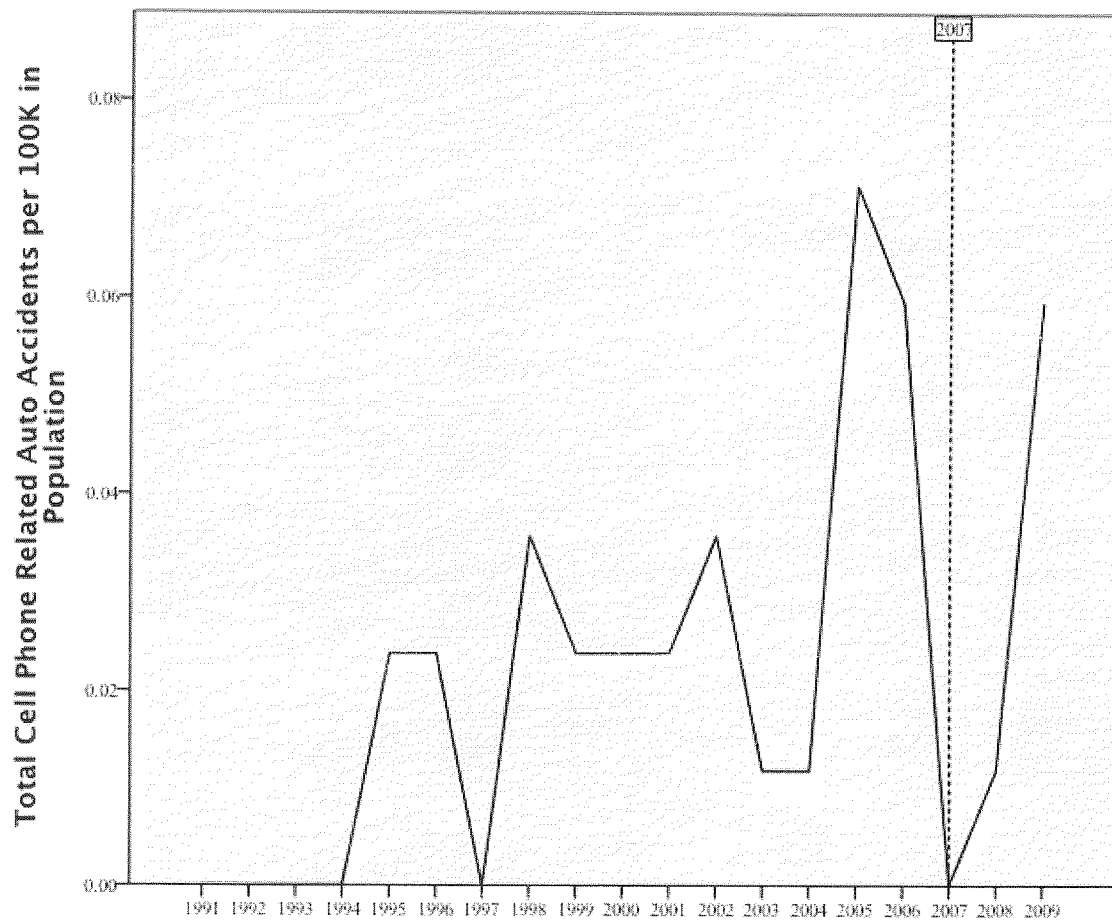


Figure 3: Cell phone Related Automobile Accidents per 100K in Population in New Jersey, 1991-2005

Five states had distracted driving laws enacted in 2008. Figure 4 represents the first of those states, Alaska. Like its predecessors above, Alaska did not register any cell phone related distracted driving accidents until around the turn of the century.

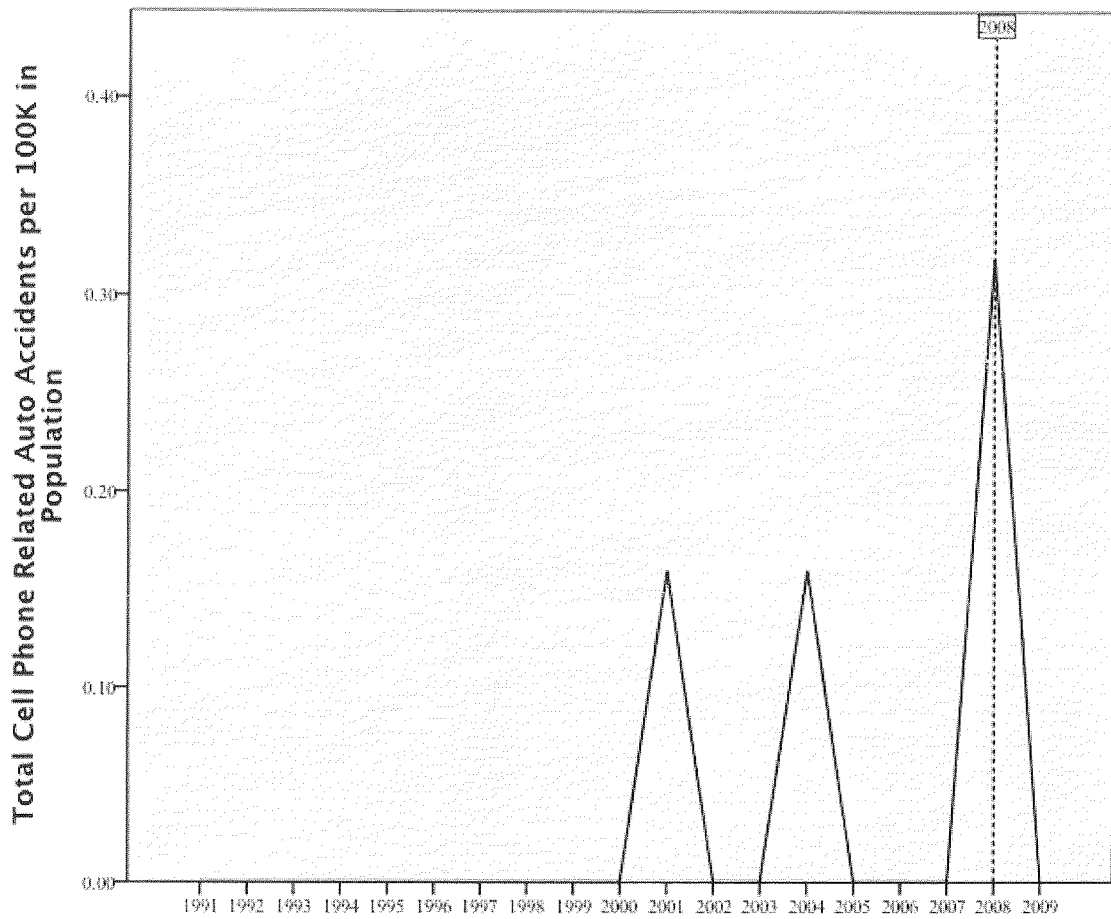


Figure 4: Cell phone Related Automobile Accidents per 100K in Population in Alaska, 1991-2005

Unlike the states above, however, Alaska sees an increase in cell phone related automobile accidents during the year in which the legislation went into affect and a decrease immediately following 2008. Although the accident rate is relatively minimal, this pattern goes against those previously set forth by three states discussed above. This sort of behavior does, however, sit inline with the hypothesis that cell phone related distracted driving laws would not prevent distracted driving accidents or fatalities.

Figure 5 illustrates cell phone related auto accidents in Louisiana per 100K in population from 1991-2009. It appears that distracted driving accidents slowly became prevalent through the '90's but really came to a head in 2004. They peaked in 2006 before declining in 2007 but increased through the implementation date of 2008 and continued to rise.

It's possible that trends like this, a decrease in accidents a few years prior to implementation but not during or after, indicate a growing awareness through the country around the mid 2000's to the dangers of cell phones and distracted driving.

As a result, a deterrent effect occurs, exists, and decays before a state even has the ability to implement its own laws. And, it's possible that by the time a law is implemented the driving population does not care.

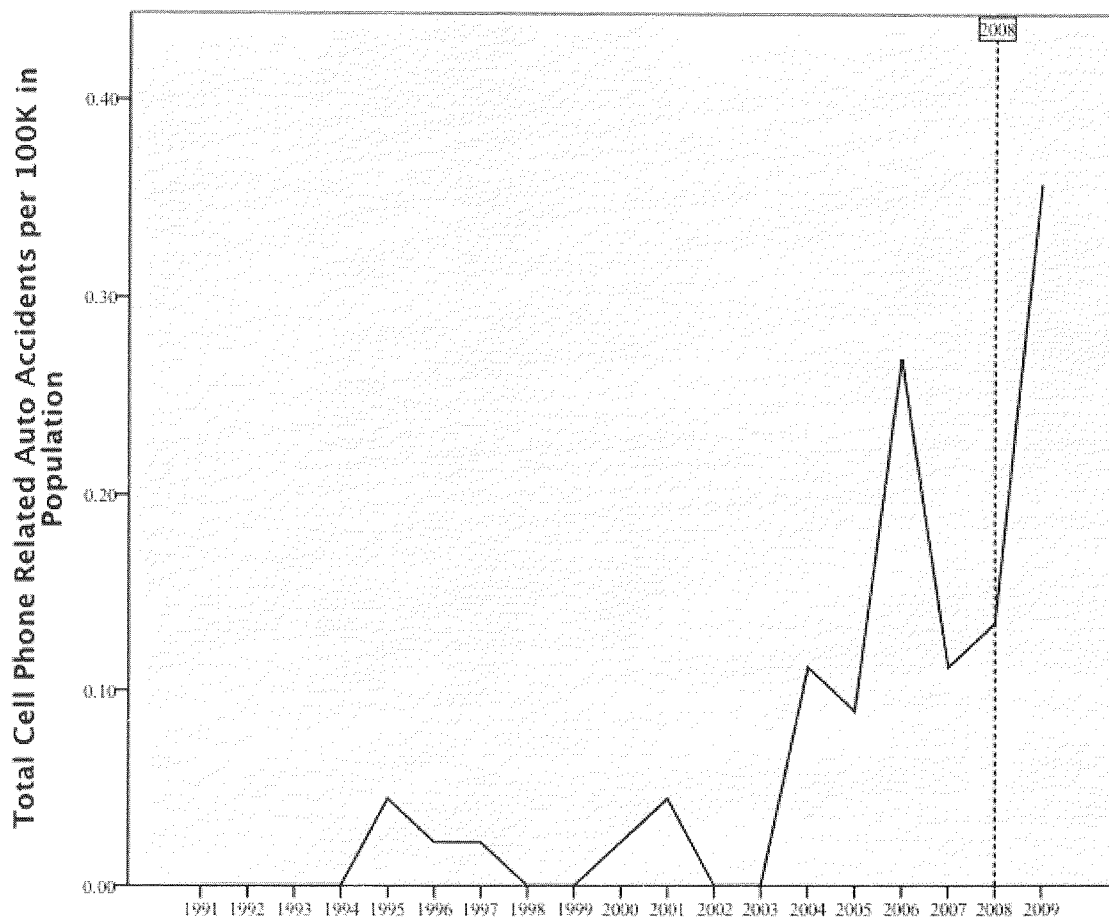


Figure 5: Cell phone Related Automobile Accidents per 100K in Population in Louisiana, 1991-2009

Figure 6 represents cell phone related accidents per 100K in population in Minnesota from 1991 – 2009. Accidents increased and peaked in 2007 and decreased in 2008 when Minnesota adopted distracted driving laws of their own. And, like a few of the states before, accidents began to rise in the year immediately following implementation.

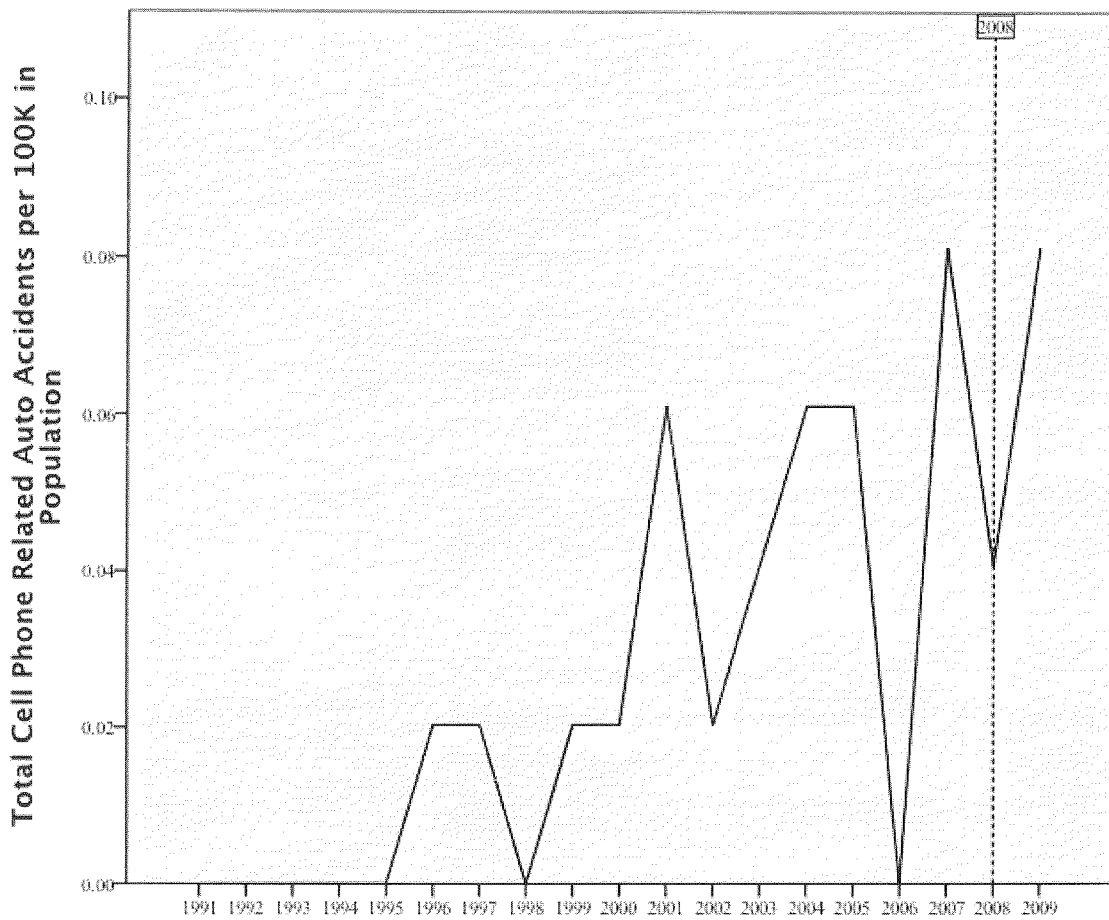


Figure 6: Cell phone Related Automobile Accidents per 100K in Population in Minnesota, 1991-2009

Figure 7 demonstrates a nearly identical pattern in Washington State for cell phone related accidents per 100K in population from 1991 – 2009. That is, light recordation in the mid ‘90’s but a steady increase of accidents in the early 2000’s led to a peak in 2007 before recording zero accidents in 2008 when Washington enacted its distracted driving legislation. Additionally, there is an immediate increase in accidents the year following.

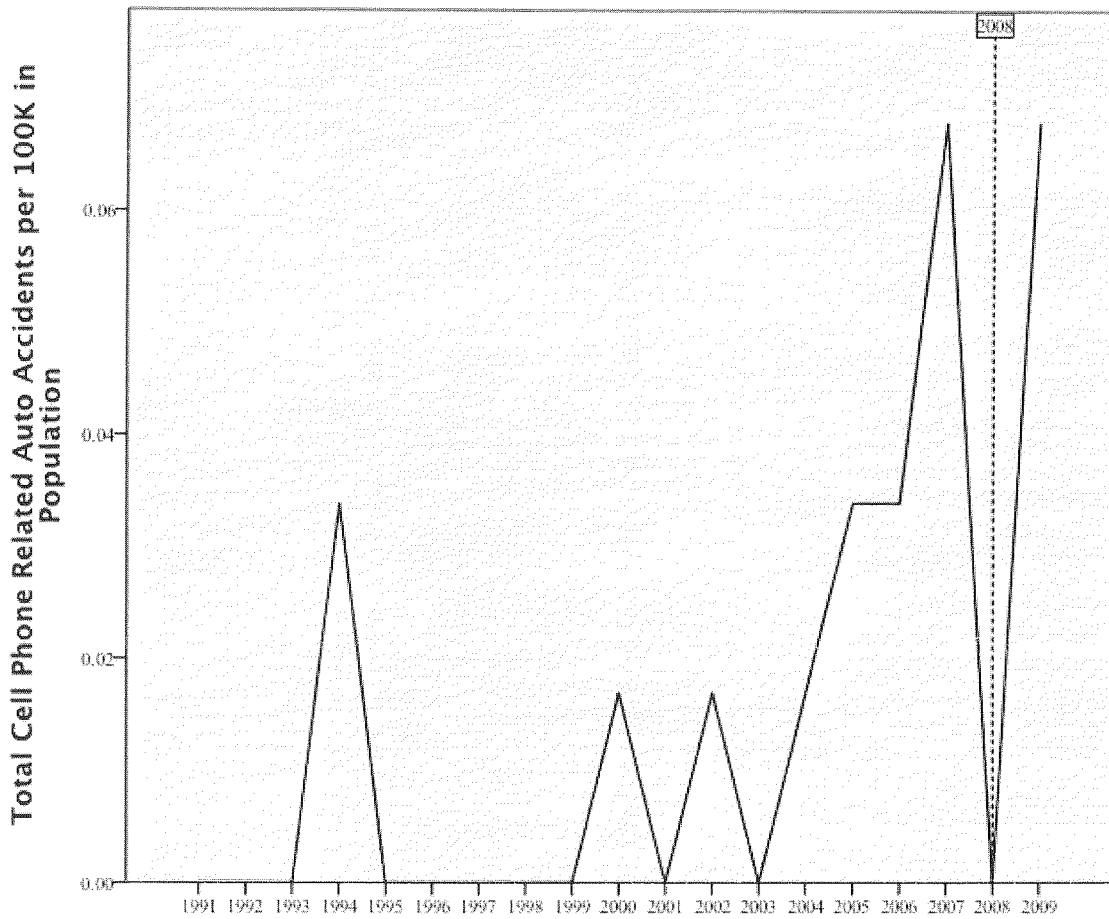


Figure 7: Cell phone Related Automobile Accidents per 100K in Population in Washington, 1991-2009

Figure 8 illustrates the impact of distracted driving laws in West Virginia on related accidents from 1991-2008. West Virginia is the last state with an implementation date of 2008 and the trends related to its effects are similar. Again, there is no recognition of cell phone related distracted driving laws before the year 2002 and a large peak in 2005 gives way to a large decrease in the years leading up to the implementation of distracted driving laws in the state.

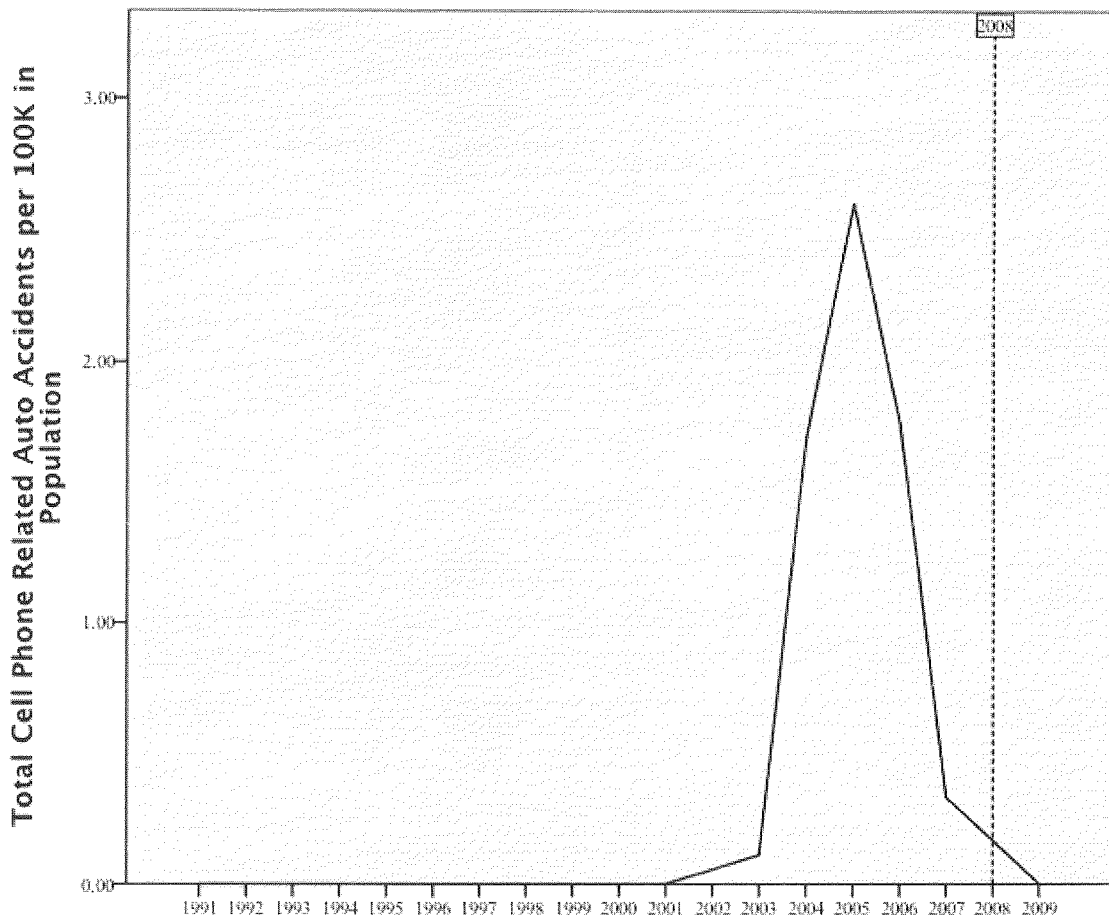


Figure 8: Cell phone Related Automobile Accidents per 100K in Population in West Virginia, 1991-2009

Figure 9 illustrates an aggregate collection of data for all 50 states with laws and without. The graph indicates a slow then sharp increase of distracted driving accidents for states without laws. Similarly, it shows a slow and sharper increase of distracted driving accidents for states with laws. For the latter group, the data peaks in 2005 before rapidly declining. The vertical line marking 2007 indicates the average year of implementation for the eight states with laws.

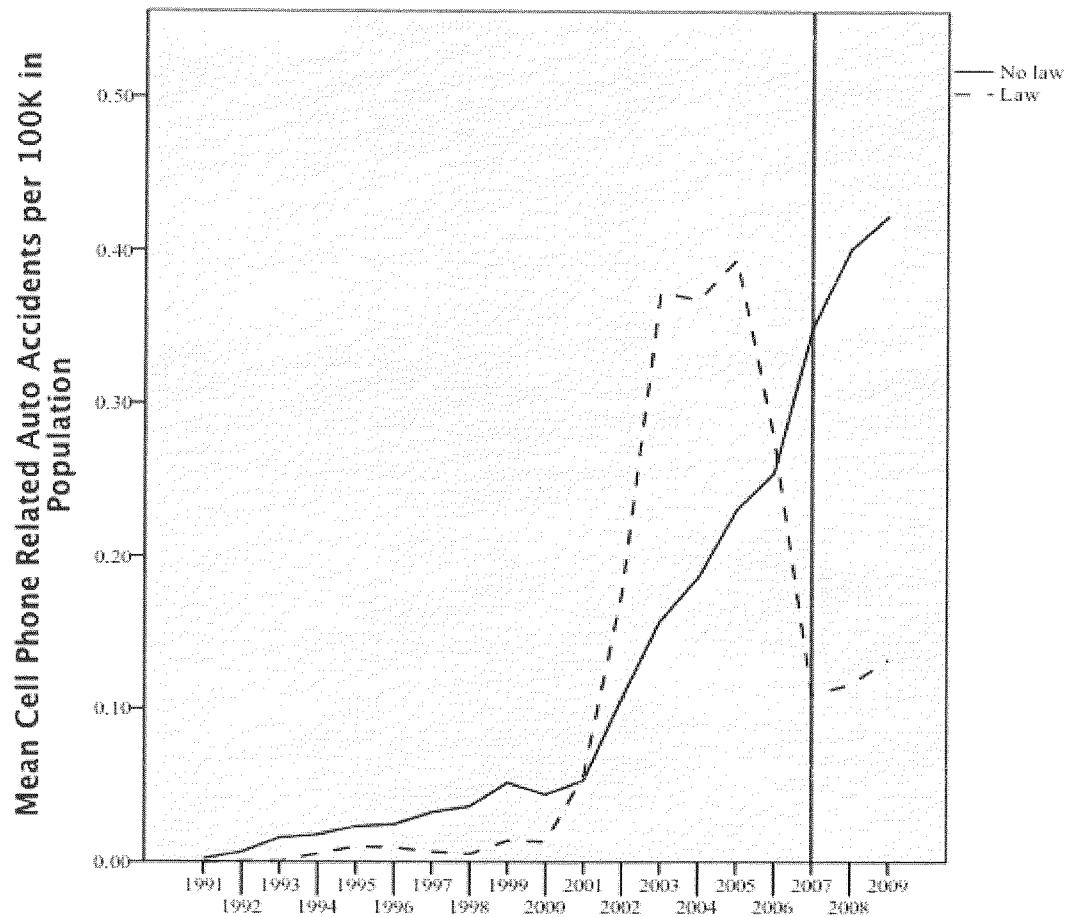


Figure 9: Mean Aggregate Distracted Driving Accidents for All States per 100K in Population Grouped by States With and Without Laws, 1991-2009

Figure 9 highlights an increase in distracted driving accidents around 2001 for both states with laws and states without. States without laws appear to have a more dramatic rise in cell phone related accidents but that figure could be skewed due to outliers in two states (Oklahoma and Pennsylvania) as reflected from the wide range in responses from Table 2. A more reasonable explanation is likely due to the explosion of



cell phone growth at the turn of the century (recall that cell phone users had increased by 114 million in just 10 years).

Analyzing whether or not a law had an impact on the rate of fatalities and accidents required two separate paired samples t-tests to compare the statistical significance of the treatment group to the control group. If a difference in before and after measurements of cell phone related auto accidents and fatalities is found to be statistically significant in the treatment group but not in the control group, I can conclude that distracted driving laws do have an effect on cell phone related auto accidents and fatalities.

The first set of analysis for the eight states that comprise the treatment group can be found in Table 5. The means for the rates of accidents and fatalities per 100K in population *decreased* from the three year pre-law observation to the one year post-law observation following the introduction of distracted driving laws (from .3998 to .0999 and .4334 to .1265 respectively). These differences equate to a decrease in means of 75% and 71% for accident and fatality rates that suggest a deterrent effect exists. However, while the difference in means might seem substantial the statistical testing indicates otherwise. For distracted driving accidents, a t-score of 1.36,  $p = .216$  is not statistically significant. These results are not enough to conclude that the difference in means from pre-law to post-law occurred due to the implementation of a new law. The same conclusion can be made regarding distracted driving fatalities. A t-score of 1.258,  $p = .249$  is not statistically significant.

Table 5: Paired Samples T-Test Examining Before and After Mean Scores for Eight States with Active Distracted Driving Laws

Paired Samples Statistics					
	Mean	N	Std. Deviation	Std. Error Mean	
Pair 1 Aggregate accidents three years before implementation of law (per 100K in population)	.3998	8	.61418	.21714	
Accidents one year after implementation of law (per 100K in population)	.0999	8	.12659	.04475	
Pair 2 Aggregate fatalities three years before implementation of law (per 100K in population)	.4334	8	.66764	.23605	
Fatalities one year after implementation of law (per 100K in population)	.1265	8	.17786	.06288	

Paired Samples Test						
Paired Differences						
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		Sig. (2-tailed)
				Lower	Upper	
Pair 1 Aggregate accidents three years before implementation of law (per 100K in pop.) vs. accidents one year after implementation of law (per 100K in pop.)	.29992	.62351	.22044	-.22135	.82119	.1361
Pair 2 Aggregate fatalities three years before implementation of law (per 100K in pop.) vs. fatalities one year after implementation of law (per 100K in pop.)	.30691	.69014	.24400	-.27006	.88388	1.258
						.216
						.249

Again, this is not enough to conclude that the intervention created any statistically significant difference between the pre-law and post-law means.

The second set of analysis (related to the test of the first independent variable) for the 42 states that comprise the control group can be found in Table 6. While controlling for populations, the means for both accidents and fatalities *increased* from the three-year pre-2007 measurement to the one-year post-2007 measurement (from .2234 to .4005 and .2607 to .4546 respectively). These differences equate to an increase of means by 79% and 74% for accident and fatality rates that suggest no deterrent effect (as expected in states with no law). However, as was the case before, the analysis indicates that this increase is not statistically significant. For distracted driving accidents, a t-score of -1.149,  $p = .257$  is not statistically significant. The same conclusion can be made about cell phone related distracted driving fatalities; a t-score of -1.137,  $p = .262$  is not statistically significant and is not enough to conclude that any statistically significant difference exists between the means of the before and after 2007 observations.

Table 6: Paired Samples T-Test Examining Before and After Mean Scores for 42 States without Active Distracted Driving Laws

Paired Samples Statistics					
	Mean	N	Std. Deviation	Std. Error Mean	
Pair 1 Aggregate accidents three years before 2007 (per 100K in population)	.2234	42	.75039	.11579	
Accidents after 2007 (per 100K in population)	.4005	42	1.59303	.24581	
Pair 2 Aggregate fatalities three years before 2007 (per 100K in population)	.2607	42	.87262	.13465	
Fatalities one year after 2007 (per 100K in population)	.4546	42	1.80626	.27871	

Paired Samples Test						
		Paired Differences				
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
					Lower	Upper
Pair 1	Aggregate accidents three years before 2007 (per 100K in pop.) vs. accidents one year after 2007 (per 100K in pop.)	-.17719	.99982	.15428	-.48875	.13438
Pair 2	Aggregate fatalities three years before 2007 (per 100K in pop.) vs. fatalities one year after 2007 (per 100K in pop.)	-.19386	1.10503	.17051	-.53822	.15049
				t	df	Sig. (2-tailed)
				-1.149	41	.257
				-1.137	41	.262

Figure 10 is a graph designed to highlight the effects of different strictness levels of laws on average auto accidents related to distracted driving. A quick glance indicates that the first level (most lenient, no law) and the second level (just one law) saw a relatively small, yet steady increase in auto accidents around the turn of the century. The third level of strictness (most strict, more than one law in place) saw the largest peak in average auto accidents and subsequently the largest drop in auto accidents after 2003. While this graph is helpful to visually understand the impacts of a law's strictness it's impossible to infer any statistical conclusion. One might proffer, however, that the graph suggests that analysis might yield results that are favorable to strictness level three in terms of statistically significant findings to support distracted driving laws.

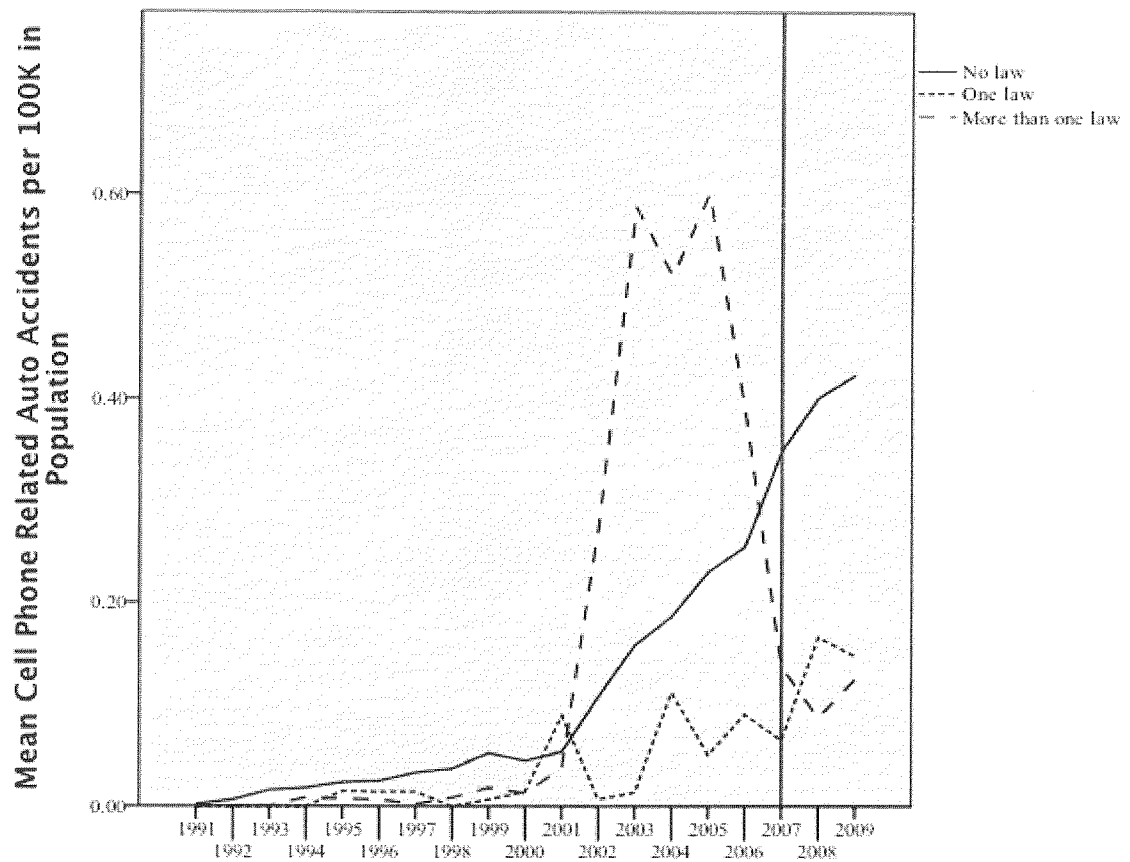


Figure 10: Mean Aggregate Distracted Driving Accidents for All States per 100K in Population Grouped by State's Strictness Level of Distracted Driving Law, 1991-2009

Table 7 illustrates the analysis of variance, used to examine differences between means before the implementation of a law and means after the implementation of a law for both accidents and fatalities divided by state strictness levels of distracted driving legislation. A result that indicates statistically significant findings in the post-law groups would signify meaningful differences exist between the means of groups subsequent to a treatment effect (i.e. implementation of state law).

Table 7: Analysis of Variance Comparing Means of Cell Phone Related Accidents and Fatalities Before and After Implementation of Laws Grouped by Strictness Level of State Law

		Sum of Squares	df	Mean Square	F	Sig.
Cell phone related accidents per 100K in population over three years before implementation of law	Between Groups	.738	2	.369	.688	.508
	Within Groups	25.199	47	.536		
	Total	25.936	49			
Cell phone related accidents per 100K in population one year after implementation of law	Between Groups	.618	2	.309	.139	.870
	Within Groups	104.149	47	2.216		
	Total	104.767	49			
Cell phone related auto fatalities per 100K in population over three years before implementation of law	Between Groups	.832	2	.416	.580	.564
	Within Groups	33.709	47	.717		
	Total	34.541	49			
Cell phone related auto fatalities per 100K in population one year after implementation of law	Between Groups	.753	2	.377	.132	.877
	Within Groups	133.958	47	2.850		
	Total	134.711	49			

With that in mind, however, none of the groups indicate a statistically significant difference between means in the post-law comparison of accidents or fatalities. While I may expect not to find a statistically significant difference in the pre-law comparisons, any treatment effect found as a result of distracted driving legislation would be highlighted in the post-law significance testing of variances between the mean scores. Because no differences exist, no further analysis is necessary to dissect differences between strictness groups. Again, no statistical significance exists and no conclusions can be drawn.

## SECTION 5: DISCUSSION & CONCLUSION

While the analysis suggests that distracted driving laws do not have any effect on cell phone related accidents and fatalities, the nature of the data and the confines of the study limit the conclusions that can be made. The reliability and validity of the data provided by FARS remains unknown and, as a result, the research is more exploratory than scientific. While these specific findings don't appear useful, valid lessons for future research can be drawn. Specifically, identifying limitations and discussing new contributions to enhance the knowledge of the topic is part of a broader contribution that can still be made.

### *Limitations*

For this thesis, the largest criticism from the relevant literature is related to the degree and implementation style of cell phone related distracted driving enforcement at the local law enforcement level. Each state has differences in policing techniques or law enforcement strategies that is unique to their region. And, as a result, the certainty-oriented aspects of deterrence may differ from region-to-region or state-to-state. This particular study is not able to investigate or compare specific certainty-oriented practices as the modern literature emphasizes as more relevant. However, as mentioned earlier, the ability to parse certainty-oriented and severity-enhancing elements of deterrence can be



difficult and the existence of a distracted driving law versus the absence of one is no different.

Furthermore, the data exposes itself to recordation critiques. As mentioned earlier, FARS is a completely voluntary census between the NHTSA and state governments. It does not appear that FARS has any enforcement properties or oversight to ensure uniformity over the data. This might lead to missing or, even worse, disproportionate or inaccurate representation of the data. For example, three states have considerably higher numbers of cell phone related accidents and fatalities. The lack of a central reporting method lends to the possibility of differences between states in the style, detail, and efficiency of recordation. It's quite possible that some states log an accident as "distracted driving" (if that) and never identify the root cause of distraction. Even the data provided by the NCSA warns that significant increases between state values may simply suggest improved reporting methods and do not indicate an accurate or proportional figure to comparable states.

Additionally, the internal validity of the study, which establishes causal relationships, is weaker than originally desired. While the control group included in the design setup aids in eliminating alternative explanations, due to the non-equivalent nature of the treatment and comparison groups as well as the already established limitations of longitudinal studies of severity-enhancing laws (Nagin, 1998), not all alternative explanations can be controlled for. For one, states could have more city miles of road versus highway miles of roads and these nuances may prove vital in relationships related to distracted driving. As Durlauf (2011) said, "Policy research should be more sensitive

to heterogeneity and move away from the idea that policy effects are constant across jurisdictions. [...] Evidence that a given policy is efficacious in one jurisdiction but not in another is not a mark against the policy. Rather, such evidence means that local context matters for policy efficacy (p. 43). Any future studies will need to establish more equivalent groups via the data or procedures used.

Sherman (1990), Lunde, William, and Womack (1991) and Cohen and Einav (2003) helped identify deterrence decay as an added element to deterrence research. As discussed previously, I controlled for decay by customizing averages around the years when laws were enacted in each state; similar to the Cohen and Einav (2003) study. For this study, those averages are made up of a three-year pre-law and one year post-law observations. For eight states, with laws in place before 2009, observations shifted based on the year a law comes into effect. For 42 states, without laws, observations consistently revolved around 2007 and the three years before are averaged together for a pre-law observation and 2008 was used as the post-law observation. This will help segregate residual or transferring effects of decay between states but it may not address an overarching theme of decay. Because of the differences in time periods and different years in which laws went into affect, states with laws enacted around the mid-2000's will create a deterrent effect for other states without laws. And, that effect could already be dissipated by the time the latter state enacts laws. If so, it could be impossible to measure levels of deterrence surrounding the implementation of a law because any measurable level of such has come and gone.

Uncontrollable extraneous factors that could manipulate the results were also discussed in the review of Lund, William, and Womack (1991) and Cohen and Einav (2003). It is quite possible that public campaigns and/or state advertisements may play an additional role in deterring individuals. Sherman (1990) even offered support to demonstrate that publicity was relevant to deterrent effects. In his study, relative to the Georgetown parking and crime crackdown, he showed that over half of the surveyed population believed that a crackdown was still in full force when it had in fact been over for a month (Sherman, 1990). With that in mind, it's quite possible that congruently run public campaigns raising awareness on distracted driving laws or speaking on the dangers of distracted driving had more of a deterrent effect than the laws themselves. This study was not able to control for those variables.

My initial aim was to control for state spending relative to advertisements; however, no single monetary figure can be attributed to an ad campaign. Often, political spending is earmarked and money is distributed across a number of different ventures. As a result, finding any specific figures is not reasonable.

Furthermore, the external validity of the study is worse than originally believed. While the data takes into account all 50 states, the treatment group only makes use of eight states. Because 38 states currently have distracted driving laws in place it was initially believed that all 38 states would be part of the treatment group. However, because the data in hand only went to 2009, the only way to create a post-law observation was to include only states whose laws were created in 2008 or earlier. Unfortunately, 30 states have laws that were created in 2009 or later. As a result, they were treated as states

with no laws in place, and the generalizability of the study is called into question due to an inadequate size of the treatment group. Additionally, the differences in sample sizes calls into question the results due to the methods used. Comparing a small group of eight states to a group of 42 states makes the use and results of any t-test difficult to interpret. Again, more equivalent groups will need to be established in future research.

### *Future Research*

The literature review showed certainty-oriented aspects of deterrence are proven elements to effective deterrence. As a result, researchers need data that reflects certainty-oriented tactics of law enforcement for distracted driving to make any useful conclusions. One suggestion might be to compare states with primary enforcement versus states with secondary enforcement of distracted driving laws. Or, it could mean questioning the perceptions of drivers when they are ticketed for such infractions. Knowing their mindset may allow researchers a glimpse into why the action took place in the first place. As Nagin said, “Unless the perceptions themselves are manipulable by policy, the desired deterrent effect will not be achieved” (Nagin, 1998, p. 5). Obviously, the latter of these two suggestions is harder to carry out logistically but these are the innovative and out-of-the-box ideas that researchers need to consider to make real conclusions about distracted driving laws as an efficient, certainty-oriented deterrent. What can absolutely be deduced from this study is that more data, in general, is needed. This research showed that, albeit not statistically significant, the direction and magnitude in percent changes of means is suggestive. Thirty states had distracted driving legislation go into effect after 2008 and more states included in a treatment group study will expose truths related to distracted

driving laws and deterrence effects on accidents and/or fatalities. The addition of this data will lead not only to better methodological practices but, ultimately, more sound conclusions.

For that data to ever be collected, further attention needs to be paid to state and local collection efforts of relevant crash data going forward. Although these metrics are usually left up to the state or local municipality to decide, if scholars ever want to examine the effect of distracted driving behavior, then some measurement of distracted driving should be notated at the scene.

Future research must also examine aspects of deterrence decay. While this study showed no statistically significant evidence related to deterrence, I believe a replicated study with better data could prove otherwise. Eight states were examined in the treatment group but reported numbers of cell phone related accidents and fatalities declined in six of them the year a law went into effect. Additionally, in the majority of cases, the reported number of accidents and fatalities increased the year immediate following implementation. If I assume for a moment that a replicated study with more up-to-date data shows deterrence, it's quite plausible to conclude that it may also show immediate effects of deterrence decay. Changing policies to address deterrence decay isn't an easy task but repeated crackdowns and public awareness campaigns are just two possible policy implications that may let the public know that law enforcement hasn't given up. Longitudinal studies, as used by Sherman (1990) proved to be effective in identifying initial effects of deterrence and longer post-law periods could be measured to identify long-term effects of deterrence and the possibility of decay.

Besides observing and researching certainty-oriented aspects of deterrence, law enforcement agencies, policy makers, etc. must begin by adapting their day-to-day operational behavior to have any real effect on distracted driving. As mentioned earlier, this may include shifting hand held cell phone use or texting while driving from secondary infractions to primary infractions. In sum, police cultures need to be examined more closely to determine if they believe these changes are worthwhile and important.

Recall that Schwartz and Orleans (1967) and Wenzel (2004) concluded that an appeal to one's own conscience and the use of a "socially mediated deterrence" among friends and family is a very effective deterrent when coupled with certainty-oriented aspects. Public awareness campaigns could create a level of shame associated with texting while driving or could create a level of disappointment if their friends and family members found out.

Lastly, while this study attempts to examine severity-enhancing aspects of deterrence as they apply to distracted driving legislation, it is very difficult to disentangle severity of a law from certainty-oriented enforcement. Enacting a new law (as was the case with the treatment group) implies that a new level of severity-enhancing deterrence exists but it simultaneously implies that a level of certainty-oriented deterrence exists now too. Future research needs to make better attempts at parsing these two elements to better understand how deterrence applies to distracted driving. One way to do so might include studying specific levels of severity-enhancing techniques by examining the punishments of the laws themselves (i.e. cost of citations, loss of license, etc.). While this

doesn't address the overlapping issues of both elements it does emphasize one concept more clearly.

In conclusion, deterrence research is never easy. But even an exploratory exercise in research that doesn't exemplify ideal empirical tests can be useful in exposing holes for future research. The mean rates of accidents and fatalities within all 50 states are divided between Table 5 and Table 6. And, tests suggest a decline in mean accidents and fatalities for those states with laws and a rise in mean accidents and fatalities for those states without laws. However, the statistical significance indicated that no relationship exists between distracted driving laws and distracted driving accidents and/or fatalities. And, although I identified a number of weaknesses within the study, the conclusion is the result of the best possible resources at my disposal.

In sum, more work is needed. Deterrence research has come a long way to prove that certainty-oriented practices work but deterrence research related to distracted driving is just a few years old. Only 20 years ago did scholars first begin to realize that cellular telephones could impact the way an individual drives and that's when telephone ownership was estimated at just two million. Since then, 280 million more cell phones users have been put into existence and with growing social uses and mobile business at your fingertips the temptation to multi-task, especially while driving, is everywhere. As social scholars, we have a moral obligation to determine if a given law, program, intervention, etc. is harmful or helpful to the social world. If we decide that a law isn't helping and accident or fatality rates are increasing, might we conclude that they are just

as harmful? Only time will tell; but we need to take better steps to arrive at more sound conclusions.



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## CURRICULUM VITAE

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