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Assessing the long term benefit of banning the use of hand-held wireless devices while driving

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ABSTRACT

An increasing number of legislative efforts have been undertaken to prohibit the use of hand-held wireless devices while driving. As of July 2012, ten states and the District of Columbia enforce laws banning the use of hand-held cell phones while driving. Thirty-nine states and the District of Columbia have banned text messaging while driving. Recent studies of driver behavior suggest that hand-held wireless device usage negatively impacts driver performance. However few studies at the aggregate level address the plausible link between the use of hand-held wireless devices while driving, increased risk of automobile accidents, and government legislative efforts to reduce such risk. This paper analyzes data at the aggregate level and builds a regression model to estimate the long term accident rate reduction due to a hand-held ban. This model differs from previous studies, which consider short term accident rate reduction, by considering time trends in the accident rate due to the ban. Additionally, counties considered in this analysis are placed into groups based on driver density, defined by the number of licensed drivers per centerline mile of roadway, and a separate analysis is performed within these groups. This approach allows one to better quantify the effect of hand-held bans in counties of different driver densities. Results from this paper suggest that bans on hand-held wireless device use while driving reduce the rate of personal injury accidents in counties with high levels of driver density, but may increase accident rates in counties with low driver density levels. These results can inform transportation policymakers interested in reducing automobile-accident-risk attributable to the use of hand-held wireless devices while driving.

1. Introduction

The rapid growth in hand-held wireless device usage while driving in the United States has led to growing public concern regarding their impact on driver performance and road safety. According to CTIA – The Wireless Association (2011), as of December of 2010, the number of wireless subscriber connections in the United States exceeded 302.9 million. The number of wireless subscriber connections has increased steadily since 1995 and the 302.9 million connections in 2010 represent 0.98 subscriber connections per person, which is a ninefold increase in subscriber connections since 1995. Text messaging activity has also increased rapidly since 2005, from an estimated 85 billion text messages sent in 2005 to an estimated 2 trillion texts sent in 2010 (CTIA – The Wireless Association, 2011). According to a phone survey conducted by Boyle and Lampkin (2008), 81% of drivers admitted to carrying a cell phone with them when driving, and of those drivers, 64% usually

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or always answer incoming phone calls. The same study found that among those 81% of drivers who carry a cell phone, 16% admit to talking on their phone during most of their trips and an additional 17% admit to talking during at least half of their trips. These statistics suggest that cell phone use has increased dramatically since 1995 and the proportion of those users who use their wireless devices while driving is substantial.

In this paper, the term *hand-held wireless device* refers to all hand-held wireless devices, including cell phones, and the term *hand-held ban* refers to a ban on the use of these hand-held wireless devices. Some studies referenced in the paper refer specifically to cell phones, and hence, when discussing these studies, the term *hand-held cell phone* refers to all mobile telephones which are not classified as hands-free devices. As hand-held wireless device use while driving is a frequent occurrence, the effect of this behavior on driving ability has been the focus of several observational and simulation-based studies. These studies suggest that using a hand-held wireless device while driving impairs driving ability and results in an increased accident risk. In one study conducted by the National Highway Transportation Safety Association, subjects operating a driver simulator were given the following tasks to perform with and without concurrently using a hand-held cell phone: car following, lead-vehicle braking, lead-vehicle cut in, and merging. They observed that hand-held cell phone use while driving impairs driver performance, increases response time to lead-vehicle speed changes during car following, and degrades automobile control (Ranney, 2005).

In a study conducted by Klauer (2006), cameras were placed in the cars of 100 selected drivers and behavior and accident rates were observed over the course of almost 43,000 vehicle hours. The observed rate of crashes and near-crashes, as compared to the rate with no driver distraction, is 180% greater while dialing a hand-held cell phone, 30% greater when talking on a hand-held cell phone and 40% greater while reaching for a hand-held cell phone, though only the increase due to dialing a hand-held cell phone was found to be statistically significant. These observational studies suggest that hand-held wireless device usage while driving results in distracted driving. This claim is supported by the National Highway Transportation Safety Association as they classify hand-held wireless device use while driving as a type of distracted driving (United States Department of Transportation, National Highway Traffic Safety Administration, 2012). In the observational study conducted by Klauer (2006), distracted driving was estimated to contribute to 23% of all crashes and near-crashes. Dialing and talking on a hand-held cell phone, two types of distracted driving, each contributed to 3.6% of all crashes and near-crashes. For each accident reported in the study, driver behavior was noted only for the driver participating in the study. Other drivers involved in accidents with the participants in the study may be using their hand-held cell phone when the participant is not, and hence, 7.2% may be an underestimate for the percentage of accidents that occur while a driver is using a hand-held cell phone.

Due to the concern that hand-held cell phone use increases driver distraction, every state in the United States has considered a ban on the use of hand-held cell phone while driving (Sundeen, 2003). As of June 2012, ten states have enacted bans which prohibit all drivers from using hand-held cell phones while driving: New York in 2001, Connecticut in 2005, California, New Jersey, and Washington in 2008, Maryland and Oregon in 2010, Delaware in 2011, and Nevada and West Virginia in 2012 (United States Department of Transportation, National Highway Traffic Safety Administration, 2012). In order for a statewide ban to be effective in reducing the accident rate, drivers must comply with the ban by forgoing all hand-held cell phone use while driving. The *compliance rate* of a ban is defined as the percentage of drivers that used a hand-held wireless device while driving during the pre-law period that do not use their hand-held wireless device in any way while driving during the post-law period. Measuring the compliance rate in the period immediately following the ban and in the subsequent years is important to determine the effectiveness of the statewide ban.

Only a handful of studies have estimated the compliance rate with statewide hand-held bans. In an observational study conducted in New York and Connecticut, researchers note that the hand-held wireless device usage rate in New York, which began enforcing a hand-held ban in November 2001, decreased from 2.2% in 2001 to 1.1% in 2002 after the hand-held ban was passed but returned to near pre-law levels at 2.1% in 2003 (McCartt and Geary, 2004). Drivers observed in the same study in Connecticut, where no ban existed at the time, had their usage rates change from 2.9% in 2001 to 2.9% in 2002 to 3.3% in 2003. The authors of this study concluded that after a brief period of compliance with the ban that drivers returned almost completely to their pre-law period behaviors. The study does not include any observations after the two year period following the enactment of the law. A later study using similar methodology concluded that the usage of hand-held cell phones in 2008 in New York was 24 percent lower than usage would have been without the ban (McCartt et al., 2010). Neither study made observations in counties with high driver density, which are shown in this paper to be counties in which the hand-held ban is most effective. The combined results of these two studies suggest that the compliance rate may take years to differ significantly from zero. Therefore, analysis to determine the effectiveness of hand-held bans must consider the accident rate for several years following enforcement of the ban.

Studies conducted by Nikolaev et al. (2010) and Sampaio (2010) considered the long term effects of a statewide hand-held ban in New York on the accident rate. In Nikolaev et al. (2010), personal injury and fatal accident data from the state of New York were analyzed and the authors concluded that both the average fatal injury accident rate and the personal injury accident rate were significantly lower in the *post-law period*, the years 2002–2008, compared with in the *pre-law period*, the years 1997–2001, in most New York counties. A two sample *t*-test was performed for each county that compared the average personal injury accident rate in the pre- and post-law periods. Counties with more licensed drivers per square mile also exhibited larger *t*-statistics, suggesting that the ban may have been more effective in counties with higher driver density. However, the decrease in personal injury accidents attributed due to the hand-held ban may be the result of unknown factors that decrease accident rates over time.