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Research Note

Driver hand-held cellular phone use: A four-year analysis

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Abstract

Introduction: The use of hand-held cellular (mobile) phones while driving has stirred more debate, passion, and research than perhaps any other traffic safety issue in the past several years. There is ample research showing that the use of either hand-held or hands-free cellular phones can lead to unsafe driving patterns. Whether or not these performance deficits increase the risk of crash is difficult to establish, but recent studies are beginning to suggest that cellular phone use elevates crash risk. *Methods:* The purpose of this study was to assess changes in the rate of hand-held cellular phone use by motor-vehicle drivers on a statewide level in Michigan. This study presents the results of 13 statewide surveys of cellular phone use over a 4-year period. Hand-held cellular phone use data were collected through direct observation while vehicles were stopped at intersections and freeway exit ramps. Data were weighted to be representative of all drivers traveling during daylight hours in Michigan. *Results:* The study found that driver hand-held cellular phone use has more than doubled between 2001 and 2005, from 2.7% to 5.8%. This change represents an average increase of 0.78 percentage points per year. The 5.8% use rate observed in 2005 means that at any given daylight hour, around 36,550 drivers were conversing on cellular phones while driving on Michigan roadways. The trend line fitted to these data predicts that by the year 2010, driver hand-held cellular phone use will be around 8.6%, or 55,000 drivers at any given daylight hour. *Conclusions:* These results make it clear that cellular phone use while driving will continue to be an important traffic safety issue, and highlight the importance of continued attempts to generate new ways of alleviating this potential hazard.

Keywords: Mobile phone; Traffic safety; Distraction; Direct observation; Crashes

1. Introduction

The use of hand-held cellular (mobile) phones while driving has stirred more debate, passion, and research than perhaps any other traffic safety issue in the past several years. In part, the debate centers on the risk posed by use of cellular phones by drivers. There is ample research showing that the use of either hand-held or hands-free cellular phones can lead to unsafe driving patterns. Indeed, studies in both simulators (e.g., McKnight & McKnight, 1993; Serafin, Wen, Pailke, & Green, 1993; Strayer, Drews, & Johnston, 2003) and on-the-road (Brookhuis, de Vries, & de Waard, 1991; Tijerina, Kiger, Rockwell, & Tornow, 1995) have shown that dialing the phone and certain types of conversations can distract the driver, degrading his or her performance on tasks that are important for safe driving. Whether or not these performance deficits increase the risk of crash is difficult to establish, but recent studies are beginning to suggest that cellular phone use elevates crash risk (Redelmeier & Tibshirani, 1997; McEvoy et al., 2005).

These results have led Connecticut, New York, New Jersey, and the District of Columbia to ban the use of hand-held cellular phones while driving on a jurisdiction wide level (Insurance Institute for Highway Safety [IIHS], 2005). Five additional states have bans in specific localities within those states. Additionally, 10 states and the District of Columbia restrict the use of hand-held cellular phones by novice drivers in the graduated licensing system (IIHS).

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These laws have been controversial because they are difficult to enforce and because hands-free cellular phone use, which has been shown to be equally distracting, is excluded. In addition, analyses of distraction-related crashes in national databases have shown that other distractions, such as interacting with another vehicle occupant, eating/drinking, and adjusting the vehicle controls, are much more frequent than use of a cellular phone in distraction-related crashes (see e.g., Eby & Kostyniuk, 2004; Stutts, Reinfurt, & Rodgman, 2001).

Indeed, direct observation studies of cellular phone use have shown that a relatively small percentage of the driving population engage in hand-held cellular phone conversations at any given daylight time. The 2004 National Occupant Protection Use Survey (NOPUS) found 5% of U.S. drivers using hand-held cellular phones (Glassbrenner, 2005). Use rates of 5% or less have been found in several American states (Eby & Vivoda, 2003, 2005; McCartt, Braver, & Geary, 2003; Reinfurt, Huang, Feaganes, & Hunter, 2001), the United Kingdom (Johal, Napier, Britt-Compton, & Marshall, 2005), and Australia (Horberry, Bubnich, Hartley, & Lamble, 2001).

These rates, however, may not be static. According to wireless industry trends (Deloitte Touche Tohmatsu, 2005), wireless subscriptions (of which cellular phones comprise the vast majority) have been increasing steadily each year and are projected to reach two billion worldwide by the end of 2005. What effect will the increase in cellular phone subscriptions have on the use of cellular phones while driving? The purpose of this study was to analyze statewide driver cellular phone rates in Michigan from 2001 to 2005 in order to evaluate changes in use rates.

2. Methods

We conducted 13 statewide surveys of driver hand-held cellular phone use in Michigan between August 2001 and September 2005. All survey waves in this study used the same sample design and methods. The sample design was closely based upon one used by Streff, Eby, Molnar, Joksch, and Wallace (1993). The objective of the sample design was to select observation sites that accurately represent front-outboard vehicle occupants in eligible vehicles in Michigan (i.e., commercial and non-commercial passenger cars, vans/minivans, sport-utility vehicles, and pickup trucks), while following federal guidelines for safety belt survey design (National Highway Traffic Safety Administration [NHTSA], 1992, 1998).

To begin, all 83 Michigan counties were rank ordered by population (U.S. Census Bureau, 1992) and the low population counties were eliminated following federal guidelines. The resulting sample space consisted of 31 counties (comprising about 85% of Michigan's population) that were then separated into four strata based upon historical belt use rates and vehicle miles of travel (VMT). To achieve the required precision of less than 5% relative error, and to ensure an adequate representation of belt use for each day of the week and for all daylight hours, the number of necessary observation sites was determined to be 168. Because total VMT within each stratum was roughly equal, observation sites were evenly divided among the strata (42 each), and proportionately divided between limited-access roadway exit ramps and surface street intersections based upon estimates of Michigan VMT by roadway type (10 limited-access; 32 surface street intersections per stratum).

This sample design was constructed so that each observation site was self-weighted by VMT by selecting sites with equal probability, and by setting the observation interval to a constant duration for each site. Within each stratum, observation sites were randomly selected. The day of week and time of day for site observation were randomly assigned to sites in such a way that all days of the week and all daylight hours had essentially equal probability of selection. The sites were observed using a clustering procedure. The day in which the cluster was to be observed was randomly determined.

Data collection for each survey wave involved direct observation of driver hand-held cellular phone and safety belt use, as well as estimated age and sex of those drivers traveling in eligible vehicles during daylight hours. The data collection periods for the 13 surveys can be found in Table 1. Observations were conducted when a vehicle came to a stop at a traffic light or a stop sign.

Observation sites in the sample were visited by one observer for a period of one hour. To address security concerns, sites in and adjacent to Detroit were visited by two-observer teams for 30 minutes. For all sites, observers were instructed to observe vehicles in only the lane immediately adjacent to the curb regardless of the number of lanes present. Observations began immediately after completion of a five-minute count of all eligible vehicles traveling on the traffic leg under observation, and continued for 50 minutes at sites with one observer, and 25 minutes at sites with two observers. At one-observer sites, a second five-minute vehicle count followed the 50-minute observation period.

Prior to the beginning of data collection for each survey, field observers participated in several days of training including both classroom review of data collection procedures and practice field observations. After intensive review of the procedures manual, observers conducted practice observations at several sites. Each observer was paired with every other observer and practiced recording safety belt use, sex, age, vehicle type, and cellular phone use until there was an inter-observer reliability of at least 85% for all measures for each pair of observers. To ensure proper data collection, each observer was spot checked in the field on at least three occasions per survey wave by the field supervisor.

Driver hand-held cellular phone use rates were calculated by weighting the data for each site by a factor based upon the vehicle counts and the number of vehicles observed. Weighted values were used in all analyses to obtain rates