

**Long-Term Effects of Hand-Held Cellphone  
Laws on Driver Hand-Held Cellphone Use**

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## **ABSTRACT**

**Objectives:** As of September 2009, seven US states and the District of Columbia (DC) ban driving while talking on a hand-held cellphone. The current study examined the long-term effects of such bans on driver use of hand-held phones in DC, New York State, and Connecticut.

**Methods:** The percentage of drivers talking on hand-held cellphones was measured over time based on daytime observation surveys in the three jurisdictions with bans and in comparison jurisdictions without bans. Trends in phone use rates over time were modeled using Poisson regression to estimate differences between actual rates and rates that would have been expected without a ban.

**Results:** The ban in DC immediately lowered the percentage of drivers talking on hand-held cellphones by 41%. Nearly 5 years after the ban, the phone use rate was 43% lower than would have been expected without the ban. Cellphone use in Connecticut declined an estimated 76% immediately after the ban; 3½ years later, phone use was 65% lower than would have been expected without a ban. In New York, cellphone use declined an estimated 47% immediately after the ban; when measured more than 7 years later, phone use was 24% lower than would have been expected without the ban. Fifteen months after the laws took effect, compliance in New York was lower than in DC, and the difference appeared due to more intensive enforcement in DC. However, this linkage is no longer clear because enforcement in New York has picked up such that levels of enforcement in 2008 appeared comparable in DC and New York, whereas enforcement in Connecticut lagged behind. In all of the jurisdictions, the likelihood was low that a driver violating the ban would receive a citation, and there were no publicized targeted enforcement campaigns in any of the three jurisdictions.

**Conclusions:** Jurisdictional bans on driver use of hand-held cellphones have reduced hand-held phone use and appear capable of maintaining reductions for the long term. However, it is unknown whether overall driver phone use has been reduced because many drivers may have switched to hands-free devices. Further research is needed to determine whether the reductions in hand-held cellphone use have reduced driver crash risk.

**Keywords:** Cellphones; Hand-held cellphones; Cellphone driving laws

## INTRODUCTION

Surveys of US drivers indicate that many are talking on cellphones. Observational surveys conducted by the National Highway Traffic Safety Administration (NHTSA) at intersections controlled by stop signs or stop lights indicate that, at any given time during daylight hours in 2008, 6% of drivers were talking on hand-held phones; this was double the rate observed in 2000 (Glassbrenner, 2005; NHTSA, 2009). This means that about 812,000 passenger vehicle drivers on the road at any given daylight moment in 2008 were talking on hand-held phones. The phone use rate for the youngest drivers estimated to be ages 16-24 was 8%, significantly higher than the use rates for drivers estimated to be ages 25-69 (6%) or 70 and older (1%). The rate of visible headset cellphone use was 0.6%, and the rate of visible manipulation of hand-held devices was 1%. Precise measurements of hands-free cellphone use cannot be obtained through observation surveys, but many drivers report using hands-free phones in telephone surveys (Boyle and Lampkin, 2008; Harris Interactive, 2006; Nationwide Insurance, 2008).

A large body of research has addressed the risk of talking on a cellphone while driving (McCartt et al., 2006a). Two controlled epidemiologic studies directly linked talking on a cellphone to increased crash risk. It is important that studies of crash risk verify the phone use of crash-involved drivers independent of police crash reports or driver self-reports, which are unreliable sources of information. One source for verifying phone use is cellphone company billing records. Such records have been unavailable in the United States, but studies conducted elsewhere have found a fourfold increase in the risk of a property-damage-only crash associated with cellphone use (Redelmeier and Tibshirani, 1997) and a fourfold increase of a crash serious enough to injure the driver (McEvoy et al., 2005). The increase in crash risk did not differ significantly between male and female drivers or between younger and older drivers, and the increased risk was similar for hand-held and hands-free phones. The studies were unable to estimate crash risk from different types of hands-free devices. Nor were they able to determine whether there was any benefit associated with hands-free devices while placing a call.

A review of more than 120 cellphone studies reported that experimental studies found impairment in simulated or test-track driving performance measures among users of hand-held and hands-free cellphones (McCartt et al., 2006a). Phone conversation tasks typically decreased reaction times and increased lane deviations and steering wheel movements. Statistical analyses that aggregated the

results of multiple studies reported similar findings (Caird et al., 2008; Horrey and Wickens, 2006). There are fewer experimental studies of the effects of dialing on performance measures, and the evidence is mixed with regard to whether hands-free dialing is less impairing than manual dialing (Jenness et al., 2002; McCartt et al., 2006a; Schreiner, 2006).

Other evidence comes from “naturalistic” research involving drivers observed in their own vehicles that are outfitted with cameras and other technologies. In a study of 100 vehicles monitored for about a year, cellphone use was a common source of driver distraction (Klauer et al., 2006). The odds of an at-fault near-crash/crash was 2.8 times higher when dialing a hand-held device than when phones were not being used; the odds when talking on a hand-held phone was 1.3 times higher, a nonsignificant increase. However, the sample of crashes was small and only a few were serious enough to be reported to police.

There is growing concern about the dangers of text messaging while driving. A 2008 survey of drivers found that 40% of drivers 30 and younger who own cellphones said they send or read text messages while driving (Nationwide Insurance, 2008). There has not been a lot of research on texting and driving, but two studies of young drivers found that receiving, and especially sending, text messages led to decrements in simulated driving performance, particularly lane keeping and reaction time (Hosking et al., 2006; Reed and Robbins, 2008). A soon-to-be-released naturalistic study reports a 23-fold increase in the risk of crashing, nearly crashing, traffic conflicts, or drifting from the driving lane among truckers who texted while they drove (Hanowski et al., 2009; Virginia Tech Transportation Institute, 2009). Most of the incidents involved lane drifts.

A number of jurisdictions worldwide, including several US states, make it illegal to use a hand-held cellphone while driving. Such bans are in effect in California, Connecticut, New Jersey, New York State, Oregon, Utah, Washington, and the District of Columbia (DC) (Insurance Institute for Highway Safety, 2009). More common in the United States are laws that restrict young drivers from using any type of cellphone or school bus drivers from using all cellphones. Text messaging is banned for all drivers in 18 states and DC. In addition, young drivers are banned from texting in 9 states, and school bus drivers are banned from texting in 1 state.

Prior research has evaluated the effects of restrictions on driver cellphone use. New York was the first state to ban drivers talking on hand-held phones. A study of the New York law found that the proportion of drivers talking on hand-held phones declined by about half during the first few months after the law was implemented in November 2001, relative to changes in use rates in Connecticut, an adjacent state with no such law at that time (McCartt et al., 2003). Much of this decrease had dissipated 1 year later (McCartt and Geary, 2004). In contrast, soon after DC began banning hand-held cellphone use while driving in July 2004, driver hand-held phone use dropped by about half, and this decline was largely sustained about a year later (McCartt and Hellinga, 2007). It appeared that stronger enforcement of the DC ban may have led to the sustained lower use rates compared with New York: citations for cellphone violations represented 8% of all moving violations in DC compared with 4% in New York (McCartt and Hellinga, 2007). A study of a North Carolina law prohibiting use of any mobile communication device by drivers younger than 18 found that the law had little effect on observed teenage driver cellphone use shortly after the law took effect (Foss et al., 2008). The proportion of teenagers using cellphones rose slightly from 11% before the law took effect to almost 12% shortly after. In post-law interviews, only 22% of teenagers and 13% of parents believed the law was being enforced fairly often or a lot.

The laws in New York and DC are mature. New York's law has been in effect for nearly 8 years; the DC law has been in place for almost 5 years. The current study focused on the longer term effects of the DC and New York laws on driver hand-held cellphone use. On October 1, 2005, a law prohibiting hand-held phone use while driving took effect in Connecticut, which had served as a comparison state in the earlier studies of New York's law. By comparing current observed hand-held cellphone use rates among drivers in Connecticut to earlier use rates, the effects of the Connecticut law on driver hand-held phone use also are estimated.

## **METHODS**

Patterns of changes in the rates of drivers talking on hand-held cellphones in New York State, the DC metro area, and Connecticut were examined before and after laws in these jurisdictions took effect. Driver hand-held phone use was observed in spring 2009 using the methods followed in prior observation surveys in New York and Connecticut (McCartt et al., 2003; McCartt and Geary, 2004) and in the DC metro area (McCartt et al., 2006b; McCartt and Hellinga, 2007).

Laws in the three jurisdictions are similar. All prohibit talking on hand-held cellphones when the vehicle is moving; dialing a hand-held phone and talking when the vehicle is stopped are allowed. Violations result in a fine up to \$100; no license penalty points are assessed. Driver hands-free phone use is permitted in all three jurisdictions; fines are waived for the first offense in DC and Connecticut upon proof that a hands-free device has been obtained. Connecticut and DC prohibit all phone use by school bus drivers; Connecticut bans all phone use by drivers younger than 18, and DC bans all phone use by learner's permit holders. All three jurisdictions have an all-driver ban on texting; New York's texting law takes effect on November 1, 2009.

### **DC Metro Area: Observations and Analyses**

Changes in the rates of hand-held cellphone use among drivers in DC before and after the DC law were compared with rate changes among drivers in nearby areas of Virginia and Maryland, states without bans. Observations were conducted simultaneously in all three jurisdictions in March 2004 (several months before the law took effect in July 2004), October 2004 (3 months after), October 2005 (15 months after), and April-June 2009. Observations were conducted in April 2009 rather than March 2009 because daylight saving time began in early March, and it would have been too dark to conduct the early morning observations. Observations also were scheduled to avoid Easter holidays and school recesses, which may have affected travel patterns. When the data were being prepared for analysis, low sample sizes and anomalies were identified for the DC sites. These data had been collected by a person who had not gathered data for the previous surveys; although the observer was thoroughly trained, a review of the data indicated they were not accurate. Therefore, in early June a second complete round of observations in DC was conducted by two experienced observers.

In each jurisdiction, daytime observations were conducted Tuesday-Friday at eight signalized intersections located on major arterial roads. In Virginia and Maryland, sites were located approximately 1-5 miles from the DC border on roads with heavy traffic traveling to and from DC. Only moving vehicles were observed, and emergency vehicles (police, fire, or ambulance), tractor-trailers, buses, and vehicles with diplomatic license plates were excluded. Observers recorded whether or not the driver was talking on a hand-held cellphone; the jurisdiction of vehicle registration (DC, Maryland, Virginia, other), based on

the license plate; and whether the vehicle was a passenger vehicle, taxicab, or commercial vehicle, defined as a vehicle with a commercial license plate or commercial signage.

Estimates of the proportions of drivers who were talking on hand-held cellphones in each jurisdiction were derived, and percentage changes were computed between each post-law survey and the pre-law survey. To derive rigorous estimates of the effects of the DC ban on phone use in DC, relative to patterns of phone use in nearby areas of Maryland and Virginia, a Poisson regression model was used to estimate cellphone use over time (the GENMOD procedure in SAS). It was assumed that cellphone use rates increased exponentially over time when there were no restrictions, and the relative month-to-month increase was the same for DC and for the nearby areas of Maryland and Virginia. It also was assumed that cellphone use rates increased exponentially over time when there were restrictions. The month-to-month trend for the period when there were restrictions was not necessarily the same as that when there were no restrictions. The dependent variables in the model were an indicator of the jurisdiction (1=DC, 0=MD/VA), an indicator of cellphone restriction (1=restriction, 0=no restriction), time (measured in months since December 2000), and the interaction of time and restriction.

### **New York and Connecticut: Observations and Analyses**

Daytime observations of drivers were conducted at controlled intersections on geographically dispersed, heavily traveled roads in four small to medium-size communities in upstate New York (Albany County, cities of Binghamton and Kingston, Village of Spring Valley) and in two communities in central Connecticut (Town of Hamden, City of Hartford). Areas considered for observation in New York excluded the downstate counties of Nassau, Suffolk, and Westchester due to pre-existing local bans on cellphone use while driving; New York City because of its unusual traffic patterns, major congestion, and difficulty in finding suitable observation sites; and the western and northernmost counties due to inclement winter weather conditions. Limited access highways were excluded. Observations were conducted on a Thursday or Friday. Emergency vehicles, tractor-trailer trucks, and buses were excluded. Cellphone use was recorded as “yes” only if the driver was talking on a hand-held cellphone while the vehicle was moving.

Observations were conducted about 1 month before New York’s warning period began on November 1, 2001; immediately after a fine-with-waiver phase took effect on December 1, 2002;

immediately after a fine-without-waiver phase took effect on March 1, 2002; during March 2003; and during April 2009. Thirty-five minutes of each observation period focused on recording cellphone use. A hand-held counter recorded drivers not using a hand-held cellphone. For drivers using phones, the following information was recorded: estimated age (younger than 25, 25-59, 60 or older), gender, and vehicle type (car, pickup truck, SUV, van or minivan, large single-unit truck with more than four tires). During the 5 minutes before and 5 minutes after the 35-minute cellphone observations, age category, gender, cellphone use, and vehicle type were recorded for a sample of drivers in passing traffic.

Estimates were derived of the proportion of drivers who were talking on hand-held cellphones. For each community and for the communities combined in each state, cellphone use rates for the December 2001 and March 2002 surveys were not significantly different; thus, data for these surveys were combined to measure short-term compliance. Percentage differences in state use rates (i.e., with communities combined) were compared between each of the post-law surveys and the pre-law survey. To derive the proportions of observed cellphone use for the recorded driver characteristics, the percentage distributions of driver characteristics observed during the 10-minute observations of passing traffic were applied to the total vehicles counted during the 35-minute cellphone observation periods. The formulae for these calculations and associated 95% confidence intervals (CIs) are provided in (McCartt et al., 2003).

Observations in Connecticut were not available for the months immediately before and after the restriction began on October 1, 2005. However, if it is assumed that trends in use rates over time were similar for Connecticut and New York, then these missing observations can be estimated. A Poisson regression model was used to accomplish these estimations. The dependent variable was the logarithm of the cellphone use rate. The independent variables in the model were an indicator of the state (1=NY, 0=CT), an indicator of cellphone restriction (1=restriction, 0=no restriction), the interaction of state and restriction (1=NY after restriction began, 0=all other), time (measured in months since December 2000), and the interaction of time and restriction. In these models, data for the December 2001 and March 2002 surveys were not combined.

## **RESULTS**

### **Results for DC**

When drivers were observed several months before the DC law took effect in July 2004, 6.1% were talking on hand-held cellphones (Table 1). Post-law use rates were 3.5% shortly after the law in October 2004, 4% 1 year later in October 2005, and 4.2% in spring 2009. The percentage difference in post-law use rates compared with the pre-law rate declined over time, from 43% in October 2004 to 31% in spring 2009, and all three differences were statistically significant. Hand-held phone use in nearby areas of Maryland did not follow a consistent pattern. The use rate declined slightly from 6.3% before the law to 5.7% shortly after the law took effect, increased substantially (to 8%) a year later, and then declined to 5.2% in spring 2009. In nearby areas of Virginia, the use rate increased steadily from the pre-law rate of 4.7% to the spring 2009 rate of 8.5%.

Table 2 summarizes the rates of talking on hand-held cellphones in DC based on the jurisdiction of vehicle plate registration. Although trends in the post-law surveys varied by jurisdiction, use rates for all three post-law surveys were significantly lower than the pre-law rates for DC, Virginia, and Maryland drivers.

A Poisson regression model estimated the effects of the DC law on driver hand-held cellphone use rates (Table 3); the predicted trends in use rates for DC and Maryland/Virginia sites combined are shown in Figure 1. According to the model, use rates increased by an estimated 0.31% per month ( $100(\exp(0.0031)-1)$ ) in both DC and at Maryland/Virginia sites before the restriction took effect. The restriction on driver phone use immediately lowered rates by an estimated 41% ( $100(1-\exp(-0.5266))$ ) in DC. Use rates then began to rise in DC by approximately 0.28% per month ( $100(\exp(0.0031-0.0003)-1)$ ). If there was no cellphone ban in DC, the model predicted that the April 2009 use rate would have been 7.41% ( $100 \times \exp(-2.9477+0.0348+0.0031(100))$ ); the observed rate of 4.22% was 43% lower than the expected rate of 7.41%. Thus, when measured against the phone use rates that would have been expected without the ban, initial reductions in phone use in DC have been largely sustained.

### **Results for New York and Connecticut**

Table 4 shows rates of hand-held cellphone use in New York and Connecticut during each of the four observation periods spanning September 2001-April 2009. For the New York communities

combined, the New York pre-law use rate of 2.3% declined to 1.1% immediately after the law took effect. Use then rose during the following year to 2.1% in March 2003. During the same time period, the rate for the Connecticut communities combined was 2.9% before the New York law and immediately after the law, and 3.3% about a year later. In surveys conducted in April 2009, 3.7% of drivers observed in New York were talking on hand-held phones. This was 64% higher than the pre-law rate of 2.3% and also substantially higher than the prior survey in March 2003. In Connecticut, where a law prohibiting hand-held cellphone use took effect in October 2005, 2.1% of drivers were observed talking on hand-held phones in April 2009. This was 35% lower than the use rate observed in March 2003 and 25% lower than the use rate of 2.9% observed in September 2001, prior to New York's law.

A Poisson regression model estimated the effects of the New York and Connecticut laws on driver hand-held cellphone use rates (Table 5); the predicted trends in use rates for New York and Connecticut are shown in Figure 2. According to the model, use rates increased by an estimated 0.84% per month ( $100(\exp(0.0084)-1)$ ) in Connecticut and New York before the restrictions took effect. Restrictions on driver phone use immediately lowered rates by an estimated 76% ( $100(1-\exp(-1.4229))$ ) in Connecticut and an estimated 47% ( $100(1-\exp(-1.4229+0.7885))$ ) in New York. Use rates then began to rise again in both Connecticut and New York by approximately 1.23% per month ( $100(\exp(0.0084+0.0038)-1)$ ). If there was no cellphone ban in Connecticut, the model predicted that the April 2009 use rate would have been 6.04% ( $100 \times \exp(-3.6471+100(0.0084))$ ); the observed rate of 2.14% was 65% lower than the expected rate of 6.04%. If there was no cellphone ban in New York, the model predicted that the April 2009 use rate would have been 4.91% ( $100 \times \exp(-3.4671-0.2072+100(0.0084))$ ); the observed rate of 3.74% was 24% lower than the expected rate of 4.91%.

Thus, if trends in use rates over time were similar for Connecticut and New York, the model indicated that the bans reduced driver hand-held cellphone use in both states. Although compliance faded over time, use rates still were lower than would have been expected without the laws, particularly in Connecticut.

### **Cellphone Use Rates by Driver Gender, Age, and Vehicle Type**

In New York and Connecticut, cellphone use rates by driver characteristics were calculated for the April 2009 survey (Table 6). Differences were judged significant if the 95% confidence intervals of the

estimated use rates did not overlap. In both states, the cellphone use rate was higher for females than for males. The difference among New York drivers was marginally significant. Also in both states, use rates were substantially higher for drivers younger than 25 than for drivers ages 25-59; in New York, this difference was significant. In both states, less than 1% of drivers ages 60 and older were talking on hand-held phones, and this rate was significantly lower than rates for the younger drivers. Use rates were higher for SUV drivers in both states, but differences by vehicle type were not statistically significant.

## **DISCUSSION**

The current study is a continuation of research assessing how bans on driver hand-held cellphone use affect such use. As of September 2009, seven US states and DC ban talking on hand-held cellphones while driving. Rates of driver hand-held phone use were tracked in New York, Connecticut, and DC. For all three jurisdictions, there were substantial declines in driver hand-held phone use immediately after the ban. When observed several years after the ban, phone use still was lower than would have been expected without the ban, but the size of the reduction varied.

Determining the effects of a ban was most straightforward in DC, where one pre-law observation survey and three post-law surveys were conducted in DC and in nearby areas of Virginia and Maryland, states without bans. Relative to trends in driver cellphone use in Maryland and Virginia, the ban produced an estimated 41% reduction in phone use immediately after the law and an estimated 43% reduction nearly 5 years later. Long-term reductions were observed among drivers in DC no matter in which jurisdiction the vehicles were registered.

In earlier studies of the effects of New York's ban on hand-held cellphone use, patterns of use in New York before and after the ban were compared with patterns of use in Connecticut, which had no law (McCartt et al., 2003; McCartt and Geary, 2004). However, in October 2005 Connecticut implemented its own ban, so effects of the bans in New York and Connecticut were modeled by assuming similar increases over time in the two states before the ban, and similar increases after the ban. The rate of phone use observed in Connecticut in April 2009 was much lower than the observed rate in prior surveys, and the model also predicted large immediate (76%) and longer term (65%) reductions in phone use compared with the expected use without a ban. In New York, observed phone use fell by about half after

the ban, but use then increased in subsequent surveys. However, the observed phone use rate for April 2009 (more than 7 years after the law) was 24% lower than would have been expected without the ban.

It is unclear why the effects of the bans appear stronger in DC and Connecticut than in New York. Earlier research found that compliance was lower in New York than in DC 15 months after the laws took effect (McCartt and Geary, 2004; McCartt and Hellinga, 2007). It was hypothesized that this difference was due at least in part to more intensive enforcement in DC. Cellphone citations represented 4% of citations for all moving traffic violations in New York, but 8% in DC. Based on traffic citation data provided by Connecticut, DC, and New York, enforcement of the hand-held cellphone ban in New York has picked up such that levels of enforcement in 2008 appear comparable in DC and New York, whereas enforcement in Connecticut lagged behind. In 2008, cellphone citations represented 6% of citations for all moving violations in Connecticut (data from the Office of Chief Court Administrator) compared with 15% in New York State (data from the Department of Motor Vehicles) and 11% in DC (data from the Department of Motor Vehicles). DC also maintains records of cellphone warning tickets; in 2008, there were 7,519 warnings issued for cellphone violations in addition to 12,936 citations issued. When measured per capita or per licensed driver, rates of cellphone citations also were lower in Connecticut than in New York or DC (Federal Highway Administration, 2007; US Census Bureau, 2008a).

Patterns of observed driver hand-held cellphone use rates varied among the four New York communities. The percentage of drivers talking on hand-held phones in April 2009 ranged from 2.9% in Kingston to 4.8% in Binghamton. Information was obtained on citations issued in the four counties in which observations were conducted. As a percentage of citations issued for all moving violations in 2008, the rates of cellphone citations in all four counties were lower than the statewide rate of 15%: 6% in Broome County, where Binghamton is located; 8% in Ulster County, where Kingston is located; 9% in Rockland County, where Spring Valley is located; and 11% in Albany County. Although the lowest rates of cellphone citations and the lowest rates of driver hand-held phone use occurred in Broome County, it is unclear to what extent enforcement was a factor in the higher rate of phone use. The phone use rates observed in April 2009 were similar in the two Connecticut communities; information on citations issued in the Connecticut counties in which observations were conducted was not available.

The review of citation data indicate that cellphone citation rates and hand-held phone use rates do not line up well among the three jurisdictions. Enforcement levels were higher in New York than in Connecticut, but the effects of the ban on phone use appeared stronger in Connecticut than in DC, and particularly in New York. However, citations are an imperfect measure of enforcement effort because they reflect both the amount of resources devoted to enforcement and levels of compliance with a law. Regardless of the relative intensity of enforcement in the study jurisdictions, the chance was very low in all of them that a driver violating the cellphone ban would receive a citation. None of the jurisdictions has had well-publicized, sustained enforcement campaigns directed at cellphone violations.

Considerable research has found that neither education alone nor the enactment of a law is sufficient to achieve longer-term compliance with a law intended to change driver behavior. Publicized, targeted enforcement campaigns are needed. An example is the US experience with seat belt use. Early education on the safety benefits of seat belts increased belt use only a little (Williams and Wells, 2004). When seat belt laws first were enacted in the 1980s, there were initial increases in belt use even in the absence of vigorous enforcement. However, compliance faded over time (Williams and Lund, 1988). Numerous studies have shown that vigorous, well-publicized enforcement campaigns are needed to achieve high levels of seat belt use (Solomon et al., 2002; Williams et al., 2000).

Even if bans on driver hand-held cellphone use are effective in reducing such use, effects of the bans on traffic crashes are unknown. Controlled studies of the effects of bans on crashes are difficult to conduct because police reports do not reliably report cellphone use as a crash factor. In addition, epidemiologic studies have found that the increased crash risk associated with talking on cellphones is similar for hands-free as well as hand-held devices. If many drivers switch to hands-free cellphones following a ban on hand-held phone use, this would dilute any effects of the bans on safety. However, driver use of hands-free phones, especially fully hands-free devices, cannot be measured reliably with observers standing at the roadside. Some evidence of patterns of hands-free cellphone use following a ban comes from statewide telephone surveys of drivers in New York conducted before and after that state's ban (Dowling et al., 2005). Among drivers who said they talk on a cellphone at least some of the time while driving, the percentage who said they use hands-free features or adapters most or all of the time increased from 64% before the ban took effect in November 2001 to 77% in 2005. However, the

overall percentage of drivers who said they ever talk on phones of any type while driving declined from 66% in 2001 to 57% in 2005; 12% in 2001 said they did so very often, compared with 8% in 2005. Although a ban on all cellphone use while driving makes sense based on the epidemiologic studies of crash risk associated with phone use, enforcement of a hands-free ban would be problematic. Enforcement or court officials could obtain cellphone billing records of a driver involved in a crash, but general traffic enforcement of a hands-free ban would be nearly impossible. Texting while driving is dangerous and appears to be common (Nationwide Insurance, 2008), but laws banning this behavior also are difficult to enforce. Thus, compliance with laws targeting hands-free phone use or texting will be hard to achieve.

Devices are being developed that prevent driver cellphone use while vehicles are moving. Some systems use the GPS feature in cellphones to prevent calls from being placed or answered when the driver's vehicle exceeds a certain speed threshold. There are challenges in making these systems practical for widespread use. For example, some systems have an override feature that allows a passenger to use the cellphone while the vehicle is in motion. However, it is unclear whether drivers can be prevented from activating the passenger mode to circumvent the purpose of the system. The main use of such technology may be among fleet managers to control phone use by employees or among parents who want to monitor their teenage drivers. The technology is not yet in widespread use, and the effects are not known. Thus, although the preponderance of research shows that talking on cellphones while driving increases crash risk, it is not clear that laws that ban such use can solve the problem.

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**Table I** Rates of talking on hand-held cellphones for drivers in the District of Columbia (DC) and in nearby locations in Maryland and Virginia before and after DC hand-held cellphone law

	Percent cellphone use: % (N)				Percent differences in use rates (95% CI)		
	Pre-law March 2004	Post-law 1 October 2004	Post-law 2 October 2005	Post-law 3 Spring 2009	Post-law 1 vs. pre-law	Post-law 2 vs. pre-law	Post-law 3 vs. pre-law
District of Columbia (DC)	6.1 (19,906)	3.5 (16,185)	4.0 (15,854)	4.2 (18,112)	-43 (-48, -37)	-35 (-41, -29)	-31 (-37, -24)
Maryland suburbs of DC	6.3 (12,951)	5.7 (12,200)	8.0 (11,645)	5.2 (15,098)	-9 (-18, 1)	27 (15, 40)	-18 (-25, -9)
Virginia suburbs of DC	4.7 (15,262)	6.2 (13,221)	6.5 (14,550)	8.5 (17,428)	34 (21, 48)	39 (26, 53)	82 (66, 99)

**Table II** Rates of talking on hand-held cellphones for drivers in the District of Columbia (DC) by plate of vehicle registration before and after DC hand-held cellphone law

Vehicle plate jurisdiction	Percent cellphone use: % (N)				Percent differences in use rates (95% CI)		
	Pre-law March 2004	Post-law 1 October 2004	Post-law 2 October 2005	Post-law 3 Spring 2009	Post-law 1 vs. pre-law	Post-law 2 vs. pre-law	Post-law 3 vs. pre-law
District of Columbia (DC)	5.3 (6,114)	2.8 (5,016)	2.7 (4,934)	3.9 (5,127)	-47 (-56, -35)	-50 (-59, -39)	-26 (-38, -12)
Maryland	6.2 (7,943)	4.1 (6,267)	5.3 (5,706)	4.3 (7,245)	-34 (-44, -23)	-14 (-26, -1)	-30 (-40, -20)
Virginia	6.7 (4,766)	3.4 (3,833)	3.3 (4,213)	4.1 (4,316)	-49 (-58, -38)	-51 (-60, -40)	-39 (-49, -27)
Other	7.7 (1,083)	3.5 (1,066)	5.7 (1,001)	5.2 (1,424)	-55 (-69, -34)	-26 (-47, 3)	-33 (-51, -8)

**Table III** Results of Poisson regression on cell phone use rates of drivers in the District of Columbia (DC) and nearby locations in Maryland and Virginia

Parameter	Estimate	Standard error	p-value
Intercept	-2.9477	0.0323	<0.0001
Jurisdiction (DC)	0.0348	0.0332	0.2938
Restriction (yes)	-0.5266	0.0784	<0.0001
Time (months)	0.0031	0.0005	<0.0001
Time × restriction	-0.0003	0.0011	0.7761

**Table IV** Rates of talking on hand-held cellphones for drivers in New York and Connecticut before and after New York hand-held cellphone law

	Percent cellphone use: % (N)				Percent differences in use rates (95% CI)			
	Pre-law Sep 2001	Post-law 1		Post-law 3 Apr 2009	Post-law 1 vs. pre-law	Post-law 2 vs. pre-law	Post-law 3 vs. pre-law	Post-law 3 vs. post-law 2
		Dec 2001/ Mar 2002	Post-law 2 Mar 2003					
Connecticut (2 cities combined)	2.9 (7,110)	2.9 (14,205)	3.3 (6,992)	2.1 (6,651)	2 (-14, 20)	14 (-5, 38)	-25 (-40, -7)	-35 (-47, -19)
Hamden	2.9 (3,884)	2.8 (7,634)	2.8 (3,976)	2.1 (3,999)	-3 (-23, 22)	-1 (-24, 28)	-28 (-46, -4)	-27 (-45, -3)
Hartford	2.8 (3,226)	3.0 (6,571)	3.8 (3,016)	2.2 (2,652)	8 (-16, 38)	35 (3, 78)	-21 (-43, 9)	-42 (-57, -20)
New York (4 cities combined)	2.3 (11,768)	1.1 (25,694)	2.1 (12,571)	3.7 (12,962)	-51 (-59, -42)	-10 (-24, 7)	64 (41, 90)	81 (56, 110)
Albany	2.2 (3,537)	0.8 (8,328)	2.1 (3,917)	3.3 (4,423)	-66 (-76, -53)	-7 (-32, 26)	61 (23, 109)	73 (34, 125)
Binghamton	2.2 (3,327)	0.8 (6,198)	0.7 (2,872)	4.8 (2,843)	-65 (-76, -50)	-70 (-82, -51)	117 (63, 187)	628 (351, 1077)
Kingston	1.9 (2,805)	1.1 (6,329)	2.1 (2,901)	2.9 (2,663)	-44 (-61, -20)	9 (-24, 58)	55 (9, 120)	42 (1, 98)
Spring Valley	3.0 (2,099)	2.3 (4,839)	3.5 (2,881)	4.0 (3,033)	-25 (-45, 2)	16 (-16, 59)	34 (-1, 82)	16 (-11, 51)

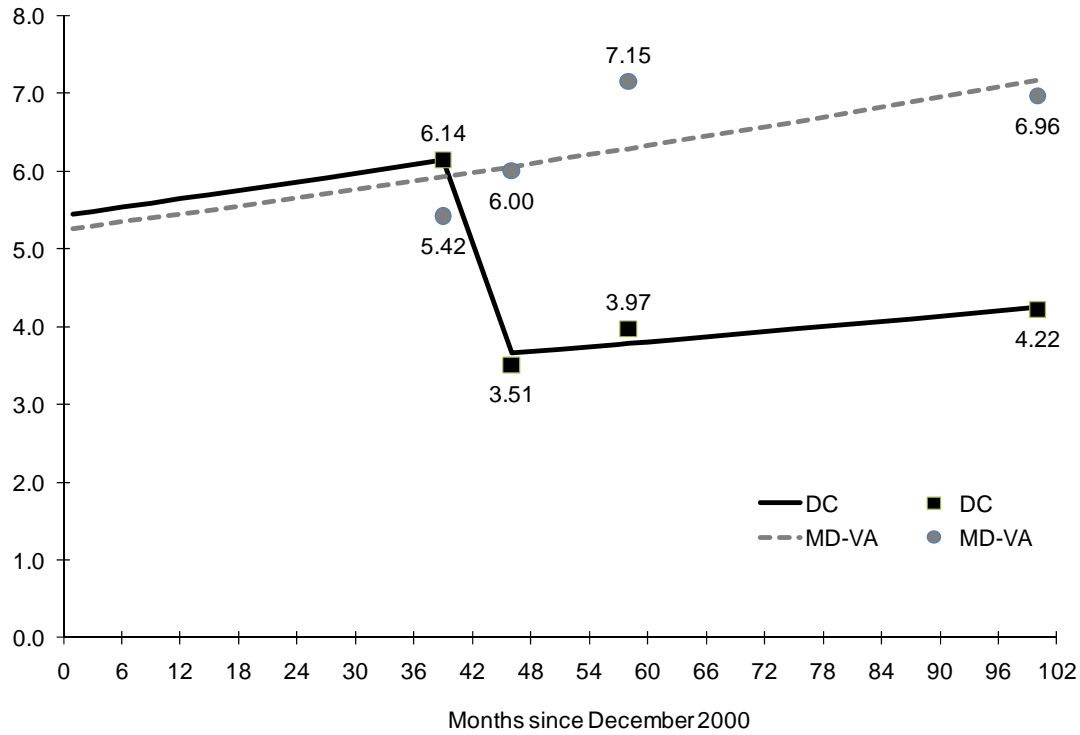
**Table V** Results of Poisson regression on cellphone phone use rates of drivers in New York and Connecticut

Parameter	Estimate	Standard error	p-value
Intercept	-3.6471	0.0869	<0.0001
State (NY)	-0.2072	0.0784	0.0082
Restriction (yes)	-1.4229	0.1427	<0.0001
State × restriction	0.7885	0.1233	<0.0001
Time (months)	0.0084	0.0049	0.0882
Time × restriction	0.0038	0.0050	0.4482

**Table VI** Percentage of drivers in Connecticut and New York observed using cell phones by driver demographics (April 2009)

State	Demographic	Proportion of sample	Number using cellphones	Use rate	95% confidence limits	
					Lower	Upper
Connecticut	Male	0.59	75	1.9	1.4	2.3
	Female	0.41	66	2.4	1.8	3.1
	<25 yrs	0.02	7	6.0	1.0	11.1
	25-59 yrs	0.93	134	2.2	1.8	2.5
	60+ yrs	0.05	1	0.3	-0.3	0.9
	Car	0.61	85	2.1	1.6	2.6
	Pickup	0.08	8	1.4	0.4	2.5
	SUV	0.23	40	2.6	1.8	3.5
Van	0.08	9	1.8	0.6	3.0	
New York	Male	0.55	233	3.3	2.8	3.7
	Female	0.45	252	4.3	3.7	4.9
	<25 yrs	0.12	104	6.8	5.2	8.3
	25-59 yrs	0.80	373	3.6	3.2	4.0
	60+ yrs	0.08	8	0.8	0.2	1.3
	Car	0.55	245	3.4	3.0	3.9
	Pickup	0.10	48	3.5	2.4	4.6
	SUV	0.24	144	4.6	3.7	5.5
Van	0.10	48	3.6	2.5	4.7	

**Figure I** Predicted percentage of drivers in the District of Columbia and nearby locations in Maryland and Virginia using cellphones, January 2001-April 2009; Observed values are labeled



**Figure II** Predicted percentage of drivers in Connecticut and New York using cell phones, January 2001-April 2009; Observed values are labeled

