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89

"Does Banning Hand Held Cell Phone Use While Driving Reduce Collision"

If you do not pay attention to the road while driving you are more likely to be involved in a car accident. Crashing into the rear end of the vehicle in front of you is best avoided by simply paying attention. Over the years the new inventions of smart phones has had a significant effect on people's lives. Day by day people have become more addicted to their phones than ever before, with new cellphones such as iPhones or blackberry's people have become less focused on their surroundings and more intrigued on their cell phones. Some people feel that they have become such experts on their cellphones such as remembering the touch keys on their phones that they feel like they can multi-task while using their phones.

About half of multi- vehicle crashes occur from the front end of one running car into the rear of another. Driver distraction accounts for a significant number of crashes each year. Recently the National Highway Traffic Safety Administration estimated that 22% of injury crashes and 16% of fatal crashes involve driver distraction. A NHTSA study from the 1970's concluded that driver error accounted for more than 90% of crashes. Cellphones are one of the newest modes of driver distraction. NHTSA estimates that any moment during 2008, 6% of drivers were using hand-held phones and 11% were using any kind of cellphone. These percentages are an increase from 2000, when an estimated 3% of drivers were talking on hand

held phones and 4% were talking on any kind of cell phone. A 2005 study by Suzanne McEvoy and colleagues of drivers in Western Australia found that drivers using cell phones were four times more likely to be in injury-resulting crashes than when not using cell phones. In 2009 I remember viewing a video on the internet by an Australian association on "No Texting while driving". The video was very vivid and had very scary images of what can happen to you as a result of texting while driving. Ever since then people have been continuing on going campaigns to educate the public on hands free driving.

A review by the Insurance Institute of Highway safety of more than 120 cell phone studies found that nearly all the studies reported a negative effect on driver performance from the cognitive distractions of cell phones use. Cell phone use typically increased reaction times, speeds, and lane deviations. Nine States and the district of Colombia have enacted laws that ban drivers of all ages from using hand-held cell phones. The bans have had a significant effect on reducing hand-held cell phone use. In New York, hand held cell phone use declined 47% immediately after the ban. Use began going back up, but was still 24% lower seven years after the ban than what would've been expected without the ban. The district of Colombia experienced a 41% drop after its ban went into effect in 2004. Connecticut experienced a 76% immediately after its 2005 ban. After three years, phone use was 65% lower than expected over all.

Hyp. Test
A 2009 IIHS phone survey confirmed the lower cell phone use while driving in states with hand held cell phone bans. To test whether these changes in hand-held cell phone use have reduced crashes, collision claim frequencies were examined before and after the enactment of the hand held phone bans in California, Connecticut, New York and the District of Colombia. Results are presented in two manners. First, plots of the monthly state data given an overview of the bans effectiveness. Second a more rigorous examination of the data uses Poisson regression. ✓

The Poisson distribution is the accepted distribution for modeling claim frequency in the insurance industry because of both the Poisson process nature of the data (number of times an event, such as a claim, occurs in a fixed period of time) and the property of combining with the gamma distribution (used to model claim severities) to produce the Tweedie distribution (used to model over all costs). A negative binominal distribution also was evaluated with little change in the parameter estimates and no change in significance at the 0.05 level.

In table 2- Effect Estimates of Hand- Held cell phone bans on collision claim frequency you can see that in the District of Colombia vs. Maryland and Virginia group ages of <25 , where there is a less rigorous state type ban status(-0.0141) there is a lesser ban effect(-1%). This means that people take the laws less seriously which results in a higher rate of accidents. In Connecticut where the state type ban status is much higher (0.0351) there is a higher ban effect (4%).

— very good try by using Poisson dist!
— Further-up study by using Exp. dist
to find the length of periods between
car accidents.



Does Banning Hand-Held Cell Phone Use While Driving Reduce Collisions?

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If you do not pay attention to the road while driving, you are more likely to crash—simple enough. Crashing into the rear of the car in front of you is avoidable in most situations by simply paying attention to the road. About half of multi-vehicle crashes occur from the front end of one car running into the rear of another car. What causes drivers to not pay attention, and what are states doing to prevent these crashes?

Driver distraction accounts for a significant number of crashes each year. Recently, the National Highway Traffic Safety Administration (NHTSA) estimated that 22% of injury crashes and 16% of fatal crashes involve driver distraction. These estimates likely underestimate the size of the problem, since only reported cases of distraction were counted. A NHTSA study from the 1970s concluded that driver error accounted for more than 90% of crashes.

Exact counts of crashes due to driver distraction are difficult to ascertain due to the wide variety of possible distractions. One only needs to look around at other vehicles to see drivers talking, eating, applying makeup, adjusting their radio, and more.

Cell phones are one of the newest modes of driver distraction. NHTSA estimates that at any moment during 2008, 6% of drivers were using hand-held phones and 11% were using any kind of cell phone. These percentages are an increase from 2000, when an estimated 3% of drivers were talking on hand-held phones and 4% were talking on any kind of cell phone.

Several studies have found increased crash risk from talking on a cell phone. A 2005 study by Suzanne McEvoy and colleagues of drivers in Western Australia found that drivers using cell phones were four times more likely to be in injury-resulting

crashes than when not using cell phones. Similar results were found in a 1997 study by Donald Redelmeier and Robert Tibshirani of Canadian drivers. Both studies used cell phone billing records to determine driver phone use. No difference in increased crash risk from cell phone use was found for males versus females, younger than 30 versus 30 and older, or hands-free versus hand-held cell phones.

A review by the Insurance Institute of Highway Safety (IIHS) of more than 120 cell phone studies found that nearly all the studies reported a negative effect on driver performance from the cognitive distractions of cell phone use. Cell phone use typically increased reaction times, speeds, and lane deviations.

Nine states and the District of Columbia have enacted laws that ban drivers of all ages from using hand-held cell phones. (Additional states restrict young drivers from using any cell phone while driving.) The bans have had a significant effect on reducing hand-held cell phone use. In New York, hand-held cell phone use declined 47% immediately after the ban. Use began going back up, but was still 24% lower seven years after the ban than what would have been expected without the ban. The District of Columbia saw a 41% drop after its ban went into effect in 2004. About five years later, the use rates were still 43% lower than expected. Connecticut experienced a 76% drop immediately after its 2005 ban. After three years, phone use was 65% lower than expected.

A 2009 IIHS phone survey confirmed the lower cell phone use while driving in states with hand-held cell phone bans. Only 30% of drivers in states with hand-held cell phone bans reported talking on a cell phone while driving compared with

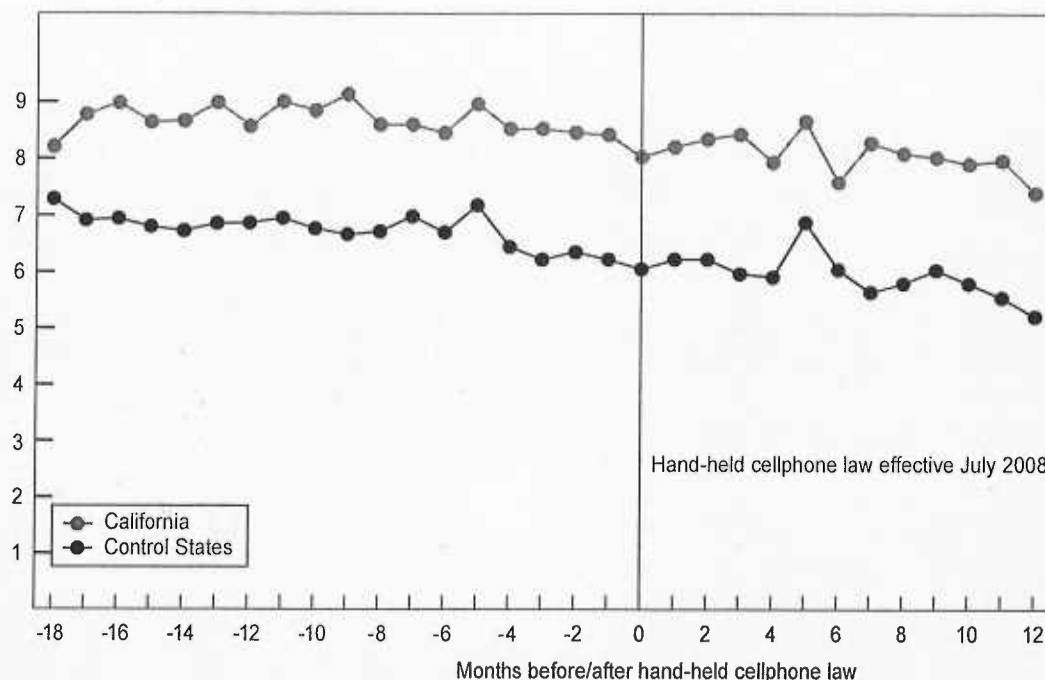


Figure 1. Collision claim frequencies for new vehicles by month, California vs. control states (Arizona, Nevada, Oregon)

44% in states without hand-held cell phone bans. Among drivers who talk on their cell phone while driving, a higher percentage reported always using hands-free devices in states with hand-held bans (22%) compared to drivers in states without bans (13%). Some of reasons for the continued use of hand-held cell phones after the bans included being unaware of the ban and believing the law was not likely to be enforced.

To test whether these changes in hand-held cell phone use have reduced crashes, collision claim frequencies were examined before and after the enactment of hand-held phone bans in California, Connecticut, New York, and the District of Columbia. Neighboring states were included in the analyses as controls. Results were based on monthly collision claim frequencies of newer vehicles (i.e., calendar year 2008 contains model years 2007 through 2009, calendar year 2007 contains model years 2006 through 2008, etc.). Only newer vehicles were included due to data availability.

Data Source

Collision claim frequency is a metric commonly used in the auto insurance industry. It measures how often claims occur over a given period of time. Claim frequency was computed by taking the ratio of the number of claims (crashes) for a group of vehicles to the amount of exposure for the group. Exposure is the amount of time an individual vehicle is insured. For example, if vehicle A was insured for six months and vehicle B was insured for 12 months, they would combine for 1.5 insured vehicle years.

Collision insurance covers first-party physical damage to a vehicle from a crash and can be from a single or multiple vehicle

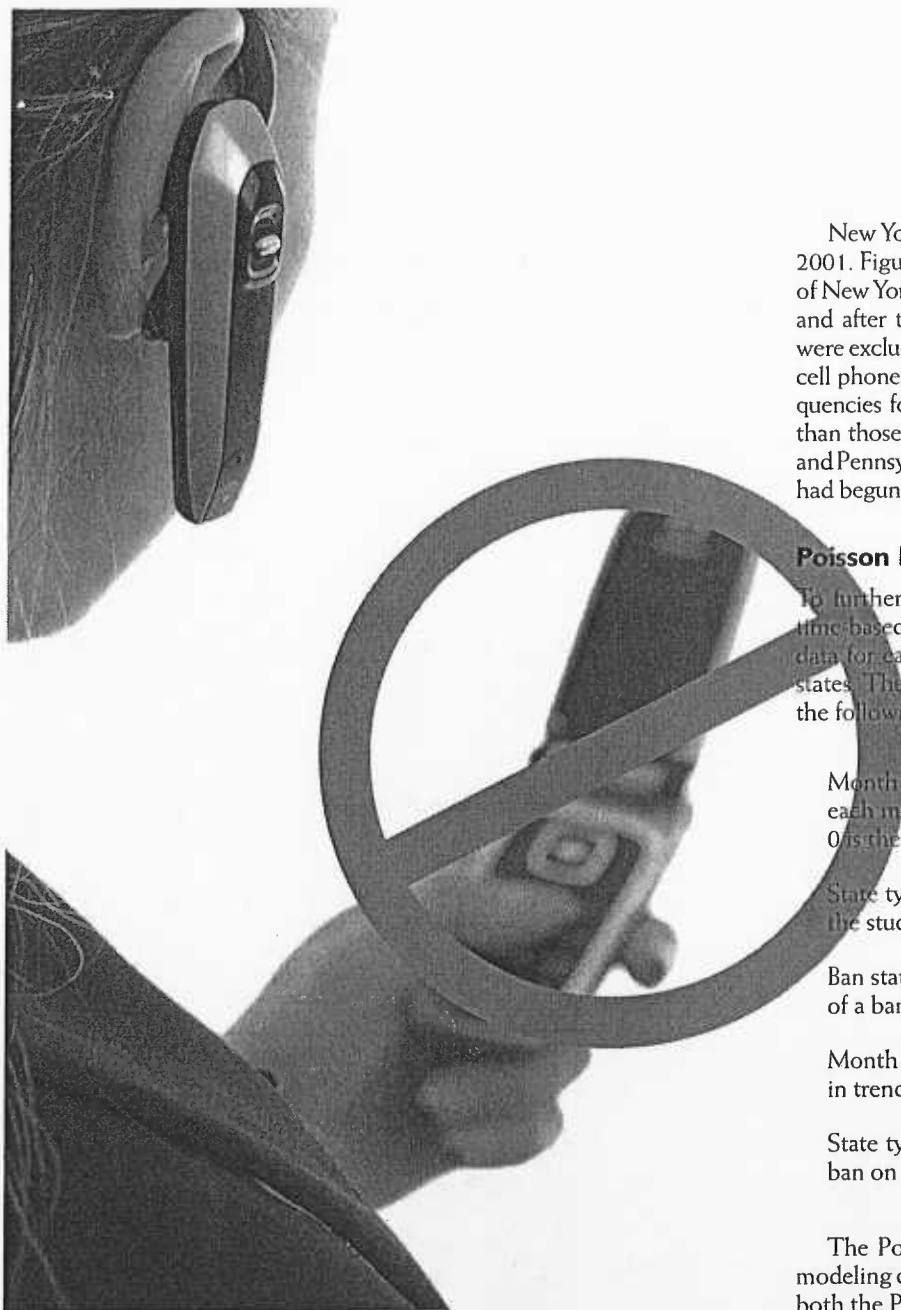
crash. For example, if vehicle A is at fault when it strikes vehicle B, the owner of vehicle A files a collision claim with their insurer for damages to their vehicle. The damage to vehicle B is covered under property damage liability insurance, which is not included in this study. Most crashes result in a collision claim, but some may not due to the driver not having collision coverage (unlikely for a relatively new vehicle) or the crash being relatively minor, with the damage amount not exceeding—or not exceeding by much—the driver's deductible (typically \$500).

The insurance claims and coverage used in this study were compiled from data supplied to the Highway Loss Data Institute (HLDI). Twenty-nine insurers currently provide data to HLDI. These insurers account for approximately 80% of privately insured passenger vehicles.

Results of Hand-Held Cell Phone Bans

Results are presented in two manners. First, plots of the monthly state data give an overview of the ban's effectiveness. Second, a more rigorous examination of the data uses Poisson regression. The regression analyses were run for drivers of all ages and only for drivers of ages less than 25. Younger drivers are more likely to talk on hand-held cell phones than other age groups, as reported in a 2008 observational study by NHTSA (8% for ages 16–24, 6% for ages 25–69, and 1% for ages 70 and older) and from a 2009 phone survey by IIHS (16% for ages younger than 30, 7% for ages 30–59, and 2.5% for ages 60 and older).

California's hand-held cell phone ban took effect in July of 2008. Figure 1 shows collision claim frequencies for California for the months before and after the ban.



Aggregate claim frequencies for the neighboring states of Arizona, Nevada, and Oregon are shown as control states. Monthly fluctuations in claim frequencies for California were similar to those for the comparison states. Although claim frequencies for California fluctuated monthly, no notable change was apparent coincident with enactment of the hand-held cell phone ban.

Figure 2 shows collision claim frequencies for Connecticut compared with control states for the months before and after Connecticut's October 2005 hand-held cell phone ban. Results for Connecticut were similar to California in that, following enactment of hand-held cell phone bans, monthly collision claim frequencies did not trend differently compared with control states. Trends in collision claim frequencies for Connecticut essentially paralleled those for the control states (Massachusetts and New York).

New York's hand-held cell phone ban began in November of 2001. Figure 3 shows collision claim frequencies for the state of New York compared with control states for the months before and after the ban. Suffolk, Westchester, and Nassau counties were excluded from analysis because these jurisdictions enacted cell phone bans prior to the statewide ban. Monthly claim frequencies for New York after the ban ultimately trended lower than those for the control states (Connecticut, Massachusetts, and Pennsylvania). However, the decreasing trend for New York had begun before the ban.

Poisson Regression Model

To further examine trends in collision claim frequencies, a time-based regression model was developed and applied to loss data for each of the study states and their respective control states. The regression models used a Poisson distribution and the following variables:

Month index: Continuous, sequential variable to identify each month in the time series (...-2, -1, 0, 1, 2 ..., where 0 is the ban enactment month)

State type: Categorical variable used to identify a state as the study state or part of the control states

Ban status: Categorical variable used to identify the status of a ban for each month (before or after ban)

Month index * state type interaction: Tests the difference in trends between study and control states

State type * ban status interaction: Tests the effect of the ban on collision claim frequencies

The Poisson distribution is the accepted distribution for modeling claim frequency in the insurance industry because of both the Poisson process nature of the data (number of times an event, such as a claim, occurs in a fixed period of time) and the property of combining with the gamma distribution (used to model claim severities) to produce the Tweedie distribution (used to model overall costs). A negative binominal distribution also was evaluated with little change in the parameter estimates and no change in significance at the 0.05 level (results not shown).

To account for the possibility of more complex trend lines, terms corresponding to month index squared and month index cubed were attempted in the model. Results produced by these more complex terms did not alter the findings for the key interaction and therefore were excluded from the model. Other variations on the model were tried with no significant change in results. These variations included adding a seasonal variable and listing the control states individually, along with their individual month index interaction.

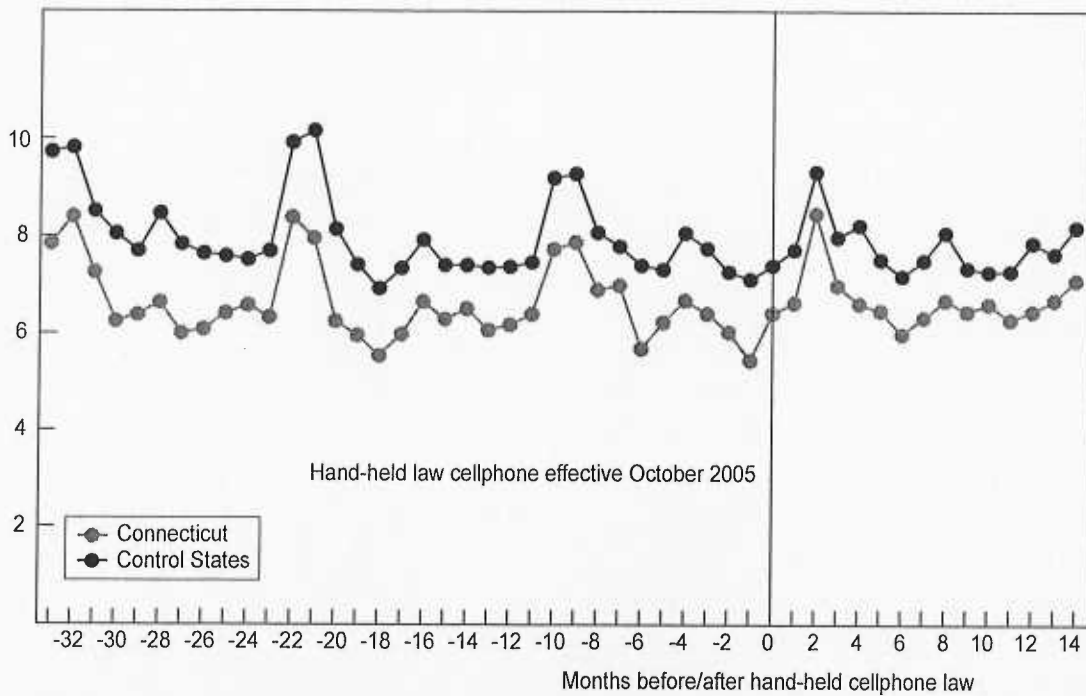


Figure 2. Collision claim frequencies for new vehicles by month, Connecticut vs. control states (Massachusetts, New York)

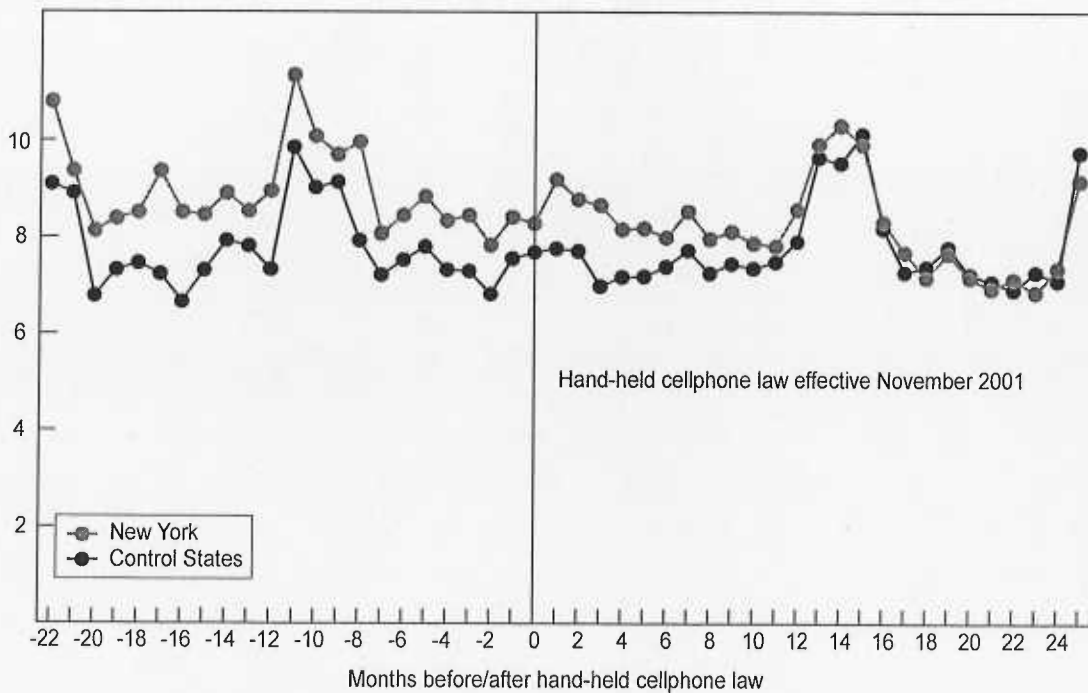


Figure 3. Collision claim frequencies for new vehicles by month, New York vs. control states (Connecticut, Massachusetts, Pennsylvania)

Table 1 lists results of the regression model for California using Arizona, Nevada, and Oregon as control states. The negative estimate for month index indicates a decreasing trend for the control states, whereas the estimate for the interaction of month index and state type indicates a slower decline for California. The positive estimate for state type indicates that, without regard to the ban, collision claim frequencies were higher for California than for control states. The estimate for the interaction of state type and ban status was not statistically significant, indicating the model did not detect an effect of the ban on collision claim frequencies for California.

Table 2 summarizes estimates for the interaction of state type and ban status for regression models using data for California, Connecticut, District of Columbia (compared with control states and Baltimore City), and New York.

Additional models examined data restricted to youthful drivers (ages 16–24). Negative estimates for the interaction of state type and ban status indicate cell phone bans in these states were associated with lower collision claim frequencies. Six of the 10 interaction estimates were negative, with their ban effects ranging from 0% to -21%. None of these estimates was statistically significant at the 0.05 level. Only all drivers in New York and all drivers in Connecticut were statistically significant, but these estimates indicated higher collision claim frequencies associated with the hand-held cell phone bans. The estimates of increased collision risk likely were a statistical artifact of the model, rather than an indication of a true harm from hand-held cell phone laws. It is, however, noteworthy that the model did not detect a statistically significant benefit of hand-held cell phone laws on collision claim frequency for any of the states or any age group within the states.

Conclusion and Discussion

Insurance collision loss experience does not indicate a decrease in crash risk when hand-held cell phone laws are enacted. This finding is somewhat surprising, given the large observed decrease in hand-held phone use after the bans were enacted and the detrimental effect cell phone use has on driving performance. One explanation may be that people simply switch to hands-free cell phones, which have been found to have the same harmful effect on driving performance as hand-held cell phones. This hypothesis cannot be examined with the current HLDI database, but national survey data indicate not all drivers switch to hands-free.

A more restrictive study design based only on claims involving driving while using hand-held cell phones may have been able to isolate the cell phone ban effect on collision claim frequencies. The information needed for this type of study is not known to HLDI or the insurance companies that supply data to HLDI. However, prior estimates of the effects of cell phone use on crash risk were so large, and reductions in observed hand-held cell

phone use following the laws were so substantial, that reductions even in aggregate crashes would be expected after enactment of hand-held cell phone laws.

The lack of an effect from hand-held cell phone bans is not completely unexpected, given that no increase in collision claim frequencies occurred during the past two decades as cell phone use was expanding. If cell phone use had significant detrimental effects on crash risk over other types of driver distractions, then one would have expected a gradual increase in collision claim frequencies as cell phone use grew. This raises the question of whether drivers are simply substituting one distraction for another or limiting distractions during more taxing road situations.

As in any longitudinal study, other variables may play a role throughout the time periods. The expected long-term rise in claim frequencies from cell phone use may have been countered by safer cars, reductions in alcohol-impaired driving, or higher collision deductible amounts. Likewise, the expected decrease in claim frequencies from hand-held cell phone bans may have been countered by other cell phone- and non-cell phone-related factors. The data from neighboring states was included in the regression models to control for these outside variables.

Based on results from this study, other states contemplating hand-held cell phone bans should not expect their crash rates to significantly decline. Studies examining bans on other types of driver distractions, such as text messaging, may find stronger effects than those found for hand-held cell phone bans. When more crash data are available, the same methods and HLDI data can be used to study the more recent texting bans. Texting is currently banned for all drivers in 28 states and the District of Columbia, with eight additional states banning texting for novice drivers. 

Further Reading

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Table 1—Results of the Time-Based Regression Model for California vs. Control States (Arizona, Nevada, Oregon)
Degrees Standard

Parameter	Degrees of Freedom	Estimate	Standard Error	Wald 95% Confidence Limits		Chi-Square	p-Value
Intercept	1	-8.657	0.0073	-8.671	-8.643	1417516.00	<0.0001
MonthIndex	1	-0.007	0.0006	-0.008	-0.005	101.91	<0.0001
StateType	1	0.293	0.0086	0.276	0.310	1168.89	<0.0001
BanStatus	1	-0.019	0.0114	-0.042	0.003	2.80	0.0943
MonthIndex*StateType	1	0.004	0.0008	0.003	0.006	30.17	<0.0001
StateType*BanStatus	1	-0.015	0.0135	-0.042	0.011	1.25	0.2635

Table 2—Effect Estimates of Hand-Held Cell Phone Bans on Collision Claim Frequency

Ban State	Group	Estimate of StateType*BanStatus	Ban Effect	p-Value
California	All Ages	-0.0151	-1%	0.2635
California	Age <25	-0.0158	-2%	0.1116
Connecticut	All Ages	0.0351	4%	0.0317
Connecticut	Age <25	0.0513	5%	0.2835
District of Columbia (vs. Maryland and Virginia)	All Ages	-0.0461	-5%	0.1753
District of Columbia (vs. Maryland and Virginia)	Age <25	-0.0141	-1%	0.9117
District of Columbia (vs. Baltimore City)	All Ages	-0.0011	0%	0.9810
District of Columbia (vs. Baltimore City)	Age <25	-0.2309	-21%	0.1670
New York	All Ages	0.0324	3%	0.0052
New York	Age <25	0.0166	2%	0.6208