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Original article

The Impact of Michigan's Text Messaging Restriction on Motor Vehicle Crashes

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A B S T R A C T

Purpose: The purpose of this study was to determine the effects of Michigan's universal text messaging restriction (effective July 2010) across different age groups of drivers and crash severities.

Methods: Changes in monthly crash rates and crash trends per 10,000 licensed drivers aged 16, 17, 18, 19, 20–24, and 25–50 years were estimated using time series analysis for three levels of crash severity: (1) fatal/disabling injury; (2) nondisabling injury; and (3) possible injury/property damage only (PDO) crashes for the period 2005–2012. Analyses were adjusted for crash rates of drivers' aged 65–99 years, Michigan's unemployment rate, and gasoline prices.

Results: After the introduction of the texting restriction, significant increases were observed in crash rates and monthly trends in fatal/disabling injury crashes and nondisabling injury crashes, and significant decreases in possible injury/PDO crashes. The magnitude of the effects where significant changes were observed was small.

Conclusions: The introduction of the texting restriction was not associated with a reduction in crash rates or trends in severe crash types. On the contrary, small increases in the most severe crash types (fatal/disabling and nondisabling injury) and small decreases in the least severe crash types (possible injury/PDO) were observed. These findings extend the literature on the effects of cell phone restrictions by examining the effects of the restriction on newly licensed adolescent drivers and adult drivers separately by crash severity.

IMPLICATIONS AND CONTRIBUTION

-Few studies have examined the effect of texting restrictions on differing levels of crash severity.

-Small changes in monthly crash rates and trends were observed after the introduction of Michigan's texting restriction.

-Strategies used to reduce other risky driving behaviors may also prove effective in reducing texting while driving.

Using a cell phone while driving increases the crash risk for all drivers [1,2]. Novice adolescents report greater willingness to engage in cell phone use while driving relative to other drivers [3]. Over half of adolescents (52.9%) report ever talking on a cell phone while driving [4], and the prevalence of texting or e-mailing in the last 30 days is estimated to be 42.9% [5]. Adolescent drivers' inexperience [6], combined with their greater willingness to use cell phones while driving, suggests that cell phone use might pose a serious crash risk for adolescent drivers.

Government agencies and safety advocates have endorsed restrictions on cell phone use for talking and texting [7–9], including an outright ban for all drivers younger than 18 years of age [10]. To date, over 40 states have passed legislation restricting all cell phone use for 16- and 17-year-old drivers, and at least

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10 states have restricted handheld cell phone use for all drivers [11,12]. However, there is little evidence demonstrating the effectiveness of these policies in reducing crashes.

Studies examining the effectiveness of cell phone restrictions show no clear relationship between the presence of restrictions and driver behavior. Survey studies suggest that drivers engage in lower cell phone use in jurisdictions where restrictions are in effect [13,14]. In contrast, observational studies of driver behavior have mixed findings. Three studies found the introduction of cell phone restrictions had no effect on handheld cell phone use while driving [15–17], whereas five studies reported significant declines in handheld use after the introduction of cell phone restrictions [18–22]. Short- and long-term evaluations of a cell phone restriction for 16- and 17-year-old drivers in North Carolina found that the law did not significantly reduce handheld cell phone use while driving [15,16]. Furthermore, although the prevalence of talking on the phone decreased among young drivers after the introduction of the restriction, physical manipulation of cell phones appeared to have increased [16].

To date, few studies have examined cell phone restrictions to determine whether they vary in effectiveness by crash severity, being more effective in reducing crashes of some but not all severities. This question has public health and economic significance. If enforcement costs are high, and social and economic benefits are relatively small (e.g., preventing crashes where minor property damage has occurred), states may consider alternative approaches to reducing cell phone use while driving. If the costs of enforcement are outweighed by the social and economic benefits (e.g., reductions in deaths and disabling injuries), this strengthens the basis for the restriction.

Previous policy evaluation studies on adolescent drivers have recommended the use of methodologically rigorous time series analyses of individual states that include crashes of all severities [23]. Using a natural experiment where a texting restriction was introduced independently of any other driving laws, the purpose of this study was to evaluate the effect of a universal texting restriction on crashes. Specifically, we hypothesized that the introduction of Michigan's texting restriction for all drivers would be followed by a reduction in crashes of all severities for drivers aged 16–50 years.

Method

Data and measures

The State of Michigan requires all crashes involving an injury (fatal or nonfatal) to any person, or property damage of $1,000 or more, to be reported to police. Monthly frequencies of all vehicles involved in police-reported crashes were extracted for drivers aged 16, 17, 18, 19, 20–24, 25–50, and 65–99 years from Michigan crash records for the period 2005–2012. Each unique vehicle involved in a crash contributed to the frequency, as a single crash could involve drivers in multiple age groups. Crash severities were categorized as fatal/disabling injury, nondisabling injury, and possible injury/property damage only (PDO) according to the KABCO classification of crash severity [24]. Although the KABCO scale is known to overestimate crash severity, in the absence of direct linkage systems between Emergency Medical Services and state crash databases, the KABCO scale correlates well with other more sensitive measures and is a reasonable estimator of variation in injury severity in crashes [25]. The monthly numbers of licensed drivers obtained from the Michigan Driver History Record were used to calculate crash involvement rates per 10,000 licensed drivers by year of age. Crash and licensing data were obtained from the University of Michigan Transportation Research Institute [26]. Due to anomalies in the 2005 licensing data and unavailability of 2012 data, numbers of licensed drivers were extrapolated by age group using cubic regression spline curves and monthly indicators to address seasonality [27].

Covariates

Comparison population. The monthly crash rates for drivers aged 65–99 years were used as a covariate series. This age group was selected as a covariate because it has the lowest prevalence of texting while driving and therefore was least affected by the introduction of the texting restriction [28]. The purpose of the comparison series was to adjust for variability in driver crash rates due to extraneous factors such as weather affecting drivers of all ages. Although time series analyses control for pre-existing secular trends in crash rates, the inclusion of the crash rates of another age group as a historical covariate to control for unmeasured factors that affect all drivers enhances the validity of the findings. Monthly crash rates of 65- to 99-year-old drivers per 10,000 licensed drivers were calculated using the identical method as for drivers in the study age groups.

Unemployment rate. An inverse relationship exists among economic activity, the amount of driving, and crashes [29,30]. In particular, economic recessions typically reduce recreational driving [31]. Unemployment data for Michigan were obtained from the Bureau of Labor Statistics [32].

Gasoline prices. An inverse relationship has also been identified between gasoline prices and fatal crash rates for drivers of all ages [33]; however, research suggests that adolescent driving behavior may be more sensitive to higher gasoline prices relative to older drivers [34]. Monthly national average gasoline prices, obtained from the U.S. Energy Information Administration [35], were used as a covariate in the analyses to adjust for their effect on the amount of driving exposure and resulting crash risk level.

Texting restriction effective date. Michigan's texting restriction for all drivers came into effect on July 1, 2010 [36]. The restriction prohibited reading, typing, or sending text messages on wireless two-way communication device and authorized law enforcement officials to cite drivers for engaging in any of these behaviors. Primary enforcement was in effect for the texting restriction, meaning law enforcement officials could stop and cite drivers on the basis of noncompliance alone.

The restriction effective date was used to estimate two covariates. The first was a binary variable indicating if a month period was before (0) or after (1) the implementation of the restriction. This provided an estimate of the change in crash rates at the time the restriction went into effect. The second was the interaction between time and the implementation of the restriction, which estimated the change in monthly crash trends over time after the restriction compared with the trends in crashes prior. All coefficients can be interpreted in units of crashes per 10,000 drivers per month.

Analytical method

Crash rates were analyzed using linear regression with Auto-Regressive Moving-Average (ARMA) errors, an approach that