



Effects of enforcement intensity on alcohol impaired driving crashes



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ABSTRACT

Background: Research measuring levels of enforcement has investigated whether increases in police activities (e.g., checkpoints, driving-while-intoxicated [DWI] special patrols) above some baseline level are associated with reduced crashes and fatalities. Little research, however, has attempted to quantitatively measure enforcement efforts and relate different enforcement levels to specific levels of the prevalence of alcohol-impaired driving.

Objective: The objective of this study was to investigate the effects of law-enforcement intensity in a sample of communities on the rate of crashes involving a drinking driver. We analyzed the influence of different enforcement strategies and measures: (1) specific deterrence – annual number of driving-under-the-influence (DUI) arrests per capita; (2) general deterrence – frequency of sobriety checkpoint operations; (3) highly visible traffic enforcement – annual number of traffic stops per capita; (4) enforcement presence – number of sworn officers per capita; and (5) overall traffic enforcement – the number of other traffic enforcement citations per capita (i.e., seat belt citations, speeding tickets, and other moving violations and warnings) in each community.

Methods: We took advantage of nationwide data on the local prevalence of impaired driving from the 2007 National Roadside Survey (NRS), measures of DUI enforcement activity provided by the police departments that participated in the 2007 NRS, and crashes from the General Estimates System (GES) in the same locations as the 2007 NRS. We analyzed the relationship between the intensity of enforcement and the prevalence of impaired driving crashes in 22–26 communities with complete data. Log-linear regressions were used throughout the study.

Results: A higher number of DUI arrests per 10,000 driving-aged population was associated with a lower ratio of drinking-driver crashes to non-drinking-driver crashes ($p=0.035$) when controlling for the percentage of legally intoxicated drivers on the roads surveyed in the community from the 2007 NRS. Results indicate that a 10% increase in the DUI arrest rate is associated with a 1% reduction in the drinking driver crash rate. Similar results were obtained for an increase in the number of sworn officers per 10,000 driving-age population.

Discussion: While a higher DUI arrest rate was associated with a lower drinking-driver crash rate, sobriety checkpoints did not have a significant relationship to drinking-driver crashes. This appeared to be due to the fact that only 3% of the on-the-road drivers were exposed to frequent sobriety checkpoints (only 1 of 36 police agencies where we received enforcement data conducted checkpoints weekly). This low-use strategy is symptomatic of the general decline in checkpoint use in the U.S. since the 1980s and 1990s when the greatest declines in alcohol-impaired-driving fatal crashes occurred. The overall findings in this study may help law enforcement agencies around the country adjust their traffic enforcement intensity in order to reduce impaired driving in their community.

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1. Background

Substantial progress has been made in reducing impaired driving in the United States since the early 1980s. According to the National Highway Traffic Safety Administration's (NHTSA's) and Fatality Analysis Reporting System (FARS), the proportion of all drivers in fatal crashes estimated to have been legally intoxicated (blood alcohol concentration (BAC) ≥ 0.08 g/dL) has decreased

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from 35% in 1982 to 20% in 1997, a 43% decrease in that proportion. However, since 1997, that proportion has varied only slightly through 2012. One indicator of the extent of the problem is the wide variability in the states of the percentage of drivers in fatal crashes with illegal BACs. Averaged over a 5-year period (2002–2006), the percentages range from a low of 12% in Utah to a high of 31% in Montana. Among many reasons for this wide variability in the states, despite basically similar impaired driving laws, are the resources devoted to policing and the enforcement strategies applied to deterrence programs.

Research shows that the solutions to impaired driving lie mainly at the state and local community levels where the laws are applied and enforced, programs are implemented, and changes can be made. State and local community leaders need evidence-based strategies that can increase the perceived risk of being stopped and arrested by law enforcement if driving while impaired. Since most states currently have a good infrastructure of impaired-driving laws, all other factors being equal, states with highly visible, highly publicized impaired-driving enforcement programs tend to have lower rates. Georgia is a good example. It has conducted highly visible, frequent, publicized DUI enforcement throughout the state for the past several years (Fell et al., 2008a). It now has one of the lowest impaired-driving-related fatal-crash rates in the nation, going from 34% in 1982 to 15% in 2011 – a 56% reduction in that proportion.

One recent study used statewide datasets to generate a metric of driving-while-intoxicated (DWI) enforcement and prosecution that focused on the rate of proactive DWI arrests (Dula et al., 2007). This analysis found no relationship between the level of DWI arrest activity and DWI-related crashes, suggesting that although the current level of resources and mix of enforcement policies may maintain the reductions in DWI crashes attained in the 1980s and 1990s, current methods are unlikely to lead to additional systematic reductions unless their deterrence value can be enhanced, such as through improved enforcement technology and increased media support.

Other studies have demonstrated connections between increased law-enforcement-activity levels and reductions in crashes. Johnson et al. (2009) performed a statistical analysis of alcohol-impaired-driving fatalities and law-enforcement-activity level (measured by DWI arrests) between 2001 and 2006. Fifteen states that experienced decreases during that period were compared to 15 states that experienced increases in impaired-driving fatalities. Increases in DWI arrests per vehicle mile traveled in a state were significantly associated with reductions in alcohol-impaired-driving fatalities in those states.

Research also shows associations between traffic crashes and certain community environmental and cultural factors, legislation, and policies in addition to law-enforcement strategies (Gruenewald et al., 1997; Holder, 1998; Ross, 1984; Sivak, 2009). For example, it has been reported that the number of fatal crashes are associated with certain factors, such as the amount and type of travel, that is, vehicle miles traveled (O'Neill and Kyrychenko, 2006); whether the community is in an urban or rural area (Burgess, 2005; O'Neill and Kyrychenko, 2006); safety-belt-usage rate, proportion of licensed drivers who are males, proportion of licensed drivers older than age 64, income per capita, and deaths caused by alcohol-related liver failures per capita (Sivak, 2009). In addition to such community and environmental factors, a number of individual characteristics are related to fatal crashes: driving on roads at high speeds, driving with high BACs, and/or driving while unrestrained (Borkenstein et al., 1974; Peck et al., 2008; Voas et al., 2007).

1.1. Prior study

While specific local and state enforcement programs have been evaluated, to our knowledge, there is no national information

currently available that could help policymakers answer questions related to the cost effectiveness of enforcement procedures. To address that issue we took advantage of nationwide data on the local prevalence of impaired driving from the 2007 National Roadside Survey (NRS) and measures of DUI enforcement activity provided by the police departments that participated in the 2007 NRS (police cooperation was intrinsic to the success of the 2007 NRS). We conducted an exploratory study (Fell et al., 2014; under review) of the relationship between the intensity of enforcement and the prevalence of drivers with positive BACs on the road. That study related three measured BACs of drivers in the 2007 NRS ($BAC \geq 0.01$; $BAC \geq 0.05$; $BAC \geq 0.08$) with six measures of enforcement intensity collected from 41 out of 71 police departments operating in the 60 communities of the NRS. We found that the number of traffic stops per capita was highly significant with drivers in those communities in the upper half of traffic stop rates having significantly lower odds of alcohol impairment ($BAC \geq 0.05$) and legal intoxication ($BAC \geq 0.08$). The same pattern was found for DUI arrests where drivers on the roads in the communities in the highest quartile of DUI arrests per capita had significantly lower odds of legal intoxication ($BACs \geq 0.08$). A similar result was obtained for saturation patrols and for citations for other traffic violations.

1.2. Current study

In this current follow-up study, we use the same enforcement data to study the relationship of enforcement intensity to alcohol-impaired-driving crashes from the national General Estimates System (GES). Specifically, we measured the intensity of enforcement based on five independent predictors (per capita): number of sworn officers, number of traffic stops, number of DUI arrests, number of other traffic citations (e.g., for speeding, running a red light, seat belt use violations, etc.), and the number of sobriety checkpoints, relating these measures to the ratio of impaired driving crashes to non-impaired driving crashes (crash incidence ratio or CIR) from the GES. We excluded saturation patrol frequency for this study because only 19 PSUs reported that data and half of the drivers in that sample were exposed to less than 0.32 saturation patrols per 10,000 drivers, a very low rate. Indeed, 17% of drivers were in PSUs with no saturation patrol activity accounting for 72% of the lowest patrol intensity quartile. At the other end of the spectrum, 108 drivers came from one PSU reporting 365 saturation patrols in 2007 (i.e., saturation patrols every night), a high number that indicates possible extreme variation or more likely a misunderstanding in the definition of this activity across PSUs. In this current analysis, we controlled for the BAC level of the drivers on the road using data from the 2007 National Roadside Survey in order to isolate the effect of enforcement on impaired driving crashes.

2. Methods

2.1. Data sources

2.1.1. National roadside survey 2007 (NRS)

A full description of the procedures employed in the 2007 NRS is contained in three reports (Lacey et al., 2009). In brief, drivers in the NRS were randomly stopped at 300 locations across 60 primary sampling units (PSUs) within the continental United States. Sites were selected through a stratified random sampling procedure used by NHTSA to develop national crash data for databases such as the General Estimates System (GES) (NHTSA, 1991). Data were collected during a 2 h Friday daytime session at 60 locations and during four 2 h nighttime periods (10 p.m. to midnight and 1–3 a. m. on both Fridays and Saturdays) at 240 locations. Both self-report

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