



U.S. Department
of Transportation

National Highway
Traffic Safety
Administration

TRAFFIC TECH

Technology Transfer Series



DOT HS 813 268

May 2022

Synthesis of Studies That Relate Amount of Enforcement to Magnitude of Safety Outcomes

Background

In the Moving Ahead for Progress in the 21st Century (MAP-21) Act, Congress directed NHTSA to establish the National Cooperative Research and Evaluation Program (NCREP) to conduct research and evaluations of State highway safety countermeasures. Under a subsequent reauthorization, the Fixing America's Surface Transportation (FAST) Act, program activities have continued. This program is administered by NHTSA and managed jointly by NHTSA and the Governors Highway Safety Association (GHSA). Each year, the States (through GHSA) identify potential highway safety research or evaluation topics they believe are important for informing State policy, planning, and programmatic activities. This project addressed one of the selected topics.

While there has been a large amount of published research showing that enforcement reduces unsafe driving behavior and crashes, there has been little research on the relationship between the intensity or amount of enforcement and the magnitude of observed safety impacts. This study investigates the research question: *What is the impact of various amounts of enforcement activity on safety outcomes?* In other words, how much change in prohibited driving behaviors could one expect in a particular jurisdiction by increasing the amount of enforcement activity by a specific amount? The answer can assist highway safety professionals in making decisions about how to best invest limited resources.

Methodology

The project team searched for all available studies that contained information regarding the relationship between levels of enforcement and safety outcomes, focusing on enforcement efforts that targeted occupant protection, distracted driving, alcohol-impaired driving, speeding, and aggressive driving. These driving behaviors are the most common focus of the grant funding provided under Sections 402 and 405 of Title 23, U.S. Code. These behaviors also represent major safety issues that contribute to

significant numbers of traffic fatalities. The following are the definitions of the targeted driving behaviors.

Occupant protection: The use of seat belts by older children and adults, and the proper use of car seats and booster seats by infants and younger children.

Distracted driving: Any activity that diverts attention from the driving task. Enforcement efforts often target observable forms of distraction, e.g., texting and handheld cell phone use.

Alcohol-impaired driving: Targeting of alcohol-impaired driving to reduce the number of alcohol-related crashes and the number of drivers with alcohol in their systems above certain thresholds (for adults, during the time of the research, a .08 g/dL blood alcohol concentration; for younger drivers, the limits vary by State).

Speeding: A type of aggressive driving behavior characterized by driving faster than the posted speed limit, or driving at or below the speed limit, but traveling too fast for roadway conditions (NCSA, 2018).

Aggressive driving: Operating a motor vehicle in a selfish, pushy, or impatient manner that directly affects other drivers, often unsafely (Neuman et al., 2003).

Through an iterative process, the list of search terms allowed researchers to identify 15,254 studies. After multiple levels of screening based on the title and key words, abstracts, and the entire text of the studies, 80 studies were deemed relevant for inclusion. The research team extracted data from each study, including levels of enforcement activities, measurement of the change in safety outcomes, context of the enforcement effort (the time frame, the strategy employed, and the jurisdiction), and evaluation methodology.

There were many kinds of enforcement activities identified, including patrols, spotters, checkpoints, and publicity of those activities. High-visibility enforcement (HVE)

emphasizes publicity of the enforcement effort to deter the public from the prohibited (illegal) behavior. Various measures of these enforcement activities were used, including simple counts such as the number of checkpoints, officer enforcement hours, and/or dollars spent for officer wages or paid media.

Results

The available literature only supported findings for occupant protection enforcement efforts and safety outcomes. HVE campaigns were generally successful, producing on average a 3.5-percentage-point improvement in seat belt use rates. One additional checkpoint per 100,000 people per week in an HVE occupant protection campaign is expected to increase seat belt use by 0.76 percentage points. For enforcement efforts conducted during the period 1993 to 2008, increasing media spending by \$1 per 1,000 residents in an HVE campaign increased seat belt use by 0.011 percentage points. However, this relationship did not apply to amounts greater than \$0.50 per resident. It also did not apply after 2008, likely due to limited data.

The synthesis could not identify a relationship between levels of enforcement and safety outcomes for distracted driving, alcohol-impaired driving, speeding, or aggressive driving. However, for all targeted behaviors, the enforcement campaigns evaluated in the available literature were generally effective in improving safety outcomes. For distracted driving, HVE enforcement efforts were effective at reducing handheld phone use. With baseline handheld phone use rates averaging 4.9 percent across the available study locations, HVE efforts reduced drivers' handheld phone usage an average of 1.7 percentage points. HVE efforts targeting alcohol-impaired driving produced positive outcomes, with 58 percent of the 90 study locations resulting in reductions in either crashes or prohibited behavior. For speeding, enforcement efforts focused on work zones produced average decreases in speed of approximately 4 mph. For aggressive driving, the limited studies only examined one program, which indicated that Ticketing Aggressive Cars and Trucks (TACT) was effective. TACT was a program centered on safe driving around commercial motor vehicles.

Conclusion

The primary research question was whether a relationship could be established between the amount of the change in enforcement activity and the magnitude of the change in safety outcome for highway safety enforcement campaigns. A positive and statistically significant relationship was found between seat belt use and both the number of checkpoints and, under certain conditions, the amount of media spending during occupant protection enforcement campaigns. However, for

enforcement campaigns related to distracted driving, alcohol-impaired driving, speeding, and aggressive driving, no such relationship was identified. The reasons likely stem from the small number of studies that provided sufficient information upon which to make cross-study comparisons and a lack of variability among the levels of enforcement used across studies. Nonetheless, the synthesis concluded that for all targeted behaviors, enforcement campaigns were effective at reducing prohibited behaviors, even though the magnitude of the observed safety improvements cannot be predicted by the level of enforcement activity used in the effort.

These findings are consistent with NHTSA's *Countermeasures That Work* (2021), a basic reference to assist State Highway Safety Offices and other highway safety professionals in selecting effective, evidence-based countermeasures for traffic safety problem areas. For increasing seat belt use, short-term, high-visibility seat belt law enforcement and integrated nighttime seat belt enforcement have demonstrated effectiveness. For preventing distracted driving, high-visibility cell phone/text messaging enforcement has demonstrated effectiveness. For preventing alcohol-impaired driving, publicized sobriety checkpoints and high-visibility saturation patrols have demonstrated effectiveness. For speeding and aggressive driving, however, the relationship between effective countermeasures in *Countermeasures That Work* and this synthesis are less clear. For example, the finding that speed enforcement was effective in work zones is not a specific countermeasure addressed in *Countermeasures That Work*.

Collection and reporting of a more complete description of the enforcement efforts using quantitative measures such as the number of enforcement hours, number of checkpoints, number of patrols, dollar amount of paid media, etc., would be helpful for future studies. Descriptions of baseline levels of enforcement that exist prior to the specific enforcement effort would be useful. Reporting safety outcomes several weeks or months after an enforcement campaign has ended would provide information on the long-term effects of a campaign. Finally, adopting a research plan informed by concepts of experimental design that would randomly select test sites and assign varying levels of enforcement efforts in a pre-determined manner would be helpful. Researchers may also find NHTSA's publication, *The Art of Appropriate Evaluation* (2008), useful when designing and collecting data, and reporting evaluation results.

Several findings could be relevant for practitioners, including the benefits of conducting HVE programs that have all program elements as the available literature

provides substantial evidence that combining enforcement, visibility, and publicity is an effective strategy. Practitioners could also collect robust data on their activities, even when they are not conducting a specialized enforcement program, allowing for greater data availability for researchers.

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Suggested APA format citation for this document:

Office of Behavioral Safety Research. (2022, May). *Synthesis of studies that relate amount of enforcement to magnitude of safety outcomes* (Traffic Tech Technology Transfer Series. Report No. DOT HS 813 268). National Highway Traffic Safety Administration.



U.S. Department of Transportation
**National Highway Traffic Safety
Administration**
1200 New Jersey Avenue SE
Washington, DC 20590

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