

## BTSCRP Project BTS-17

### Determining the Effectiveness of Combined High-Visibility Enforcement

#### Tech Brief: Recommendations for Additional Research

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## **PROJECT OBJECTIVES AND SUMMARY**

The goal of this research carried out for BTSCR Project BTS-17 was to develop an evaluation framework, which includes methodologies to determine the effectiveness of high-visibility enforcement (HVE) campaigns. To accomplish this goal, the following objectives were proposed:

- Identify methods used by agencies to measure the effectiveness of HVE campaigns
- Identify agency practices and approaches for detecting road user behaviors to target HVE campaigns
- Develop and assess evaluation frameworks suitable to evaluate the effectiveness of HVE campaigns

The research was accomplished through several major tasks, which are described in the sections below.

### **Literature Review on Effectiveness of HVE Campaigns**

A chapter included a description of how agencies select behaviors to include in HVEs, a summary of the literature review on the effectiveness of HVE campaigns, and the methodologies used to evaluate HVE campaigns. Based on the results of the literature review, the most common metrics agencies evaluate are citations/violations, arrests, stops, crashes, media posts, officer hours/resources, and seat belt use. A number of agencies also conduct surveys to assess public awareness of the campaign. The most common method used by agencies to evaluate HVE is a simple report of campaign productivity. Most agencies use tables or other simple formats which are used to show how overtime or other funds were used. Some agencies have used simple comparisons or simple statistical methods such as z-test or Chi-squared test. Several used more advanced statistics such as logistic regression but this is not a common activity.

### **Survey of Agencies**

After completion of the literature review, the team conducted a survey to gain additional information on how agencies conduct HVE campaigns as well as the data gathered and evaluation methods used. The survey was also used to better understand the challenges that agencies face in evaluating their HVE campaigns. The team received 48 responses from 29 states, Puerto Rico, and NHTSA.

### **Description of Data Utilized for Evaluation of HVE**

The team utilized a number of different types of datasets to assess the effectiveness of the evaluation frameworks developed. A chapter was included, which described these datasets in order to avoid repetition in the subsequent chapters since several of the datasets were used in multiple frameworks.

## Evaluation Frameworks

The main outcome of this project was the development of frameworks that agencies can use to evaluate the impact of an HVE campaign. In particular, the frameworks will assist agencies in evaluating the impacts of combined HVE campaigns on chosen performance measures. A combined HVE campaign is usually a single HVE campaign that targets two or more behaviors, for instance, both impaired driving and seat belt use.

The team developed the frameworks to meet two objectives. The first objective was to select methods based on the resources agencies typically have available to assess impact. For instance, most agencies are law enforcement officials who may have little background in statistics and have few additional resources. The team developed two frameworks, which can be used in these situations (*Data Visualization* and *Simple Before and After*). The second objective was to provide more rigorous statistical frameworks for agencies who have the in-house skills or resources to use outside consultants to develop more robust analyses that are capable of identifying the impact of individual factors, which can contribute to campaign effectiveness. The team developed two additional frameworks with this objective in mind (*Classical Statistical* and *Spatial/Temporal*). The report provides a description for the methods outlined in each framework.

The project team demonstrated the feasibility of each framework in evaluating combined HVE (two or more themes) using several examples. All of the frameworks can also be used for evaluation of regular HVE (single theme) but the report includes the section specific to combined HVE to show how well the models can be adapted to evaluate the impact of combined HVE.

The framework also included an evaluation of several common HVE performance measures using the datasets described in the previous section. The frameworks included:

- Data Visualization Framework
- Simple Before-After Analysis Framework
- Classical Statistical Analysis Framework
- Spatial and/or Temporal Effects Framework

## FUTURE RESEARCH NEEDS

The future research needs described below were formulated based on project outcomes.

### Research Need 1: Develop a Data Collection Toolbox

Most agencies conducting HVE are resource constrained. As a result, many collect the basics needed for reporting. However, collection and preservation of more information can significantly improve the ability to conduct evaluations later. BTS-17 provided a description of some datasets and included recommendations for how agencies could utilize these datasets. However, the focus of BTS-17 was on evaluation frameworks. As a result, development of a toolbox, which describes different types of data that can be collected, would be useful for agencies to decide if and how to collect/archive data. The toolbox could include:

- Description of potential datasets
- Methods for preserving raw data obtained for observational or studies (e.g. speed, seat belt surveys) to conduct other evaluations later if not needed initially
- Best practices in creating data dictionaries (short summaries of how data were collected including dates of data collection, data collection methods, or where data were collected) which can be helpful when using the data for other purposes

## **Research Need 2: Assess Efficacy of Large Datasets for Use in Evaluating Impacts of HVE**

Several large datasets were identified as part of the research for BTS-17. Due to resource constraints, it was not feasible to utilize them for this project. However, many agencies already collect or have access to some of these datasets, which could be utilized for evaluation of HVE. For instance, Wejo data include individual vehicle data, such as speed, which can be geolocated to a specific roadway and then used to compare speeds before and after a campaign. Examples of large datasets that could be utilized for evaluation of HVE include (but are not limited to):

- INRIX: integrates data from connected cars and mobile devices, cameras and roadway sensors
- Michelin: collects data from vehicles, tires, or driver experience apps
- Streetlight: uses cell phone data to estimate speed, origin/destination, volume
- Wejo (or similar company): collects individual vehicle trajectories from connected vehicle data

Datasets already collected by agencies, which could also be utilized include stationary sensors and cameras, which collect speed and volume data (i.e. ATR, traffic camera).

## **Research Need 3: Conduct Additional Research into Effectiveness of HVE**

Although the objective of BTS-17 was to develop evaluation frameworks, the team collected various datasets and in the process of demonstrating statistical methods, the team developed crash modification factors (CMF) using an empirical Bayes before-after method. This resulted in a CMF of 0.95 for the impact during campaigns and a CMF of 0.93 immediately after the campaign. The models showed both an impact due to different campaigns (seat belt versus impaired) as well due to the campaign in general.

As far as the team is aware, this is the first CMF that has been developed to show the effectiveness of HVE campaigns. Federal Highway Administration has expressed an interest in the results. Although BTS-17 was able to develop CMFs, there is an advantage to having several studies show similar results. Additionally, the CMFs for this report were conducted using data from Iowa. Better geographic representation would also be useful.

As a result, development of CMFs using data from different types of HVE campaigns and for different geographic areas would be useful to enable agencies to better demonstrate the benefits of HVEs.