



FMCSA Safety Program Effectiveness Measurement: Roadside Intervention Effectiveness Model FY 2010

Two of the Federal Motor Carrier Safety Administration's (FMCSA's) key safety programs are the Roadside Inspection and Traffic Enforcement programs. The Roadside Inspection program consists of roadside inspections performed by qualified safety inspectors. These inspections follow the guidelines of the North American Standard, which were developed by FMCSA and the Commercial Vehicle Safety Alliance. Most roadside inspections are conducted by the States under the Motor Carrier Safety Assistance Program. There are six levels of inspections that include a vehicle component, a driver component, or both. Separately, the Traffic Enforcement program is composed of two distinct activities: a traffic stop as a result of a moving violation and a subsequent roadside inspection.

FMCSA developed an analytic model to measure the effectiveness of roadside inspections and traffic enforcements in terms of crashes avoided, injuries prevented, and lives saved. This model, previously known as the Intervention Model, is currently known as the Roadside Intervention Effectiveness Model (RIEM). In this model, traffic enforcements and roadside inspections are considered interventions.

OVERVIEW

The RIEM is based on the premise that roadside inspection and traffic enforcement interventions, which correct vehicle and driver violations, contribute to a reduction in crashes. The model associates each violation of the Federal Motor Carrier Safety Regulations with a specific crash probability. Using these probabilities, analysts can estimate the number of crashes avoided as a result of correcting these violations. Additionally, the RIEM provides FMCSA management with information to address the Government Performance and Results Act of 1993, which requires Federal agencies to measure the effectiveness of their programs as part of the budget cycle process. It also provides FMCSA and State safety program managers with a quantitative basis for optimizing the allocation of safety resources in the field. Table 1 presents a summary of the benefits of the Roadside Inspection and Traffic Enforcement programs over the past 3 years, based on RIEM estimates.

Table 1. Program effectiveness from FY 2008 to FY 2010 using the RIEM Version 3.0.

Intervention Benefits	FY 2008	FY 2009	FY 2010
Crashes avoided due to roadside inspections	8,464	8,149	8,154
Crashes avoided due to traffic enforcements	9,053	8,789	8,330
Total Crashes Avoided	17,517	16,938	16,484
Injuries prevented due to roadside inspections	5,381	5,206	5,129
Injuries prevented due to traffic enforcements	5,755	5,615	5,240
Total Injuries Prevented	11,136	10,821	10,369
Lives saved due to roadside inspections	304	276	258
Lives saved due to traffic enforcements	325	297	263
Total Lives Saved	629	573	521

The model can be combined with the Compliance Review Effectiveness Model (or CREM, available at <http://ai.fmcsa.dot.gov/pe/CompliancePg.aspx>) to provide a powerful performance measurement tool for assessing FMCSA's safety programs.

DETERMINING CRASH RISK REDUCTION

Since the occurrence of a single violation implies a certain degree of crash risk, each inspection that uncovers and corrects at least one violation can be interpreted as having reduced crash risk. The model expresses this risk reduction in terms of the elimination of specific crash probabilities associated with each violation corrected. For an individual intervention, the reduction in crash risk depends on the number and type of violations found. By summing the crash risk probabilities for all violations corrected over all inspections, the model estimates the number of crashes avoided as a result of the Roadside Inspection and Traffic Enforcement Programs.

One fiscal year (FY) (defined as October 1 of the previous year through September 30 of the FY referenced) of intervention data is extracted from the

Motor Carrier Management Information System (MCMIS) database. This database contains roadside inspection information compiled from Federal and State safety agencies, including violations (if any) cited during interventions. While inspections are not required to have violations associated with them, in practice, about two-thirds of all interventions do find one or more violations. The violation data are the key component in the model, as they represent the defects identified and subsequently corrected as a result of the two programs.

The model employs three estimates in developing the crash risk reduction probability for a violation group:

- The **crash risk** of a violation group, where the crash risk is defined as the likelihood that the unsafe behavior associated with the violation group contributes to a crash during a commercial motor vehicle (CMV) daytrip, where a daytrip is defined as a CMV's travel during 1 day.
- The **duration** of the reduction in crash risk, expressed in days, when an instance of that violation group is recorded.
- The **correction rate** of violations in that violation group that are assumed corrected as a result of the intervention.

A preliminary crash risk reduction for a violation group is calculated from the product of the crash rate probability and the violation group's duration. The preliminary crash risk reduction is then multiplied by a violation correction rate to produce the final crash risk reduction for each violation in the violation group. The violation correction rate adjusts for the reality that not all violations are corrected within the required time period. Current research indicates that 69.9 percent of Vehicle Maintenance violations and 68.8 percent of Driver Fitness violations are corrected within the allotted time. The violation correction rate thus decreases the magnitude of the crash risk reduction used in the model to account for violations not corrected.

CALCULATION OF BENEFITS

To produce an estimate of the annual number of crashes avoided due to inspections, the model first determines the number of inspections for each violation group in which a violation was recorded during the FY. The inspection count is then multiplied by the final crash risk reduction associated with the violation group, yielding the estimate of annual crashes avoided. Finally, the estimated crashes avoided are added up across all violation groups to produce an estimate of the total annual crashes avoided during the FY.

Once the number of crashes avoided is totaled for all inspections during the year, the model then computes the number of lives saved and injuries avoided as a result of

those crashes avoided. Average numbers of fatalities per crash, injuries per crash, and injuries per fatal crash are computed using MCMIS data for all crashes in the United States for the last 2 years. These averages are then multiplied by the number of crashes avoided to estimate the number of lives saved and injuries avoided due to the inspections.

FY 2010 INTERVENTION MODEL RESULTS

Total crashes avoided, total lives saved, and total injuries avoided as a result of roadside inspection and traffic enforcement activities performed during FY 2010 were estimated by the RIEM. The results are presented at the national and State levels. Beginning in FY 2006, the RIEM was implemented to estimate benefits from roadside interventions by FY; previous years were implemented by calendar year (CY). As a result, estimates of benefits for years 2005 and earlier are shown by CY.

Overall program activity was higher in FY 2010 than in the 2 previous years, with the number of performed interventions increasing by about 1.2 percent from FY 2009. However, while roadside inspections rose by 60,622 (2.2 percent), traffic enforcements decreased by 19,933 (2.7 percent).

As shown in Table 1, the Roadside Inspection program is estimated to have prevented 8,154 crashes in FY 2010, while the Traffic Enforcement program is estimated to have prevented 8,330, for a total of 16,484 crashes avoided. The number of crashes avoided decreased from FY 2009 to 2010, even as the total number of interventions increased. The proportion of inspections that found no violations was unchanged from 2009 to 2010 (34 percent).

CONCLUSION

The Roadside Inspection and Traffic Enforcement programs are two of FMCSA's most powerful safety tools. By continually examining the results of these programs, FMCSA can ensure that they are being executed effectively and are producing the desired safety benefits. Results for individual States can be examined and compared to provide guidance on how to allocate safety resources. The total national results show the scale of Roadside Inspection and Traffic Enforcement programs and the magnitude of their effects on highway safety. In 2010, these programs saved an estimated 521 lives and prevented 10,370 injuries by averting 16,487 crashes; over the past 9 years, these programs are estimated to have saved more than 6,000 lives.

For more information, please visit:
<http://www.fmcsa.dot.gov/safety/research-and-analysis/publications>.