FMCSA Safety Program Effectiveness Measurement: Roadside Intervention Effectiveness Model FY 2012

Roadside Inspection and Traffic Enforcement are two of the Federal Motor Carrier Safety Administration's (FMCSA's) key safety programs. The Roadside Inspection Program consists of roadside inspections performed by qualified safety inspectors. These inspections follow the North American Standard guidelines, 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 prevented, 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 prevented 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 2010 to FY 2012 using the RIEM Version 3.0.

Intervention Benefits	FY 2010	FY 2011*	FY 2012*
Crashes prevented due to roadside inspections	8,154	8,311	8,721
Crashes prevented due to traffic enforcements	8,330	6,468	5,703
Total Crashes Prevented	**16,484**	**14,779**	**14, 424**
Injuries prevented due to roadside inspections	5,129	5,106	5,341
Injuries prevented due to traffic enforcements	5,240	3,974	3,492
Total Injuries Prevented	**10,369**	**9,080**	**8,833**
Lives saved due to roadside inspections	258	272	285
Lives saved due to traffic enforcements	263	212	187
Total Lives Saved	**521**	**484**	**472**

* FY 2011 and FY 2012 safety benefit calculations have been enhanced; while not identical to the calculations from earlier years, the results are comparable.

The model, in conjunction with the Carrier Intervention Effectiveness Model (CIEM),[1] provides 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 crashes prevented as a result of each violation being 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 prevented as a result of the Roadside Inspection and Traffic Enforcement programs.

[1] http://ntl.bts.gov/lib/54000/54400/54484/RRA-14-011-CIEM_Summary_Report-FINAL-508C.pdf

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 result in 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 to generate the incremental crash reduction associated with correcting each violation recorded at the roadside:

- The **crash risk** of the violation, defined as the likelihood that the unsafe behavior associated with the violation 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 is corrected.
- The **correction rate** for the violation, defined as the percentage of these violations that are assumed corrected as a result of the intervention.

A preliminary crash reduction for the violation is calculated from the product of its crash rate probability and the assumed duration of its remediation when corrected. The preliminary crash reduction is then multiplied by the violation's correction rate to produce the final crash reduction for the violation. 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 prevented due to inspections, the model first determines the number of inspections in which a particular type of violation was recorded during the FY. The inspection count is then multiplied by the final crash reduction associated with that violation, yielding the estimate of annual crashes prevented as a result of correcting the violation. Finally, the estimated crashes prevented are added up across all violation types to produce an estimate of the total annual crashes prevented during the FY.

Once the number of crashes prevented is totaled for all inspections during the year, the model then computes the number of lives saved and injuries prevented as a result of those crashes prevented. 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 prevented to estimate the number of lives saved and injuries prevented due to the inspections.

FY 2012 INTERVENTION MODEL RESULTS

Total crashes prevented, total lives saved, and total injuries prevented as a result of roadside inspection and traffic enforcement activities performed during FY 2012 were estimated by the RIEM. The results are presented at the national and State levels. The RIEM has been implemented since FY 2006 to estimate benefits from roadside interventions by FY; benefits for previous years have been estimated by the model by calendar year (CY).

Overall program activity was lower in FY 2012 than in FY 2011, with the number of interventions performed decreasing by about 0.6 percent. While roadside inspections rose by 50,815 (1.7 percent), traffic enforcements decreased by 70,856 (12.2 percent).

As shown in Table 1, the Roadside Inspection Program is estimated to have prevented 8,721 crashes in FY 2012, while the Traffic Enforcement Program is estimated to have prevented 5,703, for a total of 14,424 crashes prevented. The proportion of inspections resulting in no violations increased from 37 percent in 2011 to 39 percent in 2012. Because more roadside inspections found no violations, the average number of violations per inspection decreased from 1.91 in 2010 to 1.77 in 2011 and further to 1.65 in 2012.

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 the Roadside Inspection and Traffic Enforcement programs and the magnitude of their effects on highway safety. In 2012, these programs saved an estimated 472 lives and prevented 8,833 injuries by averting 14,424 crashes. Since 2001, these programs are estimated to have saved more than 7,000 lives.

For more information, please visit: http://ntl.bts.gov/lib/56000/56900/56979/15-013-RIEM_FY2012_508C_-_V1_.pdf.