FMCSA Safety Program Effectiveness Measurement: Intervention Model Fiscal Year 2009

The Roadside Inspection and Traffic Enforcement Programs are two key Federal Motor Carrier Safety Administration (FMCSA) safety programs. The Roadside Inspection Program consists of roadside inspections performed by qualified safety inspectors following the guidelines of the North American Standard, developed by FMCSA and the Commercial Vehicle Safety Alliance (CVSA). Most roadside inspections are conducted by the States under the Motor Carrier Safety Assistance Program (MCSAP). This program has six levels of inspections, including a vehicle component, a driver component, or both. 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 avoided, and lives saved. In this model, known as the Intervention Model, traffic enforcements and roadside inspections are considered interventions. The model is based on the premise that interventions resulting in the correction of vehicle and driver violations, specifically roadside inspections and traffic enforcements, contribute to a reduction in crashes. The model associates each violation of the Federal Motor Carrier Safety Regulations and Federal Hazardous Materials Regulations with a specific crash probability to estimate the number of crashes avoided.

Additionally, the Intervention Model provides FMCSA management with information to address the Government Performance and Results Act of 1993 (GPRA), 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.

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

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, which 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 for violations in the group is defined as the likelihood that the unsafe behavior associated with the violation contributes to a crash during a commercial motor vehicle (CMV) daytrip. (A "daytrip" is defined as a CMV's travel during 1 day.)

• The duration of the reduction in crash risk when a violation in the group is identified at the roadside and corrected. The duration of the risk reduction varies according to the violation group to which the violation is assigned.

• The correction rate for violations in the group that are corrected as a result of the intervention.

U.S. Department of Transportation
Federal Motor Carrier Safety Administration

A preliminary crash risk reduction for a violation group is calculated from the product of the crash rate probability (CRP) 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. Preliminary research indicates that only 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. Lastly, 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 year. 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 2009 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 2009 were estimated by the Intervention Model. The results are presented at the national and State levels. Beginning in FY 2006, the Intervention Model was implemented to estimate benefits from roadside interventions by fiscal year; previous years were implemented by calendar year (CY). As a result, estimates of benefits for years 2005 and earlier are shown by CY.

Program activity was higher in FY 2009 than in the 2 previous years. The number of interventions performed increased by about 1.1 percent from FY 2008, roadside inspections rose by 65,152 (2.4 percent), and traffic enforcements decreased by 25,253 (3.3 percent).

Table 1 presents the estimated benefits of the two programs over the past 3 years. The model estimates that the Roadside Inspection Program prevented 8,149 crashes in FY 2009, while the Traffic Enforcement Program prevented 8,789, for a total of 16,939 crashes avoided. The number of crashes avoided decreased from FY 2008 to FY 2009, even as the total number of interventions increased, because the proportion of inspections resulting in no violations also increased (from 32 percent to 34 percent). Because more roadside inspections found no violations, the average number of violations per inspection decreased from 2.14 in 2008 to 2.07 in 2009. Traffic enforcement interventions are an exception: they prevented more crashes per intervention in FY 2009 than in FY 2008, but prevented fewer crashes overall because total interventions decreased.

Table 1. Program Effectiveness FY 2007–09 Using Intervention Model 3.0

Estimated Intervention Benefits	FY 2007	FY 2008	FY 2009
Crashes Avoided Due to Roadside Inspections	8,101	8,464	8,149
Crashes Avoided Due to Traffic Enforcements	8,769	9,053	8,789
Total Crashes Avoided	16,870	17,517	16,939
Injuries Avoided Due to Roadside Inspections	5,222	5,381	5,206
Injuries Avoided Due to Traffic Enforcements	5,652	5,755	5,615
Total Injuries Avoided	10,874	11,136	10,821
Lives Saved Due to Roadside Inspections	307	304	276
Lives Saved Due to Traffic Enforcements	332	325	297
Total Lives Saved	639	629	573

The total national results show the scale of Roadside Inspection and Traffic Enforcement Programs and the magnitude of their effects on highway safety: in 2009, 2,781,297 roadside inspections and 730,916 traffic enforcements were conducted. Together, it is estimated that in FY 2009, these interventions saved approximately 570 lives and prevented 10,800 injuries by averting almost 17,000 crashes. Over the past 9 years, it is estimated that these two programs have saved almost 6,000 lives.

For more information, please visit: http://www.fmcsa.dot.gov/facts-research/art-public-reports.aspx.