



FMCSA Safety Program Effectiveness Measurement: Carrier Intervention Effectiveness Model, Version 1.1—Report for FY 2013 Interventions

The Carrier Intervention Effectiveness Model (CIEM) provides the Federal Motor Carrier Safety Administration (FMCSA) with a tool for measuring the safety benefits of carrier interventions conducted under the Compliance, Safety, Accountability (CSA) enforcement program. The CSA program includes an array of carrier intervention types that replace the universally-implemented compliance review that was used as part of the previous enforcement model. The new enforcement model was designed to improve the level of safety in the operation of commercial motor vehicles.

Using a phased approach, FMCSA began implementing the CSA program in 2010. During the implementation period, some carriers were still subject to compliance reviews under the earlier enforcement program. The safety impacts of these compliance reviews were previously measured by the Compliance Review Effectiveness Model (CREM). The new model, CIEM, incorporates both compliance reviews and additional intervention types when assessing safety benefits. Additional intervention types include:

- Warning letters.
- Offsite investigations.
- Onsite focused investigations.
- Onsite comprehensive investigations.

This approach yields national-level measurements of the effectiveness of FMCSA’s current carrier interventions. Table 1 shows the safety benefits of all interventions, as calculated by the CIEM, for fiscal years (FYs) 2011–13. In 2013, carrier interventions led to an estimated 7,256 crashes prevented, 4,355 injuries prevented, and 229 lives saved.

Table 1. CIEM-reported safety benefits resulting from carrier interventions performed from FY 2011–13.

Fiscal Year	Crashes Prevented	Injuries Prevented	Lives Saved
2011	6,567	4,005	215
2012	5,283	3,251	175
2013	7,256	4,354	229

MODEL FINDINGS

All Carriers Receiving Interventions

The model was implemented for carriers receiving the specified intervention types in FY 2013. Total interventions decreased from 43,275 in FY 2012 to 38,140 in FY 2013, primarily reflecting a decline in warning letters issued in FY 2013. This decline in total interventions follows a 26 percent decline in total interventions in FY 2012.

Table 3 (see page 2) presents two sets of data for FY 2013 and for the two preceding fiscal years.⁽ⁱ⁾ The first three columns show the number of interventions conducted by FMCSA and its State partners and are considered as input into the model, by type, for each of the three fiscal years. The next three columns report the number of carriers receiving these intervention types as their first intervention in each fiscal year. Overall, the set of FMCSA intervention types considered by the model are estimated to have reduced motor carrier crash rates in FY 2013 (as in prior years). Consistent with CREM results in prior years, crash rate reductions are generally more pronounced for the smaller carrier size groups (as shown in Table 2).

Table 2. Adjusted⁽ⁱⁱ⁾ percent reductions in crash rates.

By Carrier Size Group	FY 2011	FY 2012	FY 2013
1 (1–5 power units)	34.3%	37.5%	43.6%
2 (6–20 power units)	31.2%	33.4%	40.6%
3 (21–100 power units)	16.7%	17.0%	23.1%
4 (100+ power units)	4.0%*	5.5%*	9.0%

Note: Negative crash rate reductions indicate increases in crash rates.
*Non-statistically significant adjusted reduction.

ⁱ Some of the intervention counts for FY 2011 differ slightly from those reported in the previously published CIEM Summary Report for that year. Subsequent to the release of that report, FMCSA made minor modifications to the way the CIEM identifies particular intervention types in instances where such information was not recorded or ambiguous in MCMIS. The intervention counts in Table 3 reflect these changes.

ⁱⁱ Raw percent reductions generated from the model are adjusted to account for reductions in crash rates experienced by carriers not receiving interventions.

Table 3. Carrier interventions by type, and number of carriers by first intervention.

Intervention Type	Number of Interventions FY 2011	Number of Interventions FY 2012	Number of Interventions FY 2013	Number of Carriers Receiving Interventions (by first intervention) FY 2011	Number of Carriers Receiving Interventions (by first intervention) FY 2012	Number of Carriers Receiving Interventions (by first intervention) FY 2013
CSA Warning Letter	39,004	23,835	20,225	38,918	23,806	20,206
Offsite Investigation	645	624	619	629	614	591
Onsite Focused Investigation	6,246	10,470	9,388	5,427	9,809	8,913
Onsite Comprehensive Investigation*	1,400	7,038	5,796	1,357	6,664	5,451
PRISM Warning Letter	1,764	-	-	1,754	-	-
Compliance Review	8,263	-	-	7,638	-	-
Non-ratable Review	877	1,308	2,112	748	1,175	2,028
Total	58,199	43,275	38,140	56,471	42,068	37,189

* Beginning in FY 2012, all reviews previously considered motor carrier safety compliance reviews are included in the CSA onsite comprehensive investigations total.

Although total carrier interventions declined in FY 2013, percent reductions in crash rates for carriers receiving interventions were higher than in the previous year, resulting in slightly higher estimated crashes and injuries prevented and estimated lives saved in FY 2013.

Additional Analysis

Further analyses were performed by implementing the model for two subsets of the full treatment group: carriers whose first intervention each year was not a warning letter, and carriers whose first intervention was a warning letter. This further analysis provides a measure of the effectiveness of CSA warning letters. These findings indicate that warning letters, which are much less expensive than more labor-intensive interventions, can be an efficient tool in reducing crashes for many carriers.

MODEL APPROACH

The model computes carrier crash rates, defined as crashes per carrier power unit (PU), for carriers receiving interventions (i.e., treatment group carriers) for defined periods prior to and following the interventions. The difference between these carriers' pre- and post-intervention crash rates represents the change in their

safety performance during this timeframe. To remove the effect of confounding factors from the calculation of the change in safety performance, the difference between pre- and post-intervention crash rates is adjusted by the change in crash rates experienced by the general carrier population during a corresponding timeframe. To control for systemic differences between small and large carrier operations, these adjustments are made within carrier size groups, based on their PU count. A set of carefully designed filters is used to identify and remove missing and outlier carrier data.

The model incorporates statistical significance testing, which only considers size group changes in crash rates that are statistically significant. Statistically significant results, measured in terms of crashes prevented, injuries prevented, and lives saved, are then extrapolated to incorporate those carriers that received interventions but were not included in the initial model calculations because of missing or inaccurate data.

In summary, FY 2013 provides strong evidence for the effectiveness of FMCSA's carrier interventions. Future implementation of the model will enable FMCSA to continue to measure the impacts of carrier interventions.

To read the complete report, please visit: <https://ntl.bts.gov/lib/61000/61200/61253/17-004-CIEM-FY13-Final-508C.pdf>.