



FMCSA Safety Program Effectiveness Measurement: Carrier Intervention Effectiveness Model, Version 1.1—Report for FY 2014 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) 2012–14. In 2014, carrier interventions led to an estimated 5,811 crashes prevented, 3,316 injuries prevented, and 168 lives saved.

MODEL FINDINGS

The model was implemented for carriers receiving the specified intervention types in FY 2014. Table 2 presents two sets of data for FY 2014 and its two

Table 1. Estimated crashes prevented, injuries prevented, and lives saved from FY 2012–14.

| Fiscal Year | Crashes Prevented | Injuries Prevented | Lives Saved |
|-------------|-------------------|--------------------|-------------|
| 2012 | 5,283 | 3,251 | 175 |
| 2013 | 7,256 | 4,354 | 229 |
| 2014 | 5,811 | 3,316 | 168 |

preceding fiscal years. Columns B through D show by type the number of interventions conducted by FMCSA and its State partners for each of the three fiscal years. Columns E through G give the number of carriers receiving these intervention types as their first intervention in those fiscal years.

Total interventions decreased from 38,140 in FY 2013 to 34,932 in FY 2014, primarily reflecting a decline in offsite investigations, onsite focused investigations, and non-ratable reviews. (This decline in total interventions follows a 12 percent decline in total interventions in FY 2013.)

Overall, the set of FMCSA intervention types considered by the model are estimated to have reduced motor carrier crash rates in FY 2014 (as in prior years). Consistent with CREM results in prior years, crash rate reductions are generally more pronounced for the smaller carrier size groups (see Table 3).

FY 2014 saw both fewer total interventions than FY 2013 and a lower crash rate reduction for all carrier size groups except size group 1.

Additional Analysis

Further analyses were performed by implementing the model for two subsets of the full treatment group: carriers whose first intervention in a 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 suggest that warning letters, which are much less expensive than more labor-intensive

Table 2. Carrier interventions by type, and number of carriers by first intervention.

| A Intervention Type | B Number of Interventions FY 2012 | C Number of Interventions FY 2013 | D Number of Interventions FY 2014 | E Number of Carriers Who Received this Intervention as their First in FY 2012 | F Number of Carriers Who Received this Intervention as their First in FY 2013 | G Number of Carriers Who Received this Intervention as their First in FY 2014 |
|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--|--|--|
| CSA Warning Letter | 23,835 | 20,225 | 20,535 | 23,806 | 20,206 | 20,529 |
| Offsite Investigation | 624 | 619 | 381 | 614 | 591 | 334 |
| Onsite Focused Investigation | 10,470 | 9,388 | 7,376 | 9,809 | 8,913 | 6,995 |
| Onsite Comprehensive Investigation* | 7,038 | 5,796 | 5,891 | 6,664 | 5,451 | 5,587 |
| Non-ratable Review | 1,308 | 2,112 | 749 | 1,175 | 2,028 | 687 |
| Total | 43,275 | 38,140 | 34,932 | 42,068 | 37,189 | 34,132 |

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

Table 3. Adjusted⁽ⁱ⁾ percent reductions in crash rates after a carrier received an intervention.

| By Carrier Size Group | FY 2012 | FY 2013 | FY 2014 |
|------------------------|---------|---------|---------|
| 1 (1–5 power units) | 37.5% | 43.6% | 47.0% |
| 2 (6–20 power units) | 33.4% | 40.6% | 35.5% |
| 3 (21–100 power units) | 17.0% | 23.1% | 20.87% |
| 4 (100+ power units) | 5.5%* | 9.0% | 0.2%* |

Note: Negative crash rate reductions indicate increases in crash rates.

*Non-statistically significant adjusted reduction

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 period 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 period 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 determined by 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 2014 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: [\[Link to be inserted once available\]](#).

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