



FMCSA Safety Program Effectiveness Measurement: Carrier Intervention Effectiveness Model, Version 1.3—Report for FY 2017 and FY 2018 Interventions

BACKGROUND

The Carrier Intervention Effectiveness Model (CIEM) provides the Federal Motor Carrier Safety Administration (FMCSA) with a tool for measuring the safety benefits of State and Federal 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 previously used by the Agency. The new enforcement program 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 implementation, 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. Intervention types include:

- Warning letters.
- Offsite State/Federal investigations.
- Onsite focused State/Federal investigations.
- Onsite comprehensive State/Federal investigations.
- Other Non-ratable Reviews.

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) 2017–18. In FY 2018, carrier interventions resulted in an estimated 9,627 crashes prevented, 5,153 injuries prevented, and 275 lives saved.

Table 1. Estimated crashes prevented, injuries prevented, and lives saved from FY 2017–18.

Fiscal Year	Crashes Prevented	Injuries Prevented	Lives Saved
2017	8,765	4,818	269
2018	9,627	5,153	275

MODEL APPROACH

The model computes carrier crash rates, defined as crashes per carrier power unit (PU), for carriers receiving interventions (treatment group carriers) for defined periods before and after interventions. The difference between these carriers’ pre- and post-intervention period crash rates represents the change in their safety performance during this timeframe. To control for systemic differences between small and large carrier operations, these comparisons are made within carrier size groups defined in terms of carrier PU counts. 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 carriers not receiving interventions during a corresponding timeframe. A set of carefully designed filters is used to identify and remove data records with missing and outlier carrier data, prior to running the model estimates.

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



MODEL FINDINGS

Version 1.3 of the model was implemented for carriers receiving the specified intervention types in FY 2017 and FY 2018 (in addition, model estimates were rerun for FY 2016 based on model Version 1.3). Table 2 presents information on the number of carriers receiving interventions in FY 2018 and the 2 preceding fiscal years. Columns B through D give counts for each of the intervention types conducted, and columns E through G give the number of carriers receiving these intervention types as their first intervention.

Overall, the set of FMCSA intervention types specified in the model are shown to have reduced motor carrier crash rates in FY 2017 and 2018 (as in prior years). Table 3 shows the percent crash rate reductions from the pre- to the post-intervention period, by carrier size group, for carriers receiving interventions in fiscal years 2016, 2017, and 2018. Consistent with prior years' results, crash rate reductions are generally more pronounced for the smaller carrier size groups (see Table 3).

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

A	B	C	D	E	F	G
Intervention Type	Number of Interventions FY 2016	Number of Interventions FY 2017	Number of Interventions FY 2018	Number of Carriers Receiving Interventions (by first intervention) FY 2016	Number of Carriers Receiving Interventions (by first intervention) FY 2017	Number of Carriers Receiving Interventions (by first intervention) FY 2018
CSA Warning Letter	30,530	26,982	26,970	30,377	26,889	26,884
Offsite Investigation	127	91	238	122	86	223
Onsite Focused Investigation	7,111	7,497	7,573	6,549	6,772	6,892
Onsite Comprehensive Investigation*	5,980	6,387	5,925	5,469	5,929	5,484
Other Non-ratable Review	611	791	534	601	687	468
Total	44,359	41,748	41,240	43,023	40,363	39,951

*Compliance reviews are now included as onsite comprehensive investigations. Note: Investigations listed here include both State and Federal investigations.



Table 3. Net percent reductions in crash rates after a carrier received an intervention, By Carrier Size Group.

By Carrier Size Group	FY 2016	FY 2017	FY 2018
1 (1–5 power units)	49.7%	53.2%	51.4%
2 (6–20 power units)	36.5%	37.8%	39.8%
3 (21–100 power units)	16.4%	21.1%	21.0%
4 (100+ power units)	2.1%	2.5%	3.1%

The model now estimates safety benefits associated with individual intervention types. (Carriers receiving more than one type of intervention during the fiscal year are assigned an intervention type, based on the nature of the first intervention it received during that year). Benefits associated with each

intervention type are presented in Table 4 for FY 2018. These findings do not necessarily speak to the relative effectiveness of the individual intervention types due to the different safety profiles of carriers receiving each intervention type.

In summary, the FY 2017 and 2018 data on pre- and post-intervention safety performance provide evidence for the effectiveness of FMCSA’s carrier interventions, as in previous years. Future implementation of the model will enable FMCSA to continue to measure the impacts of carrier interventions conducted by the agency.

To read the complete report, please visit: <https://rosap.ntl.bts.gov/view/dot/62745>

Table 4. Estimated crashes and injuries prevented, and lives saved, by investigation type, FY 2018.*

Intervention Type	All Carriers Receiving Interventions: Number of Carriers	Crashes Prevented	Injuries Prevented	Lives Saved
Onsite Focused	6,892	1,462	782	42
Onsite Comprehensive	5,484	1,135	607	32
Offsite Focused (non-ratable)	223	0	0	0
Other Non-ratable Review	468	31	17	1
Warning Letter	26,884	6,622	3,545	189

* Note: Due to various model calculations being performed at a finer level of granularity, estimated safety benefits associated with each intervention type may not add up to the total benefits shown in Table 1.

