



# FMCSA Safety Program Effectiveness Measurement: Carrier Intervention Effectiveness Model, Version 1.3—Report for FY 2021 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. The CIEM considers the following CSA intervention types when assessing safety benefits:

- 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 year (FY) 2021. In FY 2021, carrier interventions resulted in an estimated 11,305 crashes prevented, 5,599 injuries prevented, and 370 lives saved.

**Table 1. Estimated crashes prevented, injuries prevented, and lives saved from FY 2021 interventions.**

Fiscal Year	Crashes Prevented	Injuries Prevented	Lives Saved
2021	11,305	5,599	370

## MODEL APPROACH

The model computes combined motor carrier crash rates, defined in terms of 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 in crash rates between small and large carriers, and in how such carriers respond to interventions, the model estimates safety improvement within carrier size groups, defined in terms of carrier PU counts. To remove the effect of external factors from the model calculations, the difference between the calculated pre- and post-intervention period crash rates is adjusted by the change in crash rates experienced by carriers not receiving interventions during the same timeframe. In addition, a set of carefully designed filters is used to identify and remove carrier data records with missing or outlier 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 run for carriers receiving the specified intervention types in FY 2021. Table 2 presents information on the number of carriers receiving interventions in FY 2021 and the two preceding fiscal years, by intervention type. 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 considered by the model was associated with a reduction in motor carrier crash rates in FY 2021 (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 2019, 2020, and 2021. Consistent with prior years' results, crash rate reductions were generally more pronounced in the smaller carrier size groups.

**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 2019	Number of Interventions FY 2020	Number of Interventions FY 2021	Number of Carriers Receiving Interventions (by first intervention) FY 2019	Number of Carriers Receiving Interventions (by first intervention) FY 2020	Number of Carriers Receiving Interventions (by first intervention) FY 2021
CSA Warning Letter	25,652	22,250	25,919	25,574	22,204	25,876
Offsite Focused Investigation	1,013	5,058	4,821	891	4,640	4,423
Onsite Focused Investigation	6,177	3,938	4,905	5,668	3,591	4,360
Onsite Comprehensive Investigation*	5,494	2,908	2,064	5,130	2,793	1,899
Other Non-ratable Review	342	127	77	313	116	61
<b>Total</b>	<b>38,678</b>	<b>34,281</b>	<b>37,786</b>	<b>37,576</b>	<b>33,344</b>	<b>36,619</b>

\* Onsite Comprehensive Investigations were previously referred to as Compliance Reviews by the Agency. 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, FYs 2019–2021.**

Carrier Size Group	FY 2019	FY 2020	FY 2021
1 (1–5 power units)	50.3%	50.6%	63.9%
2 (6–20 power units)	34.1%	31.4%	43.2%
3 (21–100 power units)	18.7%	10.7%	25.4%
4 (101+ power units)	1.6%	1.1%	3.9%



The model also 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 2021. 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 2021 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/78050>

**Table 4. Estimated crashes and injuries prevented, and lives saved, by investigation type, FY 2021.\***

<b>Intervention Type</b>	<b>All Carriers Receiving Interventions: Number of Carriers</b>	<b>Crashes Prevented</b>	<b>Injuries Prevented</b>	<b>Lives Saved</b>
Onsite Focused	4,360	1,922	952	63
Onsite Comprehensive	1,899	178	88	6
Offsite Focused (non-ratable)	4,423	490	243	16
Other Non-ratable Review	61	0	0	0
Warning Letter	25,876	8,344	4,132	273

\* Note: Due to various model calculations being performed at a finer level of granularity for these estimates, estimated safety benefits associated with each intervention type do not add up to the total benefits shown in Table 1. Much of this disparity may be explained by smaller sample sizes in the size groups when calculating safety benefits associated with particular intervention types, which potentially impacts the statistical significance of the results obtained in each size class.

