

Des Moines Area MPO Safety Performance Targets and Methodology

January 2020

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BACKGROUND

In April 2016, the Federal Highway Administration (FHWA) released the final rulemaking for safety performance measures for the Highway Safety Improvement Program (HSIP). Included in the rulemaking are definitions of key terms, the applicability of the rule, and guidance on how to establish performance targets, determine if progress is achieved, and report targets for the HSIP.

The safety measures required to be reported annually include:

1. Number of Fatalities
2. Rate of Fatalities per 100 million Vehicle Miles Traveled (VMT)
3. Number of Serious Injuries
4. Rate of Serious Injuries per 100 million Vehicle Miles Traveled (VMT)
5. Number of Non-motorized Fatalities and Non-motorized Serious Injuries

Performance targets were established by states beginning in August 2017. A Metropolitan Planning Organization (MPO) has 180 days after the state sets its targets to either:

- 1) Agree to support the State Department of Transportation (DOT) target
- 2) Establish a target for each of the five performance measures specific to the MPO planning area

MPO target achievement will be monitored through the continued planning efforts of the MPO, including through long-range planning, project evaluation, and performance monitoring reports.

Safety Goals in *Mobilizing Tomorrow*

Mobilizing Tomorrow, approved in 2014 and updated in 2019, is the Des Moines Area MPO's long-range, regional transportation plan for the year 2050. *Mobilizing Tomorrow* outlines four high-level goals to direct Greater Des Moines toward an enhanced transportation system. Each of the goals identified several performance measures to help track the plan's implementation. Goal 4 in *Mobilizing Tomorrow* seeks to "further the health, safety, and well-being of all residents in the region" and includes four of the five measures required by federal rulemaking.

In addition to setting baseline values for tracking performance in the long-range plan, a target was set for the year 2050 to be used to evaluate the ongoing performance of the transportation system. In *Mobilizing Tomorrow*, each of the four measures have a 2050 target of decreasing from the baseline.

The Des Moines Area MPO Policy Committee does not approve of using the word "target" in the context of crashes, fatalities, and serious injuries. However, because current federal regulation requires MPOs to set so-called "targets", the Policy Committee has agreed so while maintaining that references to fatalities, serious injuries, and crashes in targeted amounts are not appropriate. Continuing to monitor crashes, fatalities, and serious injuries within the Des Moines Area MPO planning area also contributes toward regional Vision Zero initiatives.

STATEWIDE TARGETS

In August 2019, the Iowa DOT established statewide safety performance targets for the 2016-2020 period as shown in Table 1. A fatality is defined as “any injury that results in death within 30 days after the motor vehicle crash in which the injury occurred” and a major or serious injury is defined as “any injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities the person was capable of before the injury occurred.”¹

Table 1: Iowa DOT Safety Performance Targets

Performance Measures	Five-Year Rolling Averages	
	2014-2018 Baseline	2016-2020 Target
Number of Fatalities	337.4	345.8
Fatality Rate*	1.046	1.011
Number of Serious Injuries	1,499.1	1,396.2
Serious Injury Rate*	4.497	4.083
Non-Motorized Fatalities and Serious Injuries	134.2	138.1

*Rates are per 100 million vehicle miles traveled (VMT)

Per [23 § 490.209](#), the Des Moines Area MPO must establish safety targets within 180 days of the statewide targets being established, by February 27, 2020. The Des Moines Area MPO maintains two options for setting regional performance targets:

1. Support the Iowa DOT’s targets by agreeing to plan and program projects so that they contribute toward the accomplishment of the State DOT safety target for that performance measure
2. Set a quantifiable target for that performance measure for the MPO

Based on discussion with the Des Moines Area MPO Committees and the safety performance targets established for 2050 in *Mobilizing Tomorrow*, the Des Moines Area MPO determined that setting safety targets for its planning area was the appropriate action for the 2016-2020 period.

The Des Moines Area MPO first reviewed its draft 2016-2020 safety targets and methodology with its Planning Subcommittee and the Engineering Subcommittee in October 2019 and then with the Iowa DOT in December 2019. In January 2020, the 2016-2020 safety targets were presented to the Des Moines Area MPO Technical, Executive, and Policy Committees. The Des Moines Area MPO Committees are expected to vote and approve the 2016-2020 safety targets in February 2020.

¹ Performance. Iowa Department of Transportation. <https://iowadot.gov/performance/safety>.

DES MOINES AREA MPO SAFETY PERFORMANCE METHODOLOGY

Des Moines Area MPO 2014-2018 Baseline

Safety performance targets for the Des Moines Area MPO planning area were established from 2014-2018 baseline measures. Utilizing crash report data collected by the Iowa DOT for the most recent 10-year period (2009-2018), the Des Moines Area MPO calculated the five-year rolling average for the number and rate of fatalities, number and rate of serious injuries, and the number of non-motorized fatalities and serious injuries. Appendix A provides additional details on the fatalities, serious injuries, and non-motorized fatalities and serious injuries as well as their five-year rolling averages.

Table 2 presents the 2014-2018 baseline values for the five safety performance measures for the Des Moines Area MPO planning area. Vehicle miles traveled data were estimated for the MPO Planning Area based on historic data.

Table 2: Des Moines Area MPO Safety Performance Baselines

Performance Measure	Five-Year Rolling Averages
	2014-2018 Baseline
Number of Fatalities	26.8
Fatality Rate*	0.562
Number of Serious Injuries	178.6
Serious Injury Rate*	3.756
Non-Motorized Fatalities and Serious Injuries	26.2

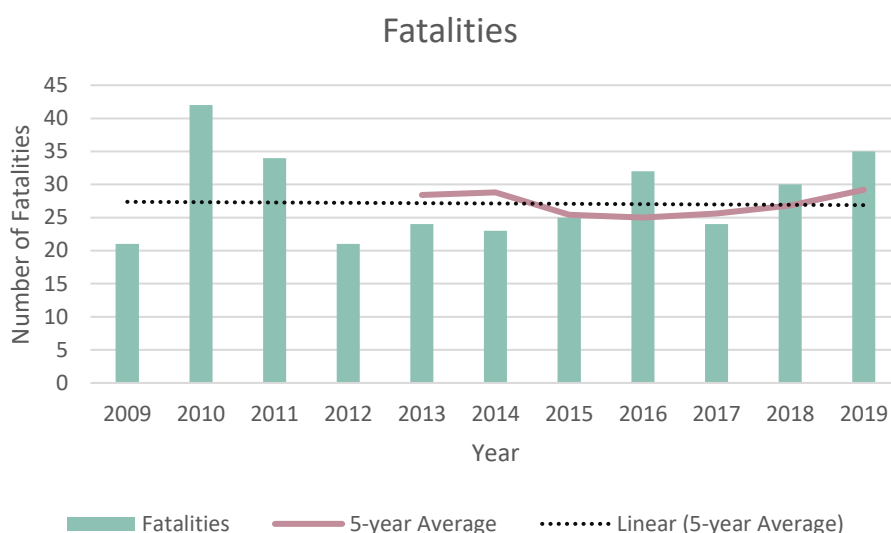
*Rates are per 100 million vehicle miles traveled (VMT)

Safety Performance Forecast – Fatalities

The Des Moines Area MPO used reported crash fatalities from the Iowa DOT's Iowa Crash Analysis Tool (ICAT)² in reviewing historic crash fatalities data and in setting future targets.

In 2019, there were 35 fatalities from crashes within the Des Moines MPO planning area. To illustrate current trends, the five-year rolling averages for crash fatalities within the MPO planning area were calculated and then a linear trendline was applied to the five-year rolling averages. The number of fatalities, the five-year rolling averages, and the linear trend for the five-year rolling averages are shown in Figure 1.

Figure 1: Historic Crash Fatalities 2009-2019



The Des Moines Area MPO forecasted the number of fatalities for the year 2020 based on historic crash data and the 2019 value using the AAA version of the Exponential Smoothing (ETS) algorithm with the upper bounds of the 50th, 75th, 85th, and 90th prediction intervals. The Iowa DOT utilizes prediction intervals in their integrated moving average (IMA) model when setting their required targets. To maintain consistency with Iowa DOT analysis, the Des Moines Area MPO also analyzed crash data with prediction intervals.

² <https://icat.iowadot.gov/>

Table 4 provides the upper bounds of the forecasted number of fatalities for the year 2020 using 2009-2019 fatalities data.

Table 3: 2020 Crash Scenario Forecasts, Number of Fatalities

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Number of Fatalities	35.0	38.7	41.0	42.6	29.1

Safety Performance Target – Fatalities

Using the 2019 crash fatalities and the forecasted values above, forecasted five-year averages were developed. Table 5 shows the forecasted five-year averages for crash fatalities in the Des Moines Area MPO Planning Area for 2016-2020.

Table 4: 2020 Crash Scenario Forecasts, Fatalities Five-Year Average

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Five-Year Average of Fatalities	31.2	31.9	32.4	32.7	30.0

After reviewing the forecasted five-year averages and the linear trendline projection, the Des Moines Area MPO determined that to continue to achieve improvement toward the goal set in *Mobilizing Tomorrow*, a 2016-2020 safety performance target should follow the linear trendline. Table 6 provides the five-year average fatalities target.

Table 5: 2016-2020 Number of Fatalities Target Five-Year Average

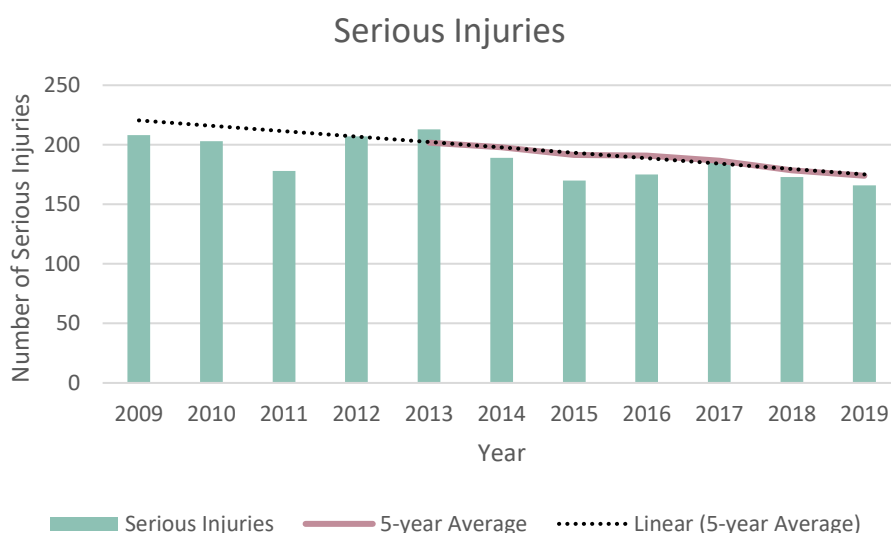
Performance Measure	Five-Year Rolling Averages	
	2014-2018 Baseline	2016-2020 Target
Number of Fatalities	26.8	30.0

Safety Performance Forecast – Serious Injuries

The Des Moines Area MPO reported crash serious injuries from the Iowa DOT's Iowa Crash Analysis Tool (ICAT) in reviewing historic crash serious injuries data and in setting future targets.

In 2019, there were 169 serious injuries from crashes in the Des Moines Area MPO planning area. To illustrate current trends, the five-year rolling averages for crash serious injuries within the MPO planning area were calculated and then a linear trendline was applied to the five-year rolling averages. The number of serious injuries, the five-year rolling averages, and the linear trendline for the five-year rolling averages are shown in Figure 2.

Figure 2: Historic Crash Serious Injuries 2009-2019



The Des Moines Area MPO forecasted the number of serious injuries for the year 2020 based on historic crash data and the 2019 value using the AAA version of the Exponential Smoothing (ETS) algorithm with the upper bounds of the 50th, 75th, 85th, and 90th prediction intervals. The Iowa DOT utilizes prediction intervals in their integrated moving average (IMA) model when setting their required targets. To maintain consistency with Iowa DOT analysis, the Des Moines Area MPO also analyzed crash data with prediction intervals.

Table 8 provides the upper bounds of the forecasted number of serious injuries for the year 2020 using 2009-2019 fatalities data.

Table 6: 2020 Crash Scenario Forecasts, Number of Serious Injuries

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Number of Serious Injuries	181.4	186.7	190.0	192.3	166.6

Safety Performance Target – Serious Injuries

Using the 2019 crash serious injuries and the forecasted values above, forecasted five-year averages were developed. Table 9 shows the forecasted five-year averages for crash serious injuries in the Des Moines Area MPO Planning Area for 2016-2020.

Table 7: 2020 Crash Scenario Forecasts, Serious Injuries Five-Year Average

	Prediction Interval Percentiles				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Five-Year Average of Serious Injuries	176.9	177.9	178.6	179.1	173.9

After reviewing the forecasted five-year averages and the linear trendline projection, the Des Moines Area MPO determined that to continue to achieve improvement toward the goal set in *Mobilizing Tomorrow*, a 2016-2020 safety performance target should follow the linear trendline. Table 6 provides the five-year average serious injuries target.

Table 8: 2016-2020 Number of Serious Injuries Target Five-Year Average

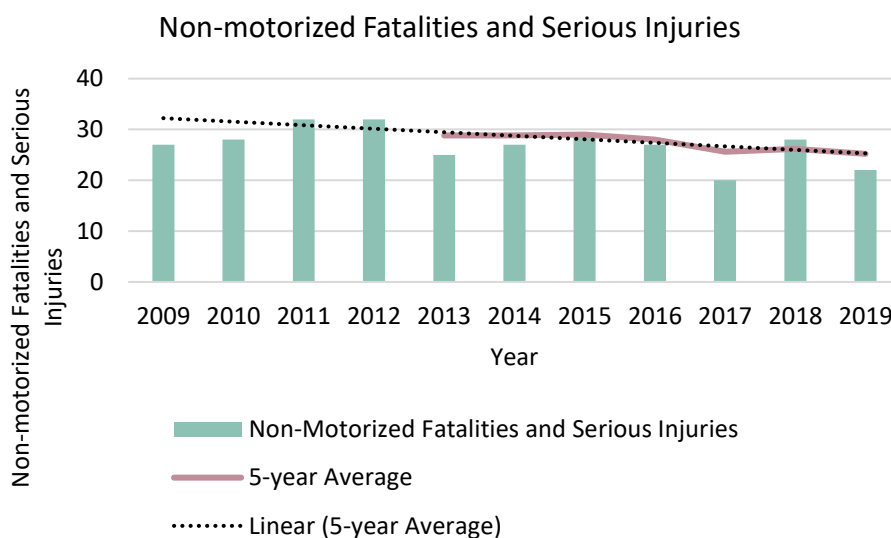
Performance Measure	Five-Year Rolling Averages	
	2014-2018 Baseline	2016-2020 Target
Number of Serious Injuries	178.6	173.9

Safety Performance Forecast – Non-Motorized Fatalities and Serious Injuries

The Des Moines Area MPO used reported crash non-motorized fatalities and serious injuries from the Iowa DOT's Iowa Crash Analysis Tool (ICAT) in reviewing historic crash non-motorized fatalities and serious injuries data and in setting future targets.

In 2019, there were 22 non-motorized fatalities and serious injuries from crashes in the Des Moines Area MPO planning area. Of which, 7 were fatalities and 15 were serious injuries. To illustrate current trends, the five-year rolling averages for non-motorized fatalities and serious injuries within the MPO planning area were calculated and then a linear trendline was applied to the five-year rolling averages. The number of non-motorized fatalities and serious injuries, the five-year rolling averages, and the linear trendline for the five-year rolling averages are shown in Figure 3.

Figure 3: Historic Non-Motorized Fatal and Serious Injury Crashes 2009-2019



The Des Moines Area MPO forecasted the number of non-motorized fatalities and serious injuries for the year 2020 based on historic crash data and the 2019 value using the AAA version of the Exponential Smoothing (ETS) algorithm with the upper bounds of the 50th, 75th, 85th, and 90th prediction intervals. The Iowa DOT utilizes prediction intervals in their integrated moving average (IMA) model when setting their required targets. To maintain consistency with Iowa DOT analysis, the Des Moines Area MPO also analyzed crash data with prediction intervals.

Table 12 provides the upper bounds of the forecasted number of non-motorized fatalities and serious injuries for the year 2020 using 2009-2019 non-motorized fatalities and serious injuries data.

Table 9: 2020 Crash Scenario Forecasts, Number of Non-Motorized Fatalities & Serious Injuries

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Number of Non-motorized Fatalities and Serious Injuries	25.2	26.3	26.9	27.4	23.3

Safety Performance Target – Non-Motorized Fatalities and Serious Injuries

Using the 2019 crash non-motorized fatalities and serious injuries and the forecasted values above, forecasted five-year averages were developed. Table 5 shows the forecasted five-year averages for crash fatalities in the Des Moines Area MPO Planning Area for 2016-2020.

Table 10: 2020 Crash Scenario Forecasts, Non-Motorized Fatalities & Serious Injuries Five-Year Average

	Prediction Intervals				Straight Line Projection
	50 th	75 th	85 th	90 th	
Forecasted Five-Year Average of Non-motorized Fatalities and Serious Injuries	24.4	24.7	24.8	24.9	24.1

After reviewing the forecasted five-year averages and the linear trendline projection, the Des Moines Area MPO determined that to continue to achieve improvement toward the goal set in *Mobilizing Tomorrow*, a 2016-2020 safety performance target should follow the linear trendline. Table 14 provides the five-year average non-motorized fatalities and serious injuries target.

Table 11: 2016-2020 Non-Motorized Fatalities & Serious Injuries Target Five-Year Average

Performance Measure	Five-Year Rolling Averages	
	2014-2018 Baseline	2016-2020 Target
Number of Non-Motorized Fatalities and Serious Injuries	26.2	24.1

Vehicle Miles Traveled Forecasting

Vehicle miles traveled (VMT) forecasting was completed using historic traffic count data provided in the Iowa DOT GIMS dataset through 2016. Using historic traffic count data, the MPO was able to calculate the VMT for each year of crash data used in the analysis period. Based on the historic VMT between 2014 and 2016, the Des Moines Area MPO saw approximately 2% VMT growth per year. As the Des Moines Area MPO planning area has continued to increase in population during that time-period and future growth projections are consistent with the 2% growth per year, the forecasted VMT for 2017, 2018, 2019, and 2020 would follow a similar growth assumption. Table 15 shows VMT forecasts for 2017, 2018, 2019, and 2020.

Table 12: Vehicle Miles Traveled 2014-2020

Year	Vehicle Miles Traveled
2014	4,558,909,249
2015	4,666,797,655
2016	4,764,701,540
2017 Estimate	4,859,995,570
2018 Estimate	4,957,195,482
2019 Estimate	5,056,339,392
2020 Estimate	5,157,466,180

2016-2020 Safety Targets

Based on historic crash data in the Des Moines Area MPO planning area, the final safety targets for the 2016-2020 period are below in Table 16.

Table 13: 2016-2020 Safety Performance Targets

Performance Measures	Five-Year Rolling Averages	
	2014-2018 Baseline	2016-2020 Target
Number of Fatalities	26.8	30.0
Fatality Rate*	0.562	0.605
Number of Serious Injuries	178.6	173.9
Serious Injury Rate*	3.756	3.512
Non-Motorized Fatalities and Serious Injuries	26.2	24.1

*Rates are per 100 million vehicle miles traveled (VMT)

Appendix A: Historic Crash Data

Table on next page.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Last Updated 1/21/2020	Linear Estimate	Exponential Smoothing AAA Estimates (Upper Bounds)			
													2020			
													50%	75%	85%	90%
Fatalities	21	42	34	21	24	23	25	32	24	30	35.0	29.1	35.0	38.7	41.0	42.6
Five-year Average					28.4	28.8	25.4	25.0	25.6	26.8	29.2	30.0	31.2	31.9	32.4	32.7
Fatalities Rate (per 100 million VMT)	0.485	0.961	0.779	0.469	0.537	0.505	0.536	0.672	0.494	0.605	0.692	0.564	0.678	0.751	0.795	0.827
Five-year Average					0.646	0.650	0.565	0.544	0.549	0.562	0.600	0.605	0.628	0.643	0.652	0.658
Serious Injuries	208	203	178	207	213	189	170	175	186	173	169.0	166.6	181.4	186.7	190.0	192.3
Five-year Average					201.8	198.0	191.4	190.8	186.6	178.6	174.6	173.9	176.9	177.9	178.6	179.1
Serious Injuries Rate (per 100 million VMT)	4.805	4.646	4.079	4.621	4.768	4.146	3.643	3.673	3.827	3.490	3.342	3.230	3.518	3.621	3.684	3.728
Five-year Average					4.584	4.452	4.251	4.170	4.011	3.756	3.595	3.512	3.570	3.591	3.603	3.612
Non-Motorized Fatalities and Serious Injuries	27	28	32	32	25	27	29	27	20	28	22.0	23.3	25.2	26.3	26.9	27.4
Five-year Average					28.8	28.8	29.0	28.0	25.6	26.2	25.2	24.1	24.4	24.7	24.8	24.9

VMT	Year
4,234,574,145	2004
4,245,291,640	2005
4,276,320,290	2006
4,272,506,770	2007
4,304,430,400	2008
4,328,873,355	2009
4,369,665,072	2010
4,363,487,765	2011
4,479,189,115	2012
4,467,722,275	2013
4,558,909,249	2014
4,666,797,655	2015
4,764,701,540	2016
4,859,995,570	2017*
4,957,195,482	2018*
5,056,339,392	2019*
5,157,466,180	2020*

* Estimate




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