Traffic Safety Impact of COVID-19

Impact to Minnesota Motor Vehicle Crashes, March 1 to May 18

June 2020

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Executive Summary

This report is an exploratory analysis of the changes to the frequency, type, and severity of crashes in the State of Minnesota from March 1, 2020 through May 18, 2020. During this time, the pandemic due to the coronavirus (SARS-CoV-2) was a threat to the health and welfare of Minnesotans. The State of Minnesota, under Governor Tim Walz, issued several executive orders that would help to slow the spread of the virus, and its associated health impacts now commonly known as COVID-19.

Many businesses, schools, and other institutions restricted hours and operations, and the vast majority of Minnesotans confined themselves to stay at home and shelter in place. With much of the population confined to home, vehicular traffic across the state dropped considerably across the entire state. Motor vehicle traffic volume fell by nearly 70% from the baseline volumes by mid-April. (TDA 2020).

The Minnesota Department of Transportation (MnDOT) Office of Traffic Engineering monitored crashes throughout the timeframe and noticed certain trends emerge from the normal baseline established in the preceding years.

Compared to prior years:

- Number of crashes was 45% lower
- Total number of traffic fatalities during this time was initially higher but converged to recent average
- Total number of serious injuries was 33% lower
- Number of vehicle crashes involving a non-motorist was 33% lower
- Percent of crashes involving a non-motorist was 20% greater with an early April peak of 40% greater
- Number of vehicle crashes involving speed was 44% lower
**Introduction**

The spread of the novel coronavirus (SARS-CoV-2) across the globe and the United States has had significant impacts on the daily activities of many people. Minnesota has not been immune to these impacts. Due to the highly contagious nature and the lack of any immunity to the virus, many countries and states have imposed stay at home orders, closure of many types of businesses, schools, universities, and the cancelations of large public events.

All of these closures and stay-at-home orders have contributed to a significant changes in the number and distance of trips individuals make on a daily basis. With the reduction in vehicle travel, there appears to be an associated decrease in the number of motor vehicle crashes.

The purpose of this report is to publicize the crash numbers and provide the context of these numbers compared to previous years. MnDOT presents this data as a snapshot of the impacts of coronavirus on traffic safety, but the full scope of the coronavirus pandemic should include other factors, and is not within the scope of this report.
How to Read This Report

This report reviews crash data to analyze the impact of the COVID-19 pandemic and Executive Orders issued by Governor Tim Walz from March 1, 2020 to May 18, 2020.

Topic Areas

This report will highlight different aspects of the crash data. These different focuses are explained below.

Total Crashes

Analysis on the total number of motor vehicle crashes reported to the Department of Public Safety. This includes crashes resulting in fatality, injury, or property damage only.

Fatalities and Serious Injuries

Trends in fatalities and serious injuries in motor vehicle crashes. An analysis of injuries provides the magnitude of lives seriously altered by a motor vehicle crash.

Fatal and Serious Injury Crashes

Trends in crashes resulting in a fatality or serious injury. An analysis of crashes provides information on the potential events that could be mitigated regardless of the number of individuals involved.

Non-motorist Crashes

Trends in motor vehicle crashes involving a pedestrian, bicyclist, or other non-motorist (e.g. skater, horse-and-buggy). Non-motorist crashes without a motor vehicle or involving a train are not included in the dataset.

Speed-related Crashes

Trends in motor vehicle crashes that have been flagged as “speed-related.” This flag was established as a focus area in Minnesota’s Strategic Highway Safety Plan for tracking and mitigation. A speed-related crash may involve (1) exceeding the posted speed limit, (2) driving too fast for conditions, or (3) racing. There is no database field in the crash report for the actual travel speed at the time of crash; it is not possible to analyze the magnitude of speeds in crash data.

Limitations

Crash data is outcomes based. That is, crash analysis provides insight on traffic safety only when there was an incident. Other factors including travel speeds, citations, education campaigns, and social norms must be taken into account for a complete picture of Minnesotan traffic safety culture.
Key Dates

The COVID-19 impact has had significant impacts to the global population. Due to the highly infectious nature of the coronavirus, the State of Minnesota has taken several steps to limit and slow down the spread of the virus and associated health impacts. The key milestones listed here highlight the major Executive Orders issued by Governor Tim Walz.

March 13 Peacetime Emergency is declared.
March 15 Executive Order 20-02 closed all Minnesota K-12 public schools until the end of March.
March 16 Executive Order 20-04 closed all bars, restaurants, and non-essential businesses until March 27; this order later extended to May 17.
March 27 Executive Order 20-20 directed Minnesotans to Stay at Home through April 10; this order later extended to May 17.
March 30 Schools ordered to begin long distance learning for remainder of school year, canceling all in-person attendance.
April 18 Safe outdoor recreation exempted from Stay at Home order.
April 26 Non-critical exempt businesses (e.g. industrial, manufacturing, office-based) allowed to reopen with COVID-19 Preparedness Plan.
May 13 Executive Order 20-20 allowed to expire. Governor calls for Minnesotans to be “Safer At Home.”
June 1 [Anticipated] Salons, barbers, and person care services can reopen with a COVID-19 Preparedness Plan. Restaurants and bars can reopen for outdoor service.

For the most current and updated information regarding the COVID-19 Pandemic, please go to: https://mn.gov/governor/covid-19.
Methodology

Minnesota Crash Data

Minnesota statute requires any collision for a motor vehicle resulting in injury or greater than $1,000 in damage to be reported. Crash reports are submitted to the Department of Public Safety electronically by law enforcement.

The dataset includes only those crashes involving a motor vehicle on all public roads. Crashes involving only non-motorists, trains, or parked vehicles alone are not included.

Data Extract

Motor vehicle crashes were extracted from MnDOT databases on May 18, 2020. All crashes on Minnesota public roads during the analysis period from March 1 to May 18 were included in the dataset.

Comparison Groups

To better measure the impacts of COVID-19, three comparison groups have been established:

Baseline Average

The 3-year average of 2016 through 2018 provides a baseline with minimal anomalies.

Long Winter

In the spring of 2019, five significant snow/rain events played an important role over the analysis period. Heavy, wet snow over 3/09-3/10 led to roof collapses and longer removal times. (Boulay 2019a) On 4/10-4/12, the fifth largest April snowstorm on record dropped at least 6 inches of snow across 60% of the state. (Boulay 2019b)

Monthly precipitation totals were generally above normal across the state while average temperatures were below normal. (Boulay 2019c)

As a result of these unique conditions, 2019 was assigned to a group alone.

Pandemic

Behavior changes associated with 2020 COVID-19 pandemic. Mild weather conditions with one snowstorm on 4/12. (Boulay 2020b) Temperatures were above average in March with near record lows in April with near normal in May. (Boulay 2020a)
Traffic Volumes

Exposure is fundamental to traffic crashes: increased traffic volumes are correlated to increased crashes. MnDOT actively monitors aggregated traffic levels across the state to understand congestion, economic activity, and for long term transportation planning needs.

Motor Vehicle Trends

In a recent MnDOT report¹, reductions in daily traffic were typically in the range of 30% to 50% compared to prior 3 year normal. (TDA 2020) Regional summary sheets are provided online at https://www.mndot.gov/traffic/data/data-products.html.

Figure 1: Statewide Motor Vehicle Traffic Volume Monitoring, Change in Volumes 2020 compared to 2019

![Statewide Vehicle Traffic Volume Monitoring](source.jpg)

Source: (TFA 2020)

Statewide traffic volume were lower than 2019 beginning on March 13. Traffic continued to decrease until reaching a trough on April 12 at 66% below 2019 levels. Volumes have converged toward 30% below 2019 values at the end of the period. (TFA 2020)

**Non-motorist Trends**

Using continuous detection, MnDOT Office of Transit and Active Transportation tracks aggregated trends in walking and bicycling statewide.

Given that non-motorist traffic is highly variable due to a number of factors: it is helpful to smooth using a 7-day rolling average. To account for adverse weather in 2019, trends are compared to the prior three years.

Across all continuous detection sites, the average change in non-motorist traffic was nearly 65% greater than prior 3 year normal.

Figure 2: Statewide Non-motorist Traffic Volume Monitoring, Change in Volumes 2020 compared to 2017-2019 Average

Source: (OTAT 2020)
Total Crashes

Definitions

Any motor vehicle crash reported by law enforcement in the MNCRASH electronic crash reporting system.

Context

Since 2016, total crashes have increased 0.5% annually. If this trend continued, total crashes in 2020 would be 1.5% greater than baseline.

Analysis Period Trends

Total motor vehicle crashes are 45% lower than the state baseline.

Figure 3: Minnesota Motor Vehicle Crashes, Cumulative: March 1 through May 18
The number of daily crashes has decreased; this corresponds to the “flattening” of the cumulative crash curve. Daily crashes are 45% lower than baseline.
Fatal and Serious Injury Crashes

Definitions

Any motor vehicle crash which results in at least one fatality (K) or serious injury (A).

Context

Since 2016, Minnesota has reduced total fatal and serious injury crashes by 6% annually.

Analysis Period Trends

Crashes resulting in fatalities or serious injuries have trended close to 2019. Beginning on May 11, the number of fatal and serious injury crashes was much less than 2019. Although two significant rain/snow events in 2019 in this period, there is not a direct correlation between adverse weather and severe crash outcomes.

Figure 5: Minnesota Fatal and Serious Injury Motor Vehicle Crashes, Cumulative: March 1 through May 18
Figure 6: Percent Change in Daily Fatal and Serious Injury Crashes, 2020 to Baseline

Percent Change in Daily Fatal + Serious Injury Crashes: 7-day Rolling

<table>
<thead>
<tr>
<th>Date</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
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<td>-20%</td>
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</tr>
<tr>
<td>5/10</td>
<td>+4%</td>
</tr>
<tr>
<td>5/17</td>
<td>-26%</td>
</tr>
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</table>
Fatalities

Definitions

Deaths within 30 days as a result of a motor vehicle crash, including motorists, non-motorists, and passengers. Year-to-date traffic fatalities are continuously reviewed and reported by Department of Public Safety.

Context

Over the last five years, Minnesota has reduced traffic fatalities by approximately 2.5% annually. The state Strategic Highway Safety Plan (SHSP) established a goal of no more than 225 fatalities in 2025. To meet this goal, a 6% annual reduction is required.

Analysis Period Trends

Figure 7: Year-to-Date Minnesota Traffic Fatalities, Cumulative January 1 through May 18
Year-to-date fatalities have remained 10% to 15% below average for the majority of the analysis period. However, fatalities have decreased annually and thus this trend may not capture individual differences. From March 31 to April 8 (9 days), fatalities exceeded the baseline.

Fatalities in 2020 were greater than 2019 for 42 days in the analysis period (i.e. March 30 to May 10). Since then, recent year-to-date fatalities have been lower than 2019 but by a smaller margin than at the beginning of the analysis period.

Figure 8: Percent Change in Daily Fatalities, 2020 to Baseline
Serious Injuries

Definitions

Any person involved in a motor vehicle crashes with a documented “suspected serious injury” by responding law enforcement. Minnesota complies with updated federal guidance on injuries in ANSI D.16-2017. This includes:

- Severe lacerations
- Broken or distorted limbs
- Crush injuries
- Suspected skull, chest, or abdominal injury other than bruising
- Significant burns
- Unconsciousness

Context

Since 2016, Minnesota has reduced total serious injuries by 6.5% annually. The state Strategic Highway Safety Plan (SHSP) established a goal of no more than 980 serious injuries in 2025. To meet this goal, a 6% annual reduction is required.

Analysis Period Trends

Serious injury crashes have been consistently lower than both 2019 and three year average.
Figure 9: Minnesota Traffic Serious Injuries, Cumulative: January 1 through May 18
Figure 10: Percent Change in Daily Serious Injuries, 2020 to Baseline

Percent Change in Daily Serious Injuries: 7-day Rolling

- All Crashes
- Serious Injuries


-7% -32% -31% -57% -1% -37% -70% -4% -23% -25% -55% -51% -55% -6% -33% -16%
Non-motorist Crashes

Definitions

Any motor vehicle crash involving a pedestrian, bicyclist, or other non-motorist. For specific coding definition, see Minnesota Strategic Highway Safety Plan.

Context

Over the past 10 years of fatal and serious injury crashes, the percent involving pedestrians has been rising while bicyclists has remained steady. (SHSP 2020, page 9).

Analysis Period Trends

Figure 11: Minnesota Non-motorist Crashes, Cumulative: March 1 through May 18
In both 2019 and the baseline, the daily number of non-motorist crashes increases in mid-April (i.e. the slope increases in the cumulative graphs). In 2020, we do not see this change. Although cooler weather and snowstorms in 2020 may have depressed the numbers, there is no delayed convergence on prior year trends when whether returns to normal in May. (Boulay 2020b)

The prevalence of non-motorists in motor vehicle crashes (i.e. percent of crashes involving a non-motorists) has been higher than baseline. Walking and biking traffic has been documented as higher by MnDOT Office of Transit and Active Transportation. Even during adverse weather (e.g. 3/28-3/29, 4/12) the relative frequency of non-motorists has been greater than average.

Figure 12: Percent Change in Daily Non-motorist Crashes, 2020 to Baseline

Daily non-motorist crashes are lower than baseline; however, this reduction is not as large as the reduction in total crashes. In early April, non-motorist crashes were greater than the state baseline however weather and light conditions may drive result.
Speed-related Crashes

Definitions

Any motor vehicle crash where the reporting officer marks speed as a contributing factor. This includes (1) exceeding posted speed limit, (2) too fast for conditions, and (3) racing. For specific coding definition, see Minnesota Strategic Highway Safety Plan.

Context

Over the past 10 years of fatal and serious injury crashes, the percent involving speed has been rising. (SHSP 2020, page 9).

Motor vehicle crash data is can only characterize speed when the outcome is a crash. Due to this inherent limitation, it is not an appropriate source for understanding the magnitude of driver speeds.

MnDOT maintains continuous speed monitoring stations on trunk highways around the state. However there is significant bias in the site selection and may not be generalizable to all roadways statewide.

Figure 13: Minnesota State Patrol Citation Analysis, via Twitter

Source: (@MnDPS_MSP 2020)
Analysis Period Trends

While the number of all crashes have decreased, speed-related crashes have become a larger percent of these crashes. When comparing the prevalence of speed (i.e. percent of crashes involving speed), it is helpful to smooth using a 2-week rolling average.

Beginning on March 27, the relative frequency of crashes involving speed has exceeded baseline for Minnesota. There is a peak at 24% of all crashes in 2020 involving speed on 4/15. While there was a significant snowstorm on 4/12 (Boulay 2020b), the rising trend cannot be explained by a single weather event.

Weather plays an influential role in speed-related crashes. In 2019, initial snowstorms on 3/01 and 3/09 led to heavy, wet difficult to clear snowfall. (Boulay 2019a). In mid-April, there is a large spike due to the 4/10 blizzard. (Boulay 2019b). We see this weather events as spikes in speed-related crash data; as a result, comparisons to 2019 are not meaningful.
Speed crashes were lower than baseline for the entire study period. In March, speed crashes had decreased by more than the decrease in total crashes; this implies that the relative frequency of speeding was lower until the end of March. After this period, the reduction in speed-related crashes was smaller than crashes of all types: the prevalence of speeding in motor vehicle crashes was higher.
Work Zone Crashes

Definitions

Any motor vehicle crash occurring in a work zone as described by the reporting officer. For specific coding definition, see Minnesota Strategic Highway Safety Plan.

Context

Over the past 10 years of fatal and serious injury crashes, the percent in work zones has been rising. (SHSP 2020, page 9).

Analysis Period Trends

Figure 16: Minnesota Work Zone Crashes, Cumulative: March 1 through May 18
In March 2020, we see greater than average number of work zone crashes. Beginning March 28, these numbers trend downward from baseline; however the percent of crashes in work zones remains greater than baseline over the entire period.

**Figure 17: Percent Change in Daily Work Zone Crashes, 2020 to Baseline**

Daily work zone crashes are lower than baseline; however, this reduction is not as large as the reduction in total crashes. In early March and during the Easter snowstorm, work zone crashes were greater than baseline!
Crashes by Roadway Jurisdiction

Roadway system classification is a tool used by engineers, planners, and elected officials to help roadway design and driver expectations. Minnesota has several different classifications of roadways.

The Trunk Highway network (i.e. Interstate, US routes, MN routes) is designed to connect distant hubs, move large vehicles, and carry greater volumes of traffic. The County network (i.e. County State Aid Highway, County Roads) provides mobility for shorter with access to businesses, residential developments, and communities. Municipal and Townships systems provide direct access to residential, commercial, and agricultural uses.

Figure 18: Total Crashes by Jurisdiction, March 1 to May 18

The distribution of all crashes across the systems is aligned with baseline. There may be evidence of some shifting of crashes from the Trunk highway system to the County but this shift is relatively small.
Crashes resulting in fatality or serious injury have shifted from the Trunk Highway system to the local (i.e. County/Municipal) systems. Much of this has been moved to the County: over 2 in 5 fatal and serious injury crashes occurred on the County system versus nearly 1 in 5 on the Trunk Highway.

Figure 19: Fatal and Serious Injury Crashes by Jurisdiction, March 1 to May 18

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<tr>
<td>Trunk Highways</td>
<td></td>
<td></td>
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<td></td>
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<td>Municipal</td>
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<tr>
<td>Township</td>
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<td>4%</td>
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<tr>
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<td>5%</td>
</tr>
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Summary

When combining all the traffic safety factors, April 2020 had the greatest deviation from prior trends. The table below summarizes the average percent change in daily crashes by each factor in this analysis. Any percent change less than the change in total crashes implies this factor was rising in prevalence over that week; in the table below, boxes colored in yellow denote these rising relative frequencies.

Table 1: Average Daily Percent Change in Key Traffic Safety Factors, 2020 to Baseline

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Total Crashes</th>
<th>K+A Crashes</th>
<th>Fatalities</th>
<th>Serious Injuries</th>
<th>Non-motorist</th>
<th>Speed</th>
<th>Work Zone</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>3/01 to 3/07</td>
<td>-11%</td>
<td>-6%</td>
<td>-51%</td>
<td>-14%</td>
<td>+29%</td>
<td>-47%</td>
<td>+48%</td>
</tr>
<tr>
<td>2</td>
<td>3/08 to 3/14</td>
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<td>+10%</td>
<td>-52%</td>
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</tr>
<tr>
<td>3</td>
<td>3/15 to 3/21</td>
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<td>-48%</td>
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<td>-16%</td>
<td>-21%</td>
<td>-46%</td>
<td>+4%</td>
</tr>
<tr>
<td>4</td>
<td>3/22 to 3/28</td>
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<td>7</td>
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<td>-15%</td>
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<td>-41%</td>
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<td>-25%</td>
<td>-48%</td>
<td>-7%</td>
<td>-39%</td>
</tr>
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</table>
Conclusion

Over the period from March 1, 2020 to May 18, 2020 the COVID-19 pandemic significantly impacted daily life in Minnesota; this includes life on our roadways, including traffic safety. These impacts were most apparent during the month of April, where the greatest deviations from prior trends were observed.

With many people in Minnesota complying with the Stay at Home order, vehicle traffic volumes have decreased nearly 70% by mid-April. With public gather spaces closed, walking and bicycling traffic has increased by nearly 65%.

With fewer vehicles on the road, motor vehicle crashes were 45% lower than expected at this time of year (i.e. compared to baseline of 2016-2018 average). These trends extended across all crash types: non-motorist crashes down 33% and speed-related crashes down 44%.

However, the prevalence of both these crash types has increased. The percent of crashes involving a non-motorist was 20% higher over the period, with a peak in April. Similarly beginning around March 27, the percent of crashes involving speed is 35% greater than expected.

Minnesota has seen annual reductions in traffic fatalities around 2.5%, however over the month of April deaths were greater than prior years. Serious injuries resulting from a motor vehicle crash were consistently lower than prior years.

Due to the continuously evolving nature of the public health crisis, it is difficult to extrapolate these trends into long-term predictions. Speed-related crashes will continue to be a challenge in these days of reduced volumes. However, preliminary evidence suggests that fatalities, serious injuries, and the prevalence of non-motorists in motor vehicle crashes may be converging back to baseline levels for this time of year.

Recommendations

1. Daily decreases in total crashes are consistently greater than the decreases in motor vehicle traffic volumes. Traffic volumes are impacted by a wide variety of factors, and these other factors may have played a role as well. Further exploration of a public health model on traffic safety should be explored.

2. Motor vehicle crashes are strongly influenced by traffic volumes. In the future, encouraging less driving will influence a reduction in total crashes; however the impact on traffic deaths or serious injuries may be less pronounced.

3. While total crashes are down, motor vehicle crashes involving non-motorists are more prevalent. Non-motorist traffic has increased while motor vehicle traffic and crashes have shifted to the local systems. Explore options for increasing driver expectations of non-motorists.
References


