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National Highway Traffic Safety Administration

TRAFFIC SAFETY FACTS
Research Note

NHTSA

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# Continuation of Research on Traffic Safety During the COVID-19 Public Health Emergency: January – June 2021

The National Highway Traffic Safety Administration continues to explore traffic safety during the COVID-19 public health emergency. This work is crucial to further understanding changes in dangerous driving behaviors and letting us expand or evolve countermeasures to meet current needs in States and across the country. This Research Note updates traffic safety behavioral research findings during the COVID-19 public health emergency through the first half of the 2021 calendar year.

To date, NHTSA has released three reports synthesizing traffic safety data in 2020. NHTSA also released an interim report on research examining the presence of drugs and alcohol in road users who were seriously and fatally injured in crashes, which noted increased prevalence of alcohol and some other drugs among these individuals. These reports provided context to preliminary 2020 data that showed increases in the number and rate of fatalities per 100 million vehicle miles traveled (VMT) (National Center for Statistics and Analysis, 2021a). Given the importance of these findings, NHTSA immediately convened workshops and meetings with national partners, State highway safety professionals, and researchers. In these meetings, NHTSA led conversation on how to address these increases in traffic fatalities, especially focusing on risky driving behaviors. NHTSA continued to collect and synthesize data. New findings are described below. Data limitations identified in the earlier reports also apply to the data reported here.

## Background

After the declaration of the public health emergency in March 2020, driving patterns and behaviors in the United States changed significantly (Wagner et al., 2020; Office of Behavioral Safety Research, 2021a, 2021b). Of the drivers who remained on the roads, some engaged in riskier behavior, including speeding, failure to wear seat belts, and driving under the influence of alcohol or other drugs. Traffic data cited in those reports showed average speeds increased during the last three quarters of 2020, and extreme speeds, those 20 miles per hour (or more) higher than the posted speed limit, became more common. These findings were supported by analyses of data from fatal crashes that show an estimated 11% increase in speeding-related fatalities (NCSA, 2021b). Other data suggested fewer people in crashes used their seat belts. Earlier research reports showed changes in the prevalence of alcohol and other drugs during the pandemic among seriously or fatally injured road users at different phases of the pandemic (Thomas et al., 2020, Office of Behavioral Safety Research, 2021a, 2021b). For example, the Thomas group found that almost two-thirds of the seriously or fatally injured drivers in their study tested positive for at least one active drug, including alcohol, marijuana, or opioids between mid-March and mid-July 2020. They also reported the proportion of drivers testing positive for opioids nearly doubled after mid-March 2020, compared to the previous 6 months, while marijuana prevalence increased by about 50%.

This Research Note includes analyses from the Bureau of Transportation Statistics (BTS) and the Federal Highway Administration's (FHWA) National Performance Management Research Dataset (NPMRDS). These sources use telematic data that captures large volumes of information but does not permit analysis of individual performance. To address this limitation, researchers sought other data sources through traditional literature as well as "gray literature" such as blog posts to identify potential emerging behavioral safety trends that occurred during the public health emergency. They identified research reports documenting changes in distracted driving and other risky driving behaviors,

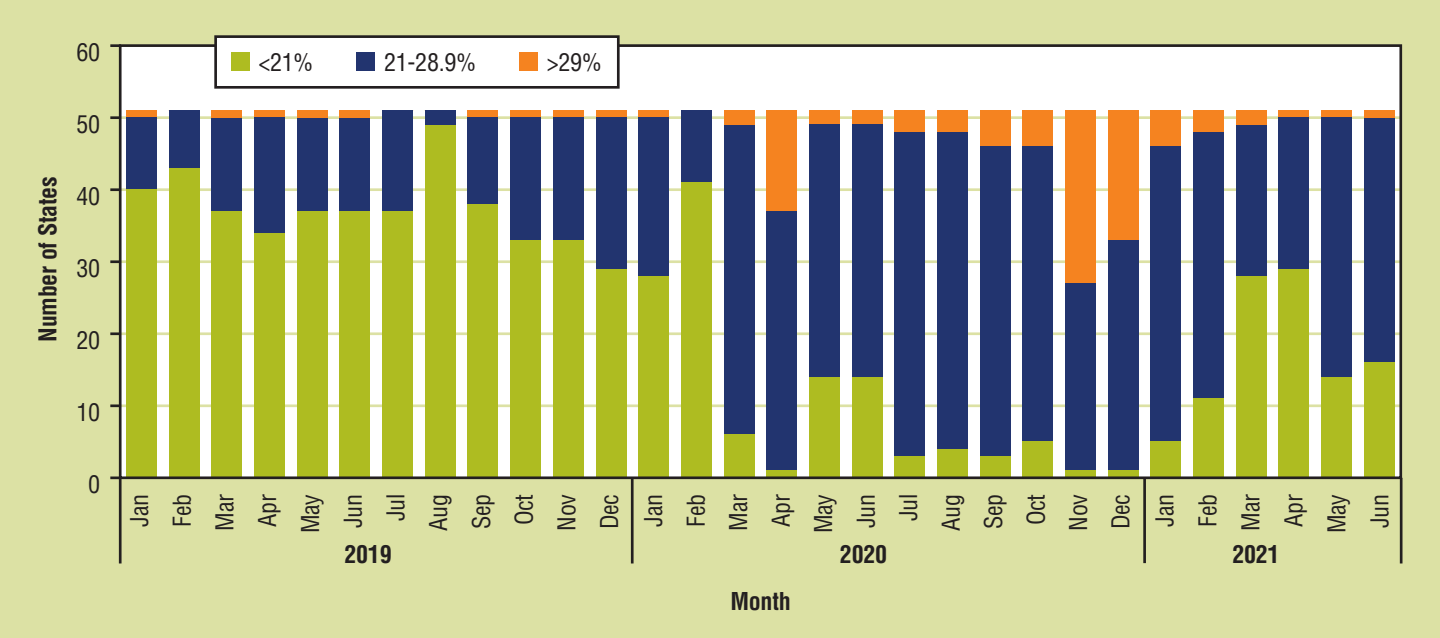
the findings of which are described later in this report. Data from the National Emergency Medical Services Information System (NEMSIS) are also included in this Research Note. NEMSIS data are derived from responding emergency medical services (EMS) agencies in States and Territories. While the database does not contain every EMS dispatch, it does include millions of motor vehicle crash-related cases every year.

## Travel Patterns

Researchers using the BTS (2021) interactive data dashboard on travel (see www.bts.gov/daily-travel) determined that in 2019 and early 2020 (before the pandemic) around 19% of the national population stayed home on any given day. During the post-public health emergency portion of 2020 (March-December) that percentage shifted to around 25%. Since the beginning of 2021, the percentage of people staying home per day has dropped from a high of 26% in January to approximately 23% in May and June. This suggests that while more people are traveling outside the home in 2021, the rates have not returned to pre-pandemic levels.

There were considerable differences among States in the numbers of people who stayed home per day throughout the pandemic. Gulf Coast States regularly had the lowest percentages of people staying home since March 2020. Washington, DC, New York, and the West Coast States had the highest percentages of people staying home. Figure 1 shows the change by month in number of States that experienced less than 21%, 21 to 28.9%, or more than 29% of their populations staying home each day in 2019, 2020, and through June 2021. These percentage ranges were selected to illustrate changes at the extremes from March to December 2020. The increasing number of States in which fewer than 21% of the population stayed home per day in 2021 suggests that these locations may be experiencing travel that approaches pre-pandemic levels.

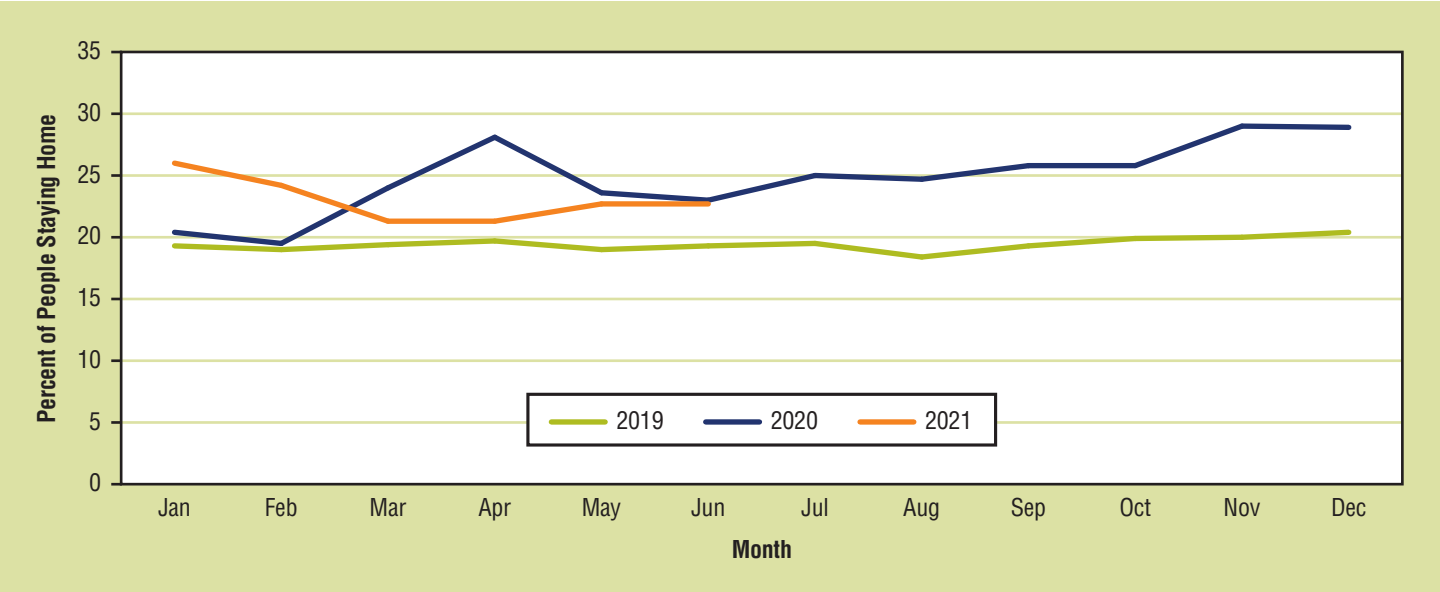
Figure 1
**Number of States in Which Different Percentages of the Population Stayed Home per Day**




Source: www.bts.gov/daily-travel

National data showed the proportion of the population who stayed home at the highest levels for the year in November (29%) and December (28.9%) of 2020 (see Figure 2). The proportion of the population staying home to-date in 2021 is higher than 2019 but is generally lower than during the 2020 post-public health emergency.

Figure 2
**Percentage of People Staying Home per Day by Month, 2019, 2020, and First Half of 2021**




Source: www.bts.gov/daily-travel

FHWA (2021) reported VMT on urban and rural roads in the first half of 2021, which indicates that compared to 2020, VMT on urban roads increased by 12.2%. For 2020 compared to 2019, VMT on urban roads decreased 14.2%. This suggests an approximate return to the VMT levels from 2019 in 2021. The VMT on rural roads in the first half of 2021 increased 14.1% compared to 2020. In 2020 compared to 2019, the VMT on rural roads decreased by 11.1%.

## Changes in Crash Rates

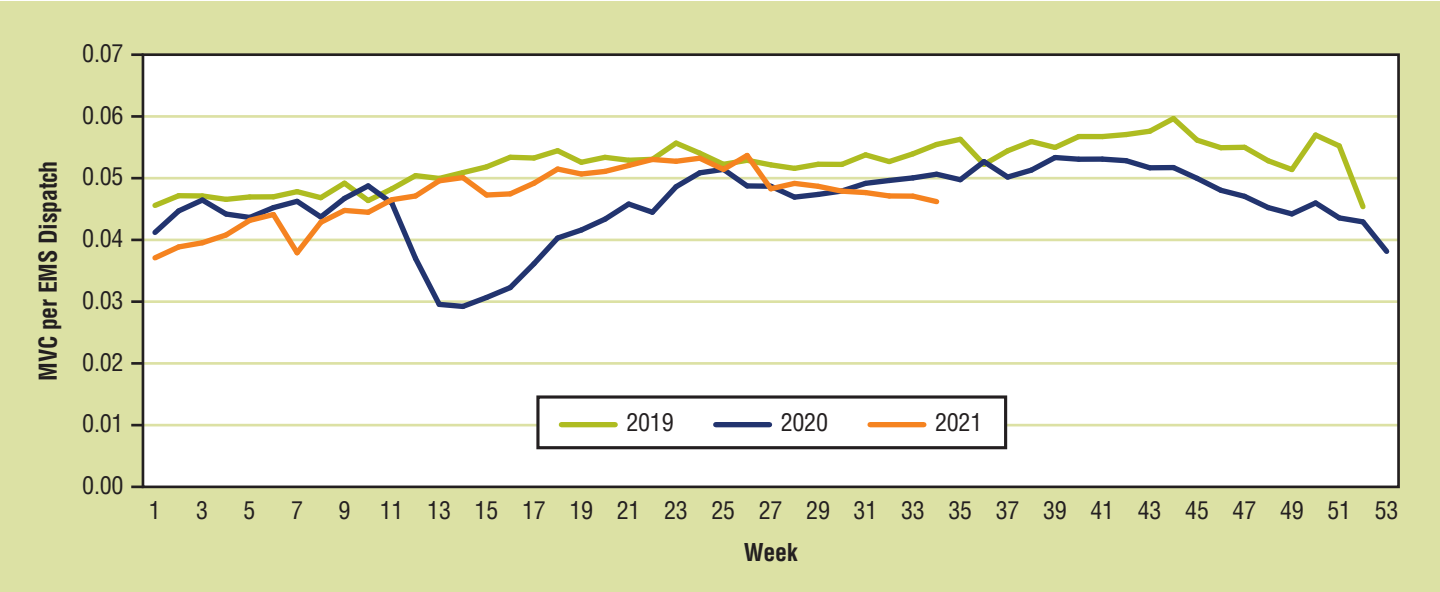
NHTSA used the NEMSIS database that includes EMS activations from 49 States and U.S. Territories to explore changes in a range of crash-related metrics that occurred between 2019[1] and first 34 weeks of 2021. NHTSA uses rates partly because the number of agencies contributing data increases each year. Therefore, counts of incidents compared across years could be misleading due to increases in the number of participating entities. The first metric is the rate of motor vehicle crashes (MVCs) per EMS activation (Figure 3),[2] perhaps a leading indicator of roadway fatalities (one would expect EMS activation decreases compared to the previous year to be associated with decreases in fatalities). Further analysis is required to determine what factors contributed to the decreased rate that counterintuitively occurred as road fatalities increased.

Preliminary analysis conducted by the NEMSIS Technical Assistance Center (Mann, 2021) suggests the rates per EMS activation for influenza-like illness (which includes COVID symptoms), cardiac arrest, scene of death, opioid-related, and mental/behavioral-related activations all increased in 2020 compared to 2019. Further, the rates seen in 2021 have not regressed to pre-pandemic levels for these EMS activations. These increases could mask changes in crash rates, especially in the severity of crashes, as hypothesized by their associations with increased alcohol use, speed increases, and ejections from vehicles. These are seen in other data presented later in this Research Note.

[1] Interested readers can explore earlier years' NEMSIS data and data added after Week 30, 2021 at https://nemsis.org/view-reports/public-reports/ems-data-cube/.

[2] In 2020 the NEMSIS database analysis year was 53 weeks.

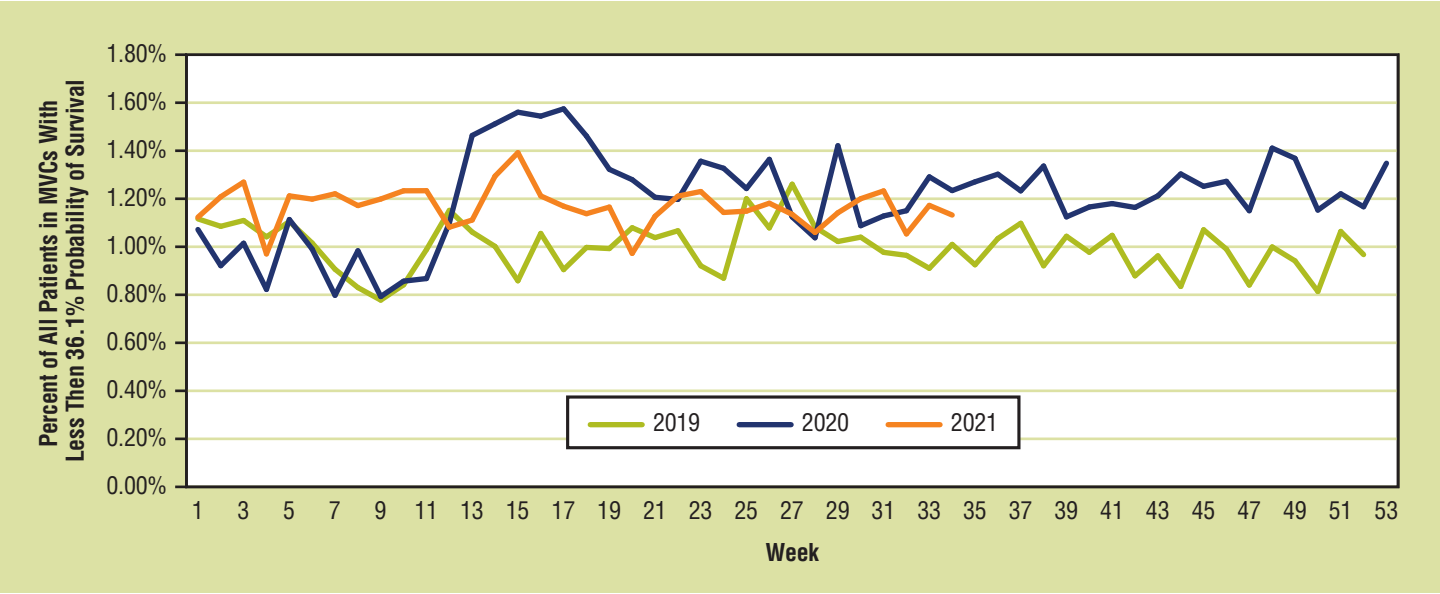
Figure 3
**Rate of Motor Vehicle Crashes per EMS Dispatch by Week of Year**




Source: NEMSIS

The NEMSIS data include metrics on crash severity. For people treated at the scenes of motor vehicle crashes, EMS professionals use an injury scoring system called the Revised Trauma Score (RTS) to determine the level of care needed to save the lives of the injured. Under RTS, patients who present with a probability of survival of 36.1% or less are considered severely injured and are often transported to Level 1 or Level 2 trauma centers that provide higher levels of critical care to the most severely injured. Figure 4 shows the percentage of patients in crashes whose probability of survival was in this range for 2019, 2020, and the first 34 weeks of 2021. Beginning in Week 12 of 2020, the percentage of those injured with a probability of survival of 36.1% or less never dropped below 1.00% — the average of 2019. The 2020 average of 1.21% strongly suggests an increase in the severity of crashes, especially considering the relatively low percentages prior to week 12 of that year. This relative increase has continued through week 34 of 2021 (the latest available data), yielding an average of 1.17% of all motor vehicle crash patients in the NEMSIS database being severely injured through that date in 2021. The practical implications of this are important to consider: in 2019, for every 10,000 patients who were injured in crashes, 100 needed high-level trauma care to survive; in 2020, there were 121 who needed that care, and in 2021, there were 117 who needed high-level trauma care. Taken in the context of the challenges that the EMS system has experienced since the start of the pandemic, which are described in the next section, this is a significant concern.

Figure 4
**Percentage of All Patients in Motor Vehicle Crashes With Probabilities of Survival 36.1% or Less (Severely Injured; Transport to Higher Level Trauma Center Recommended) by Week of Year**




Source: NEMSIS

## COVID-19 and First Responders

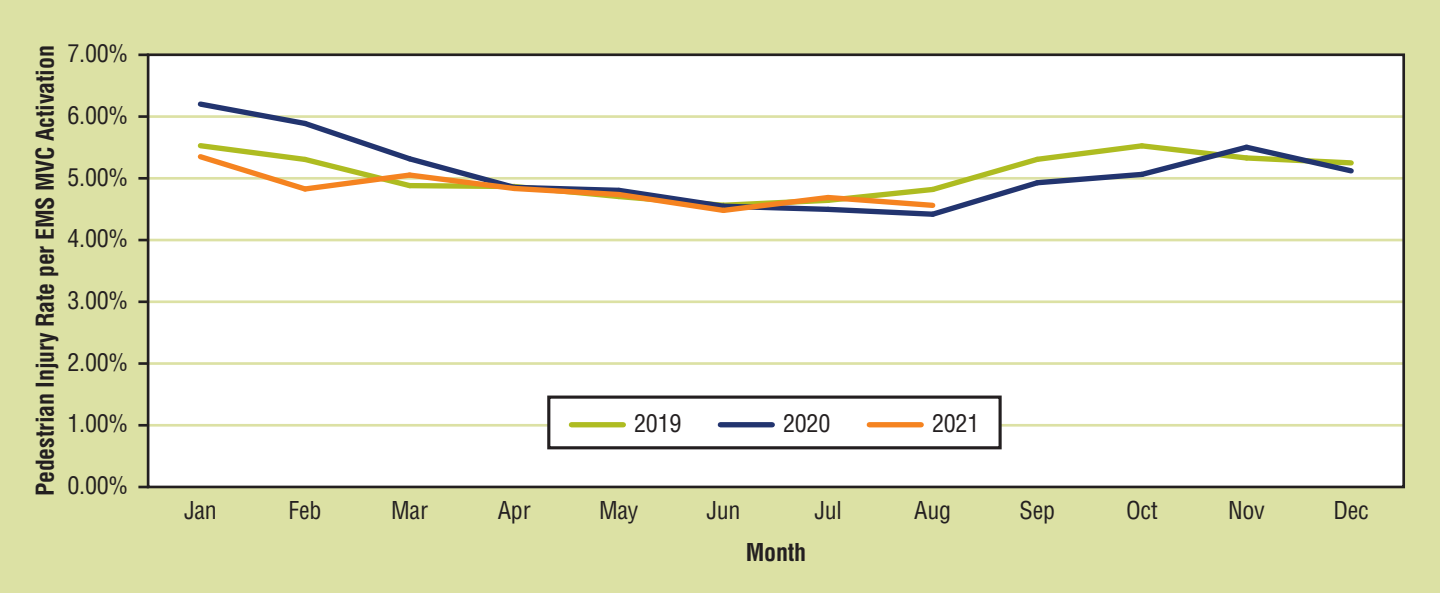
It is important to acknowledge the social context in which first responders, in particular EMS clinicians, fire, law enforcement, and telecommunicator professionals operated throughout the pandemic. From the start of the pandemic through early September 2021, NHTSA's internal estimates suggest that more than 800 first responders (law enforcement, fire fighters, EMS clinicians, and telecommunications professionals) died due to COVID-19. Research conducted by Ngo et al. (2021), suggests that during the early months of the pandemic (April – October 2020) trauma patients who were seriously injured in motor vehicle crashes were significantly more likely than the general population to be COVID-positive; of this population, more than half had at least one drug present in their system, suggesting not only clustering of risks among the injured but increased risk of exposure to COVID for people who care for those motor-vehicle trauma patients.

An additional concern regarding the EMS system is the increase in the time for EMS personnel and equipment to return to service after transporting patients. Mann (2021) notes that the average influenza-like-illness return-to-service times for responding units is minutes longer since the start of the pandemic. These are minutes that the units are not available for crash (or any other) response. A recent detailed literature review of ambulance offload delay literature by Li, Vanberkel, and Carter (2019) demonstrates poor clinical outcomes related to delays. Further, Byrne et al. (2019) note that longer response times are associated with higher MVC mortality. These issues, alongside news reports (e.g., Athans, 2021; and Nelson, 2021) and other reports of EMS staffing shortages, suggest that a better understanding of the pandemic effects on this particular subset of clinicians is necessary to limit excess road deaths.

## Pedestrian Safety

Understanding the changes in risks among different road user types is an important element for identifying appropriate countermeasures. To explore this, researchers examined NEMSIS data related to pedestrian crashes in 2019, 2020, and 2021. Figure 5 shows the pedestrian injury rate per EMS MVC activation by month in those years. The practical implications for these data are mixed. For every 10,000 EMS MVC activations in 2019, there were 506 for injured pedestrians. In 2020, that number was 510, and through August 2021, that number was 482. Analysis of 2020 State data published by the Governors Highway Safety Association (2021), projects increases in pedestrian fatalities in 2020 compared to 2019. Given the observed decreases in EMS MVC activation rates in 2021 shown in Figure 3, the change in pedestrian injury rates merits closer examination. For example, the increases in speeds discussed later in this report could have contributed to these reported increases in pedestrian deaths.

Figure 5
**Pedestrian Injury Rate per EMS Motor Vehicle Crash Activation by Month**



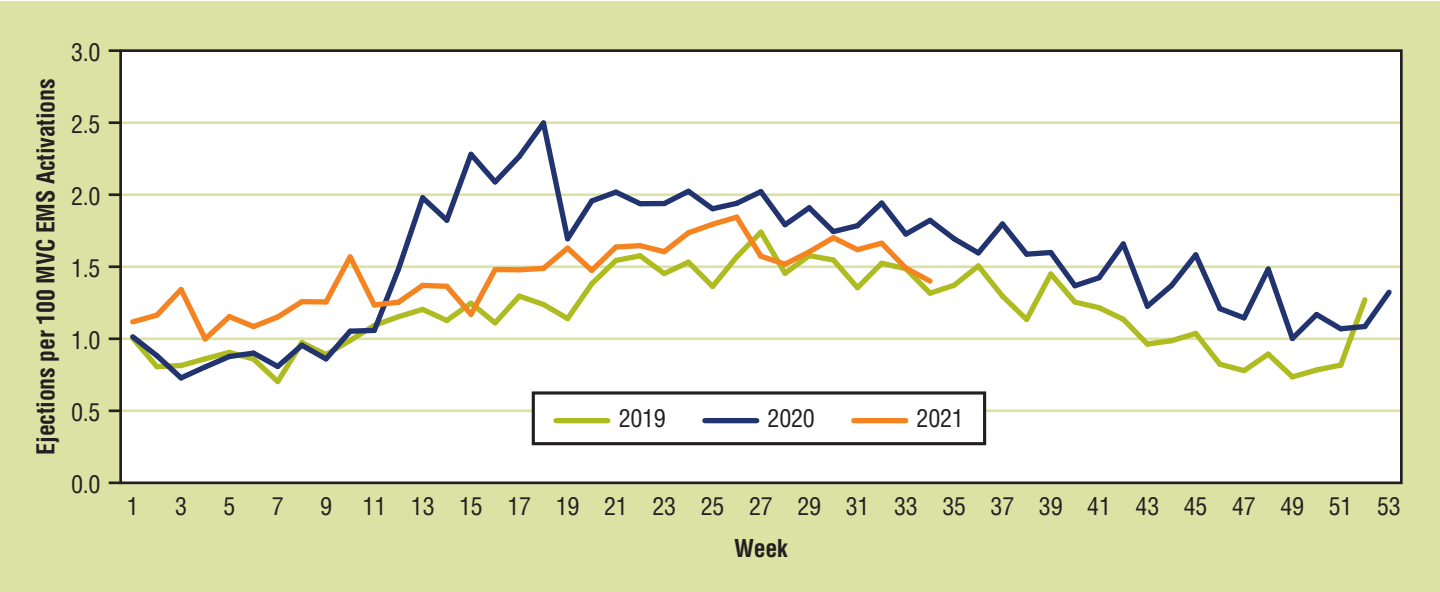

Source: NEMSIS

## Changes in Risky Behaviors

### *Seat Belt Use*

Seat belts are among the most important safety features in a vehicle because they keep occupants in place, which mitigates injuries during a crash. Ejections from vehicles are a surrogate measure of seat belt use because people using seat belts are less likely to be ejected. Ejections are also correlated with crash severity. The number and rate of ejections per EMS activation in response to motor vehicle crashes is available in the NEMSIS database (NHTSA, 2021). Figure 6 shows the ejection rate by week for 2019, 2020, and 2021 through week 34; compared to 2019, it shows an increase in the ejection rate in most of 2020 after week 10, when the COVID-19 public health emergency was declared. The ejection rates through week 34 of 2021 were also higher in most weeks than those observed in 2019.

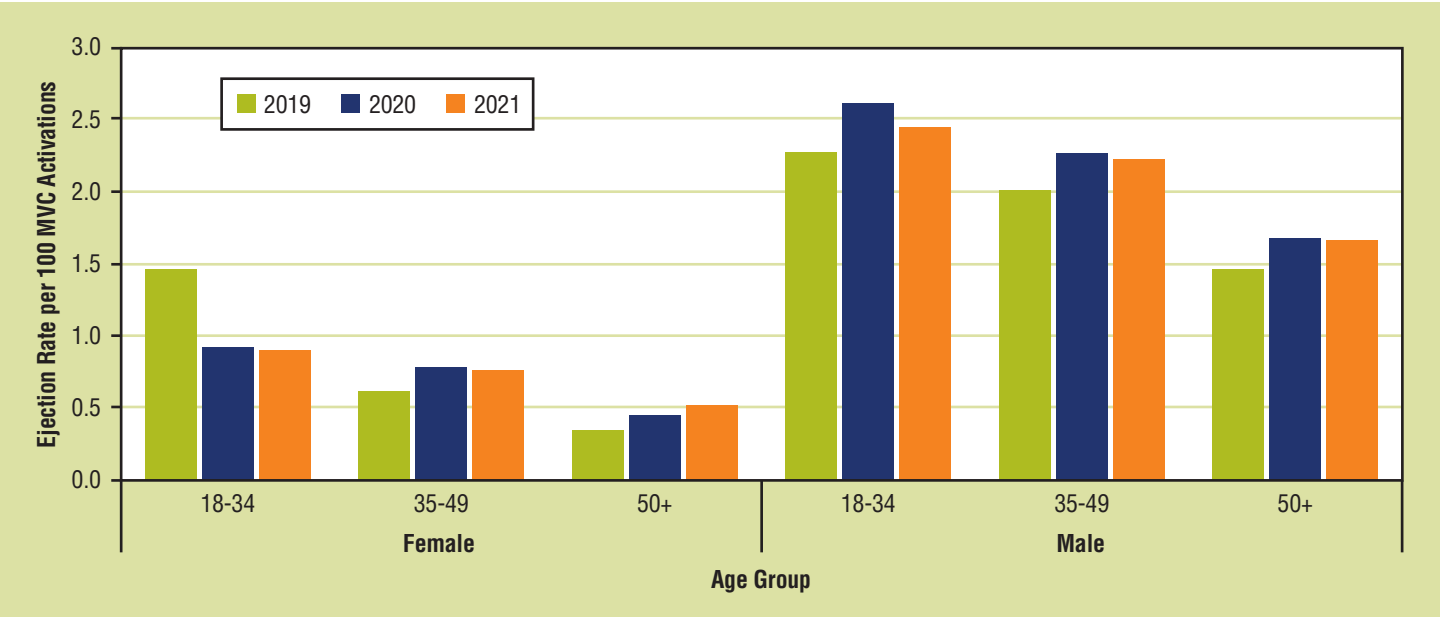
Figure 6
**Ejections per 100 Motor Vehicle Crash EMS Activations by Week of Year**




Source: NEMSIS

NHTSA queried the NEMSIS data related to the age groups and sex of those who were ejected to determine whether different groups might comprise the changes in the trends in ejection profiles in 2020 and through week 34 of 2021 (see Figure 7). In 2020, the majority of increases in ejection rates occurred among males, with the largest increases occurring among those 18 to 34 years old, followed by those 35 to 49 years old. Through week 34 in 2021, although the ejection rates for different age groups were lower than they were in 2020, these rates did not revert to those seen in 2019. It is interesting to note the steep and sustained reductions in the ejection rate among women 18 to 34 years old in 2020 and 2021 compared to 2019; understanding the reasons for this would be valuable in developing countermeasures.

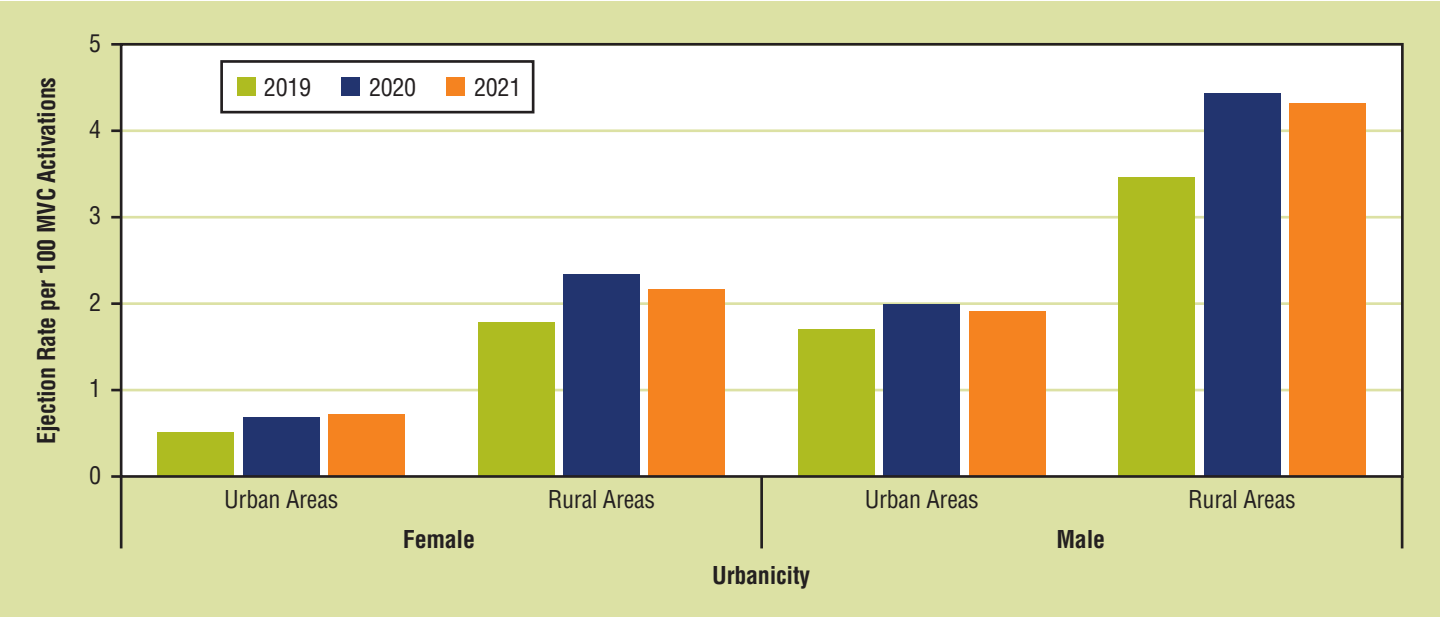
Figure 7
**Ejection Rate per 100 MVC Activations by Age Group and Sex**




Source: NEMSIS

NEMSIS data on urbanicity uses USDA Urban Influence Codes (NEMSIS, 2021). This analysis collapses the 12 categories in that system to urban and rural. The analysis of NEMSIS data regarding the urbanicity of those ejected shown in Figure 8 reveals that while there were increases in ejections in both urban and rural areas, ejections increased more in rural areas, particularly among males. Compared to 2019, the observed ejection rates for both males and females in 2020 increased in urban and rural areas. Although for the most part the rates observed in 2021 (through week 34) are lower than those observed in 2020, they remain higher than the rates in 2019. This is particularly stark in the observations from rural areas. Because EMS response times are longer in rural counties and are correlated with patient outcomes (Byrne et al., 2019), this sustained increase is concerning.

Figure 8
**Ejection Rate per 100 MVC Activations by Urbanicity and Sex**




Source: NEMSIS

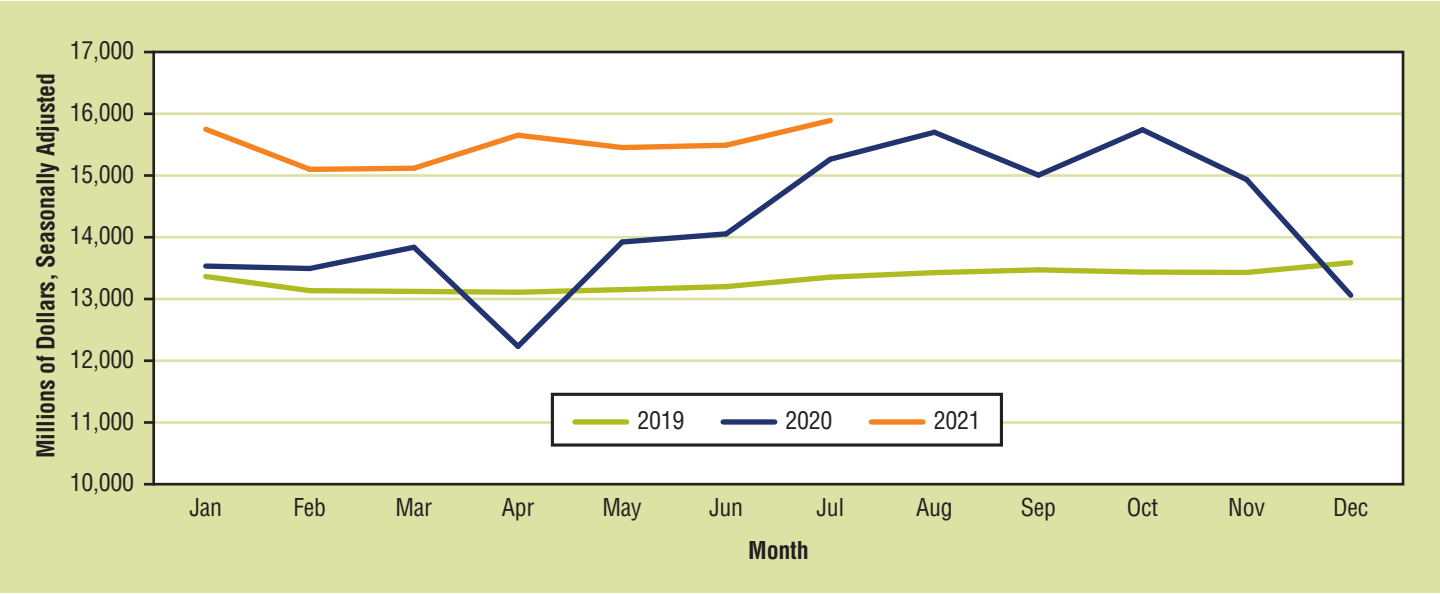
### *Alcohol and Drug Use*

Earlier research released by NHTSA (Office of Behavioral Safety Research, 2021a, 2021b; Thomas et al., 2020; Wagner et al., 2020) noted changes in alcohol and other drug use among seriously and fatally injured road users during the pandemic through the end of 2020. Updated analyses of the data from 2021 are not available at the time of writing this report.

Self-reported survey data reported by Vanlaar et al., (2021) suggests that a subset (7.6%) of the U.S. adult population was more likely to drive impaired during the pandemic than before it. Other data sources suggest continued increases in alcohol and other drug use (not necessarily related to driving) into 2021 compared to levels in 2019 and 2020. U.S. Census Bureau (2021) data shown in Figure 9 show that wholesale alcoholic beverage sales are higher in 2021 compared to 2019 and 2020. The National Institute on Alcohol Abuse and Alcoholism (2021) conducted analyses of 12 States' per capita changes in alcohol sales in 2020 compared to the average of the previous three years. The data presented in Figure 10 indicate variability in these differences by month, from a low of -2.2% in May to a high of 15.9% higher in July 2020. However, these 12 States may not be representative of the Nation in terms of alcohol consumption.

Figure 9

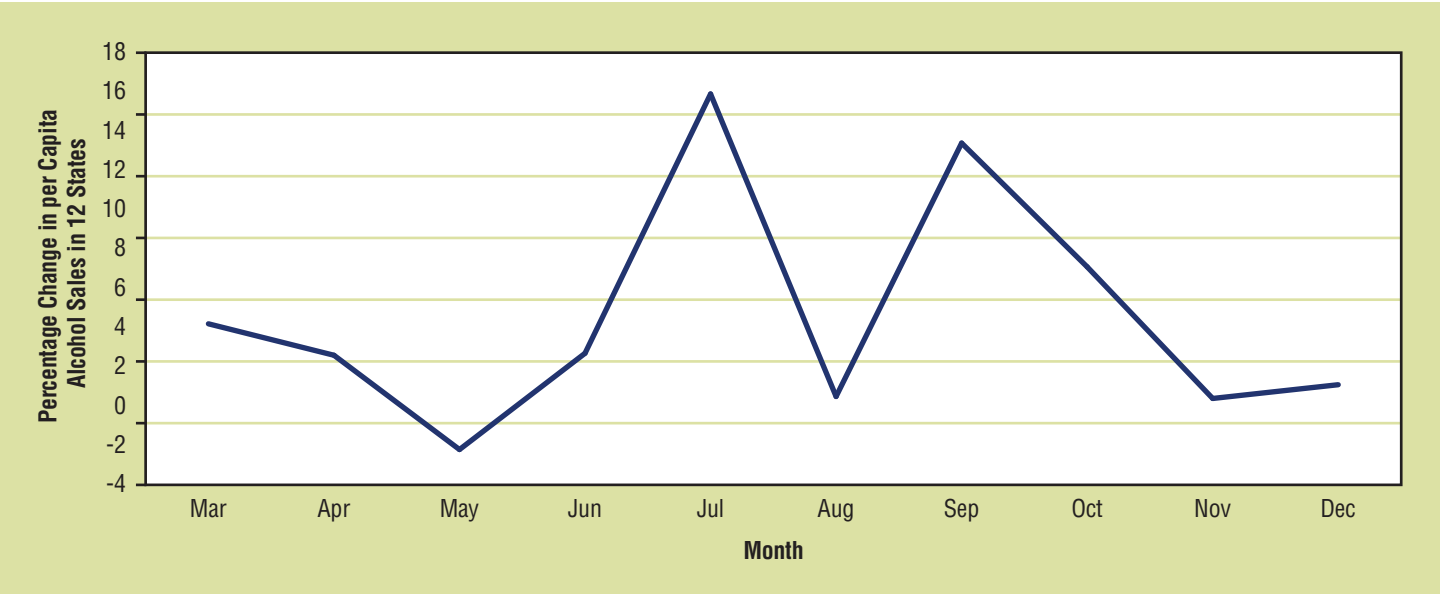
**Merchant Wholesalers, Except Manufacturers' Sales Branches and Offices: Nondurable Goods: Beer, Wine, and Distilled Alcoholic Beverage Sales, Millions of Dollars, Monthly, Seasonally Adjusted**




Source: U.S. Census Bureau

Figure 10

**Percentage Changes in Monthly per Capita Sales of Alcoholic Beverages (In Gallons of Ethanol) in 2020 Compared to the Prior 3-Year Average in 12 States (Alaska, Colorado, Connecticut, Delaware, Florida, Illinois, Kentucky, Massachusetts, Minnesota, North Dakota, Tennessee, and Texas)**



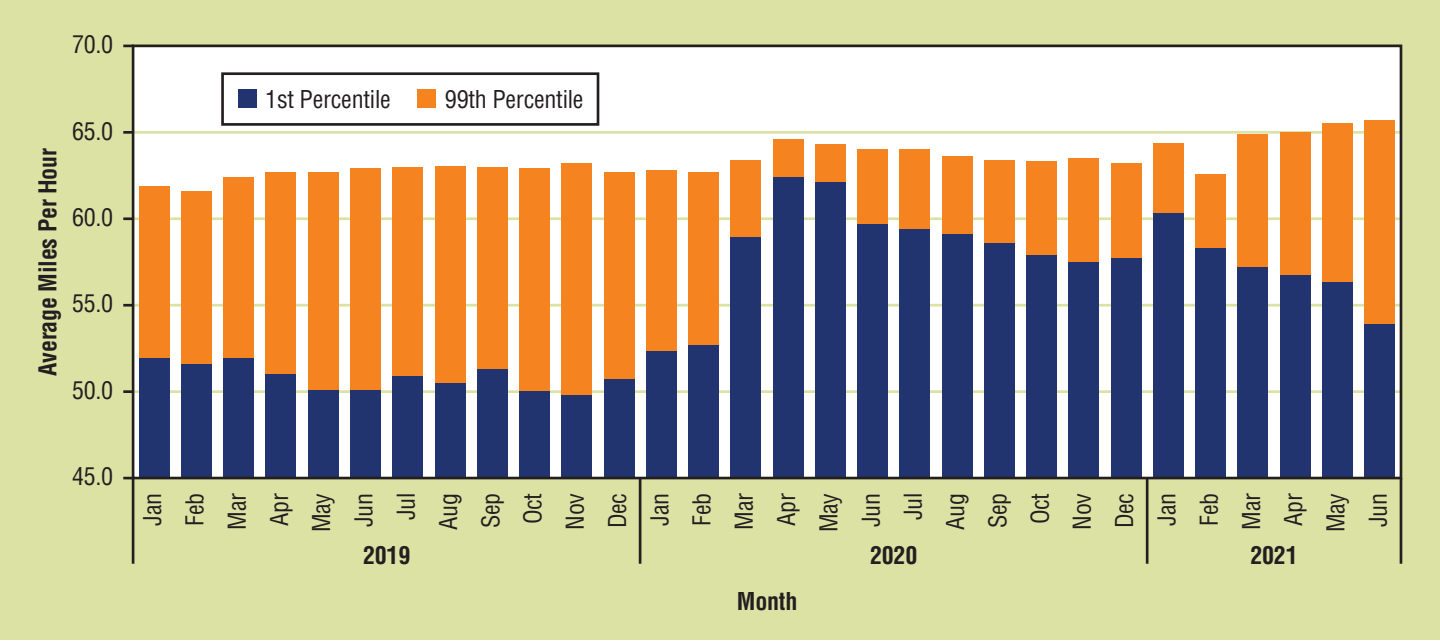

Source: National Institute on Alcohol Abuse and Alcoholism

A bulletin by the Substance Abuse and Mental Health Services Administration (2021) on mental health and substance use during the pandemic noted increases in substance use and changes in treatment of substance use disorder through calendar year 2020. This would appear to have continued into 2021, given Mann's (2021) reporting of increases in the rates of opioid overdoses and naloxone administration managed by EMS responders in 2020 and 2021 compared to previous years' rates. Similarly, States that report their cannabis-related sales taxes show year-over-year increases in sales tax revenues for the first six months of 2021 compared to 2020, and for the full year of 2020 compared to 2019 (California Department of Tax and Fee Administration, 2021; Colorado Department of Revenue, 2021; Oregon Department of Revenue, 2021; State of Nevada Department of Taxation, 2021). The apparent increase in cannabis use may not be solely related to the pandemic, as it occurs at the same time as shifting public perceptions and legislation related to marijuana (Van Green, 2021).

### *Speed*

Earlier research released by NHTSA (Office of Behavioral Safety Research, 2021a, 2021b) noted increases in speeds across urban and rural environments through the FHWA's analysis of the NPMRDS. This data set represents the average speeds across different roadway classifications nationwide. Analyses were conducted comparing the highest and lowest speeds for four different roadway classifications for 2019, 2020, and the first half of 2021 (Center for Advanced Transportation Technology, 2021). Figure 11 shows the range in speeds for urban interstates from the slowest 1% of vehicles (1st percentile) to the fastest 1% of vehicles (99th percentile) from January 2019 through June 2021. It is interesting to note that the range of speeds from March 2020 through February 2021 became relatively narrow compared to previous months; it is also interesting to note the shift to consistently faster 99th percentile speeds evidenced from March through June 2021.

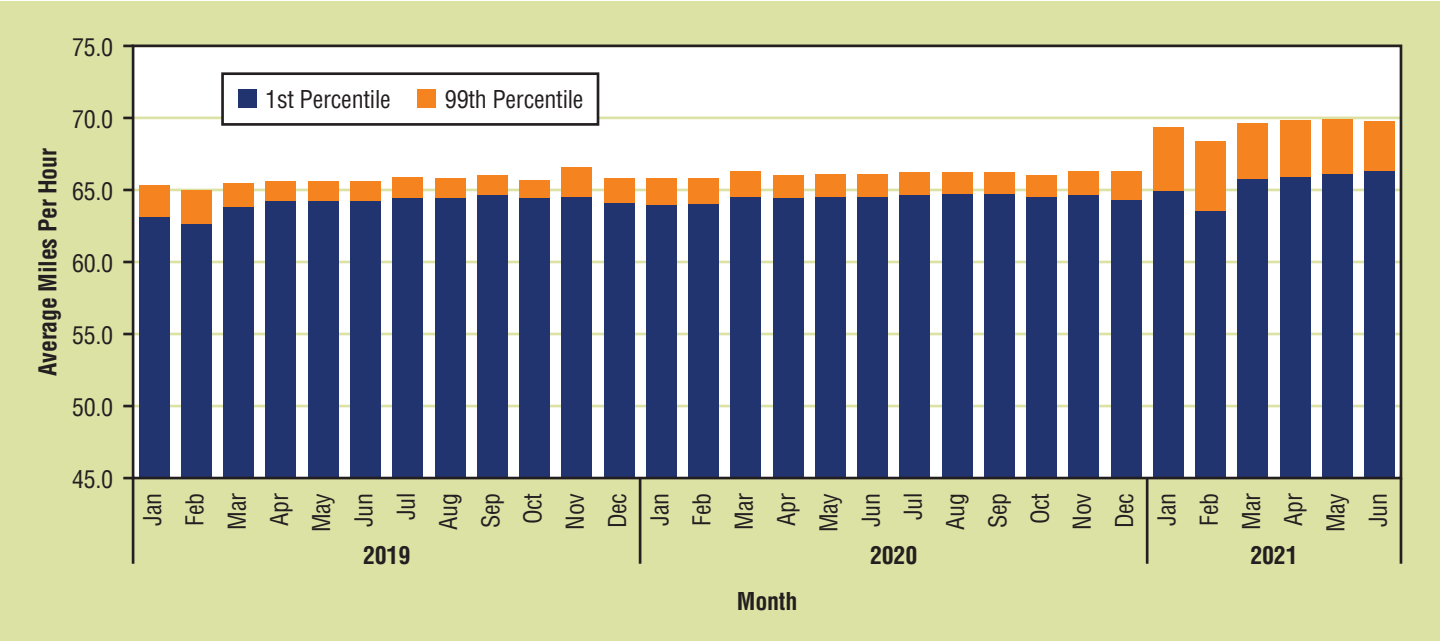
Figure 11
**Urban Interstate Range of Speeds – 1st Percentile to 99th Percentile by Month, January 2019 – June 2021**




Source: NPMRDS

Figure 12 shows the range in speeds for rural interstates from the slowest and fastest 1% of vehicles for the same timeframe. The rural interstates do not show the dispersion in speeds seen for the urban interstates. However, starting in January 2021, there appears to be an increase in the speeds of both the slowest and the fastest vehicles on these roads.

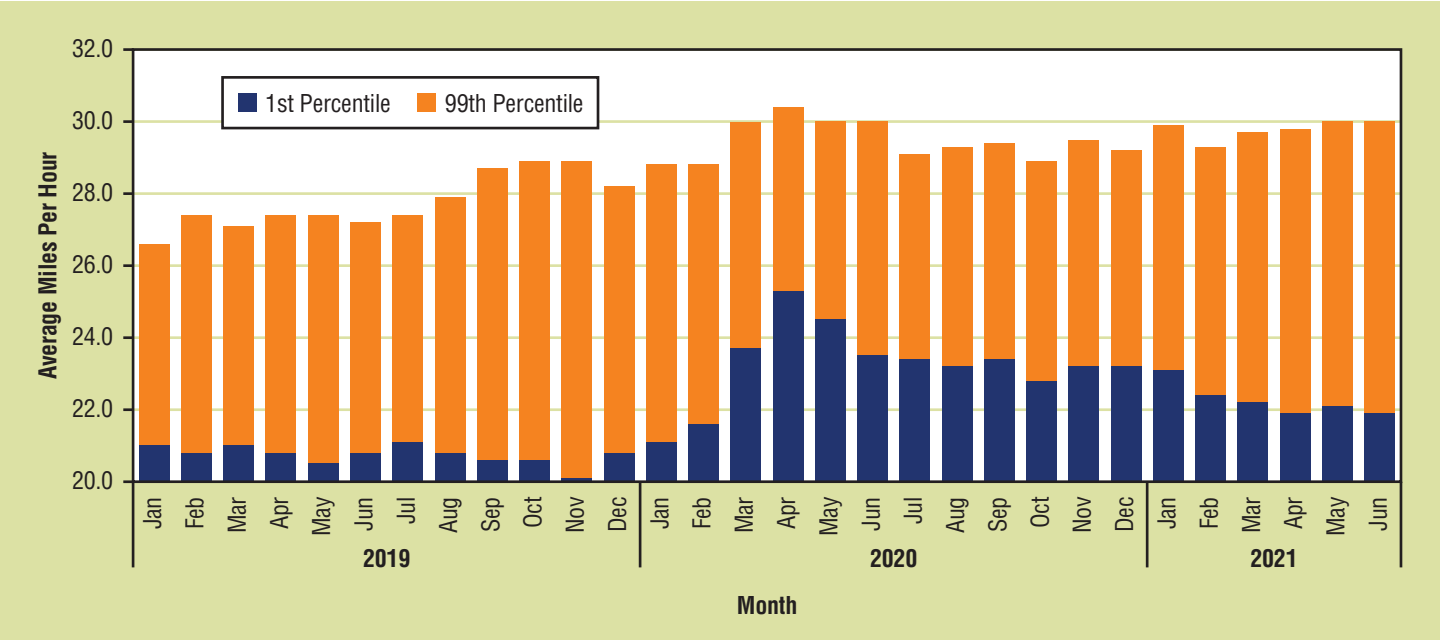
Figure 12
**Rural Interstate Range of Speeds – 1st Percentile to 99th Percentile by Month, January 2019 – June 2021**




Source: NPMRDS

Figure 13 shows the range of speeds on major collectors[3] in urban areas from January 2019 through June 2021. Starting in March 2020, the average speeds for the slowest 1% of vehicles on these roads increased. Generally, since that time, the average speeds for the fastest 1% of vehicles also increased.

Figure 13
**Urban Major Collector Range of Speeds – 1st Percentile to 99th Percentile by Month, January 2019 – June 2021**

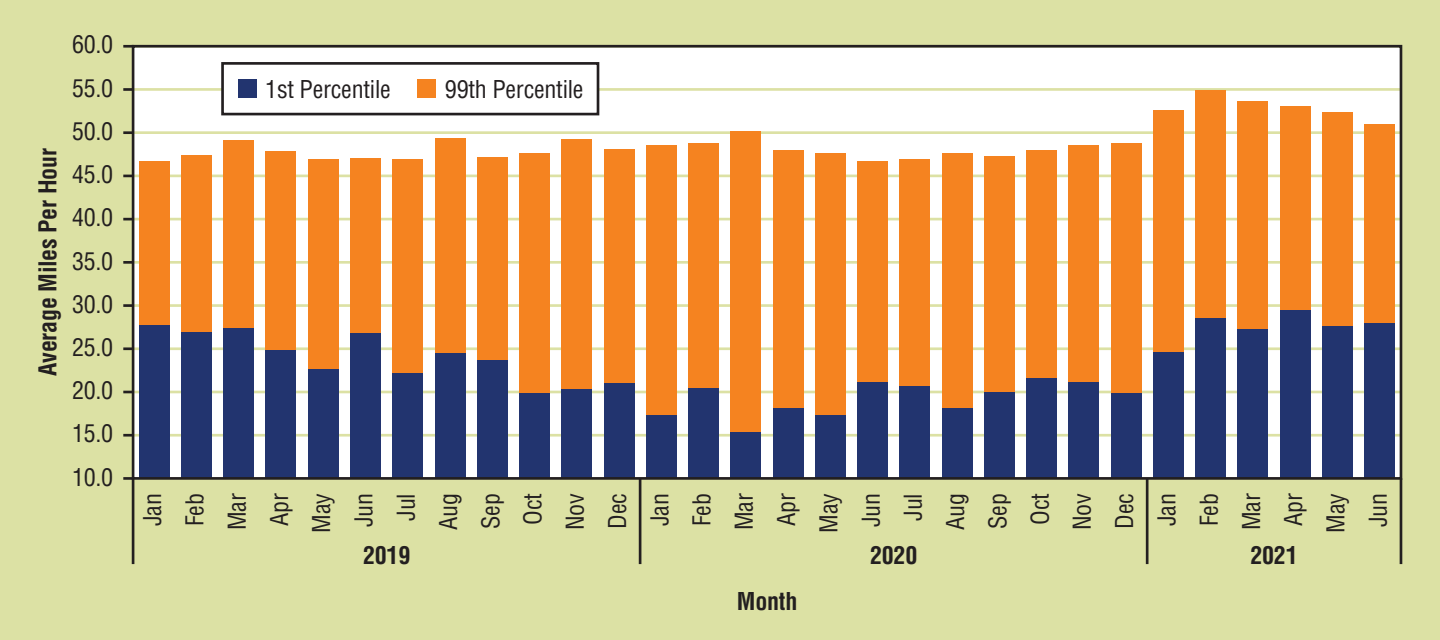



Source: NPMRDS

[3] Federal Highway Administration definitions of roadway classifications can be found at www.fhwa.dot.gov/planning%20/processes/statewide/related/highway_functional_classifications/section03.cfm

Figure 14 shows the range of speeds on major collectors for rural areas from January 2019 through June 2021. The slowest 1% of vehicles on these roads appear to have reduced their speeds throughout all of 2020 (not just during the public health emergency). Between February and June 2021, the average speeds of the fastest 1% of vehicles increased above those seen in 2019.

Figure 14
**Rural Major Collector Range of Speeds – 1st Percentile to 99th Percentile by Month, January 2019 – June 2021**




Source: NPMRDS

While the real change in speeds might have been a few miles per hour, this is still a safety concern. In a meta-analysis, Elvik (2005) found that increased driving speed increased the risk of crashes and the severity of injuries resulting from those crashes. Further, crash test research by Kim et al. (2021) showed that speeds 10 mph above the 40 mph baseline exceeded the capacity handled by the vehicle's energy-absorbing structures, and survival likelihood (as measured through crash test dummies) was significantly reduced.

Analyses of speeding behavior (driving faster than the posted speed limits) since the start of the pandemic reveal other changes. Cambridge Mobile Telematics (2021) analysis of telematic data suggested that as trips taken decreased by 50%, their measure of speeding risk increased by 45%. Further, they reported an approximate one third increase in speeding above pre-pandemic levels from November 2020 through March 2021. In their survey of self-reported behaviors, Vanlaar et al. (2021) reported that 7.6% of U.S. respondents indicated they were more likely to excessively speed during COVID-19 as compared to before the pandemic.

### *Distracted Driving*

NHTSA does not have access to detailed data related to distracted driving. Because of this, published reports by holders of the data are important for our understanding of the phenomenon and the risks associated with it during the pandemic. The data-holders use different metrics for assessing distraction, though the metrics are associated with people manipulating their cell phones while their vehicles are in transit. One of these data-holders, Cambridge Mobile Telematics (2021), reported increases in the incidence of phone manipulation per kilometer of driving through March 2021 compared to January 2020 baseline observations. Further, they reported that the 10% of most-distracted drivers have an insurance loss frequency that is 2.2 times the 10% of least-distracted drivers. Separately, Zendrive (2020) analysis showed increases in cell phone use among drivers after the mid-March 2020 start of the public health emergency. In addition, their analyses suggest that in more than 16% of the crashes their algorithms detect, a cell phone was manipulated less than five seconds before impact. These studies suggest that risks associated with cell phone distraction increased during the

pandemic. Separate from studies of telematics, Vanlaar et al. (2021) reported in their survey of self-reported behaviors that 6.8% of U.S. respondents indicated they were more likely to have driven while distracted during COVID-19 as compared to before the pandemic. Followup questions about the source of distraction suggested that competing thoughts unrelated to driving were the largest source of distraction for these drivers. Taken together, these studies suggest an increase in distracted driving during the pandemic compared to before the start of the public health emergency.

## Summary

In the first half of 2021, data suggest that trip-taking rebounded but had not reverted to levels seen before March 2020. Ejection rates remained elevated compared to the same period in 2019. The increase in severe injury rates observed throughout the latter part of 2020 is a disturbing trend that appears to have continued in 2021. The increases in ejections among males and those in rural areas in 2020 and 2021 are a cause for concern, in part because of the structure and current challenges in the EMS system, but also because speeds in rural areas tend to be higher than in urban areas. Addressing the needs of vulnerable road users requires that we understand how their risks might have changed during 2020 and 2021. Given the observed decrease in crash rates in 2021 compared to 2020 and the external projections of increases in pedestrian fatalities, there is continued need to improve data to understand potential changes in pedestrian safety, particularly in the context of the changing environments in which people were walking. The changes in drug and alcohol sales and other reported behavioral shifts also merit continued exploration. In particular, increases in sales of alcohol and marijuana, while indirect measures of risk to road traffic safety, are indicators of social changes that could have traffic safety implications.

While previous research had posited that decreases in VMT in 2020 had allowed increases in speeds compared to 2019, the return of VMT in 2021 paired with increased speeds on different roadway types in 2021 suggests this supposition may not completely explain differences in behavior. Research showing increases in speeding behavior in 2020 and 2021 causes concern for the safety implications of those increases. This note also provides a brief introduction to recent literature on distracted driving produced by companies that collect and analyze data related to cell phone or vehicle positioning. While the reports include opaque data and analysis techniques, they provide an indication that distracted driving behavior may have changed since the start of the pandemic. Survey research conducted in 2020 provided further evidence of behavioral change related to distracted driving during the pandemic. Continued monitoring of the literature could provide additional insights.

Accessing early data from 2021 has proven to be challenging. Reviewing the changing traffic safety environment as it evolves can provide direction on where to look for opportunities to deploy countermeasures. The past 18 months have provided strong impetus for NHTSA and partner organizations to focus on known, observable problems, such as the risky driving behaviors discussed here. This Research Note provides further evidence that speeding and not using seat belts remained elevated in 2021 compared to pre-pandemic times. Changes in alcohol and other types of drug use are also documented here. However, another key issue to consider is how short-term approaches to studying observable changes in behavior or crash outcomes are limited by the data available to researchers. For example, innovative analyses in non-traditional literature can teach us about behavior and can enable consideration of new countermeasures. This type of analysis could hold promise for traffic safety professionals by helping to identify emerging problems and quickly respond to changes in the traffic safety environment.

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