FOUNDATION FOR TRAFFIC SAFETY

Traffic Safety Impact of the COVID-19 Pandemic: Fatal Crashes in 2020–2022

After a brief reduction during the initial months of the COVID-19 pandemic, traffic fatalities in the United States surged to the highest levels in many years. Initially experts hypothesized that the increase was due in large part to reduced traffic volumes facilitating speeding. However, traffic fatality rates remained elevated throughout 2021 and 2022, despite traffic returning to near pre-pandemic levels. The research reported here seeks to understand how traffic safety on U.S. roads has changed since the onset of the pandemic by comparing the number and characteristics of traffic fatalities during this period to what would have been expected if the pandemic had not occurred and pre-pandemic trends continued. Data from the fatal crashes in the decade before the pandemic were used to develop statistical models that were then used to predict how many fatal crashes would have been expected during the pandemic period, without the pandemic. From May 2020 through December 2022, 114,528 people were killed in traffic crashes on U.S. roads, an estimated 16,771 (17%) more than would have been expected if the pandemic had not occurred and pre-pandemic trends continued. Findings reveal that a disparate share of the increase in traffic fatalities was experienced by disadvantaged populations. Results also highlight growing traffic safety concerns that do not appear to be attributable to the pandemic, such as pedestrian fatalities, which increased substantially during the pandemic but largely followed pre-pandemic trends. This Research Brief examines fatal crashes, drivers and vehicles involved, and victims killed in detail to provide insights into persistent traffic safety concerns as well as emergent or growing issues.

METHOD

The purpose of this study was to examine traffic safety since the onset of the COVID-19 pandemic. A previous Research Brief by the AAA Foundation for Traffic Safety (Tefft & Wang, 2022) used time-series forecasting methods to compare the number of traffic fatalities during May–December 2020 to the number that would have been expected without the pandemic, based on pre-pandemic trends. The current study adapts the methodology of the previous study to examine traffic fatalities during years 2021 and 2022 as well. The core methodology is described in detail by Tefft & Wang (2022) and summarized briefly here. Differences between the methodology of the current study versus the previous study are noted.

The main source of data for the current study was the Fatality Analysis Reporting System (FARS) database compiled by the National Highway Traffic Safety Administration (NHTSA), which contains detailed data derived from police reports on all crashes that occur each year on public roads in the U.S. and result in a death within 30 days. Data from the Centers for Disease Control and Prevention (CDC) National Vital Statistics Service (NVSS) Mortality Multiple Cause-of-Death database, derived from death

certificates, were used to examine the race/ethnicity and educational attainment of people killed in crashes. Data from the CDC's 2020 Social Vulnerability Index (SVI) were used to examine fatal crashes in relation this measure of social vulnerability based on demographic and economic data at the county level.

Pre-pandemic data from years 2010–2019 were used to develop Seasonal Autoregressive Integrated Moving Average (SARIMA) time-series models (Box & Jenkins, 1976) of the number of traffic fatalities each month, taking into account relationships between the number of fatalities each month with corresponding numbers in previous months, seasonal patterns, and trends. These models were then used to predict, or "forecast" (Hyndman & Athanasopoulos, 2018), how many fatal crashes would have been expected in each month during the pandemic, had the pandemic not occurred and pre-pandemic patterns and trends had continued. Results are presented as the actual number of fatalities and the absolute (numeric) and relative (percentage) difference between the actual number and the corresponding forecast. Positive differences indicate that the actual number of fatalities in a period was greater than would have been expected without the pandemic. Differences were considered statistically significant if the actual number of fatalities was outside of the 95% confidence interval of the forecast. Results are reported for three periods, May–December 2020 and the entire years of 2021 and 2022, to examine patterns over time during the pandemic period.

The current study forecasts monthly traffic fatalities up to 3 years beyond the data used to develop the time-series models, whereas Tefft & Wang (2022) only forecasted up to 1 year beyond the data used for model development. To validate forecast performance over the longer 3-year time horizon, the study methodology was used to forecast traffic fatalities in the 3-year period 2017–2019 using a time-series model of monthly traffic fatalities in 2007–2016. The total number of traffic fatalities forecasted over the 3 year period (112,505) was within 1.7% of the actual number (110,663) and was within 1.4%–2.3% of the actual numbers of fatalities in each individual year. All of the actual monthly numbers of traffic fatalities fell within the 95% confidence interval of the corresponding forecast (Figure 1). Collectively, these results confirm that the methods used to forecast future numbers of traffic fatalities based on patterns and trends in historical data provide accurate forecasts in the absence of phenomena such as a pandemic, which cause large and abrupt changes.

Results for the May–December 2020 period may differ slightly from those reported in the previous Research Brief (Tefft & Wang, 2022). The previous study used the NHTSA's first release of 2020 traffic fatality data, the current study uses an updated and final version of those data, which include a slightly larger number of fatalities in 2020. Results summed over subgroups may not add to corresponding overall results (e.g., the sum of results for individual age groups of drivers differ from corresponding results for all drivers) because data for each subgroup was modelled separately, and because some variables have missing values in some crashes, resulting in the exclusion of some data from subgroup analyses that were included in the overall analysis. The number of fatalities summed over victim race/ethnicity is greater than the total for all victims because analyses of race/ethnicity were based on data from CDC's Multiple Cause-of-Death database, which includes some deaths not included in FARS (e.g., deaths occurring more than 30 days after a crash), whereas all other analyses were based on data from FARS.

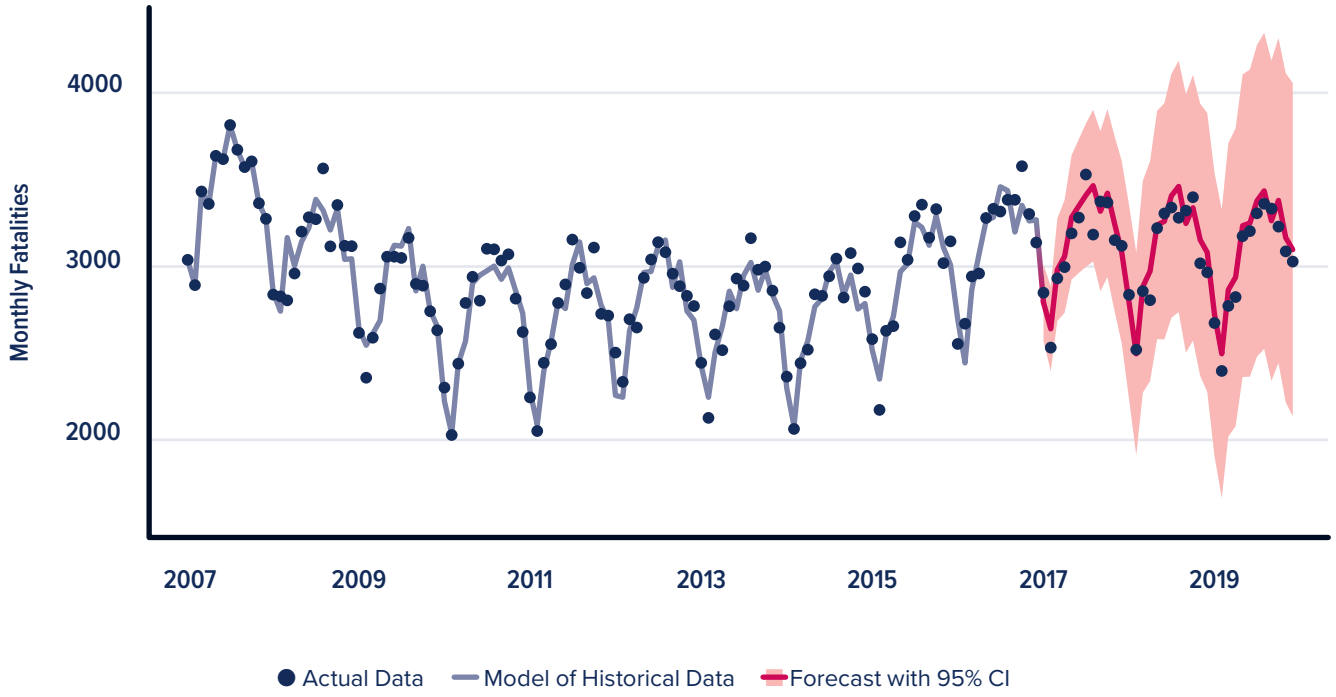

Figure 1. Model validation: Forecast of monthly traffic fatalities in 2017–2019 based on model of data from 2007–2016.

RESULTS

After decreasing sharply during March and April 2020 while most states had stay-at-home orders in effect (Moreland, 2020), monthly traffic fatalities returned to typical levels in May 2020. Then, in June, traffic fatalities surged to levels significantly greater than would have been expected without the pandemic and remained elevated throughout the remainder of 2020 as well as the entirety of 2021 and 2022 (Figure 2). A total of 28,874 people were killed in crashes on U.S. roads in May–December 2020, 3,224 (13%) more than expected without the pandemic based on time-series models of data from years 2010–2019 (Table 1). Another 43,230 people died in crashes in 2021, 7,076 (20%) more than expected without the pandemic and the most in any year since 2005 (NHTSA, 2023). In 2022, an additional 42,514 people died in crashes on U.S. roads, 6,471 (18%) more than expected without the pandemic.

Characteristics of Crash Victims

Table 1 (at end of document) shows the number people killed in crashes that occurred in each period relative to corresponding forecasts in relation to the characteristics of the people who died. In both 2021 and 2022, the actual numbers of traffic fatalities were more than 20% greater than forecasts based on pre-pandemic trends for all age groups except teens younger than 16 and adults ages 55 and older. Adults aged 55 years and older did not experience a statistically significant increase in fatalities relative to corresponding forecasts in any of the periods examined. In percentage terms, the increase in traffic fatalities relative to corresponding forecasts was greatest for young adults aged 20–24 in 2020 and 2022; in 2021 the increase was greatest in percentage terms for teens aged 16–19. The number of men killed in crashes was 14%–19% greater than

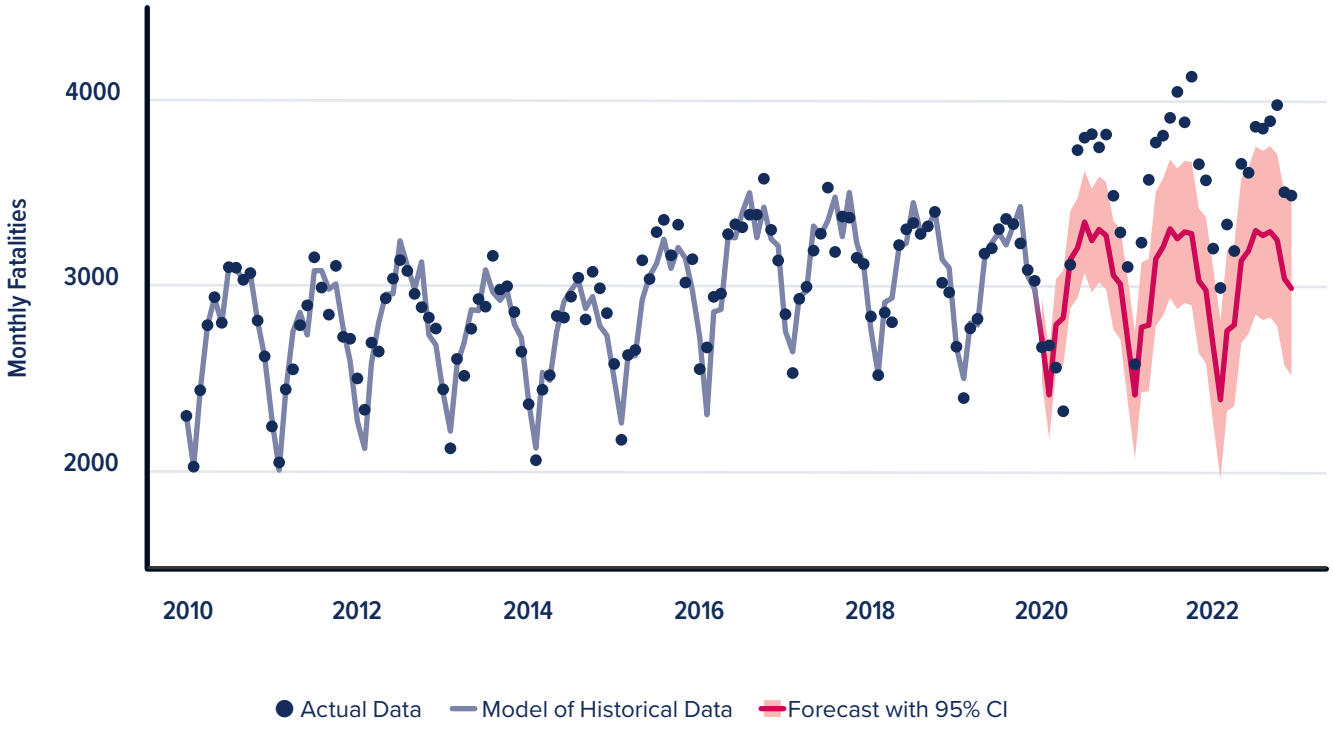

Figure 2. Monthly traffic fatalities, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

the corresponding forecast in all three periods examined. The number of women killed in crashes was 15% greater than forecast in 2021 but was not significantly different from forecasts in 2020 or 2022. The percentage increase in fatalities relative to the corresponding forecast was by far the largest for Black victims in May–December 2020 (35%) and in 2021 (34%). In 2022, increases were similar for Black (22%) and Hispanic victims (24%) (Figure 3), as well as people of other races.

Among adults aged 25 years and older, the increase in traffic fatalities relative to the corresponding forecast was by far the largest numerically for those with no education beyond high school in all three periods, and was also the largest in percentage terms in May–December 2020 (13%) and in 2021 (16%). In 2022, the increases in fatalities were similar in percentage terms for those with no education beyond high school (12%) and for college graduates (13%); however, the numeric increase experienced by those with no education beyond high school (2453 more fatalities than forecast) was more than four times as large as that for college graduates (556 more fatalities than forecast) (Figure 4). Education was not examined among people younger than 25 as it is not considered as reliable of an indicator among those who may not have yet completed their education (Harper et al., 2015).

The numbers of fatalities of vehicle occupants and motorcyclists were significantly greater than the corresponding forecasts based on pre-pandemic data in all three periods examined. In percentage terms, increases were by far the largest for motorcyclists. The increase in vehicle occupant fatalities was almost entirely among occupants not wearing seatbelts; there was no statistically significant increase in fatalities of occupants wearing seatbelts in any of the three periods examined (Table 1).

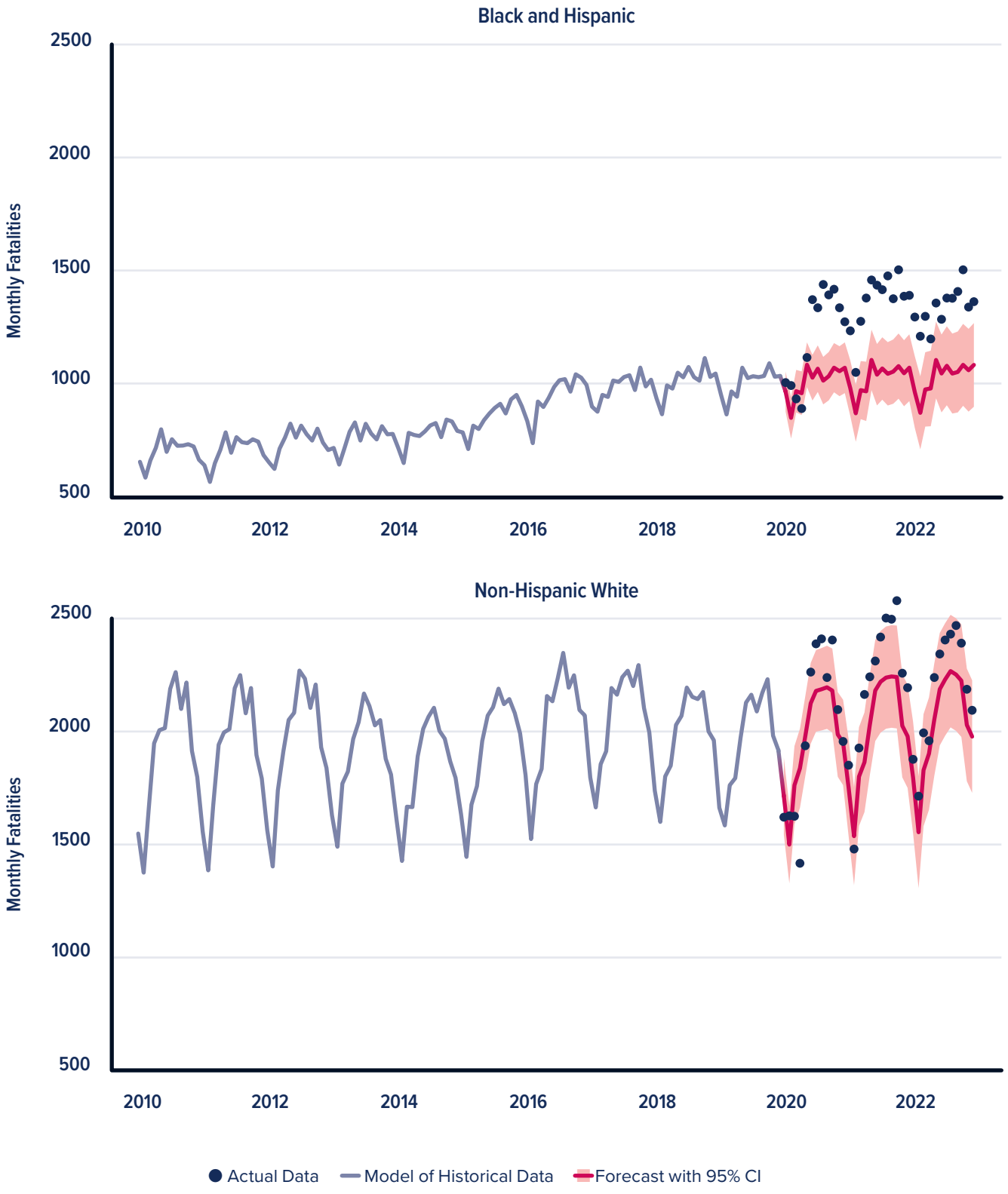

Figure 3. Monthly traffic fatalities in relation to race/ethnicity, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

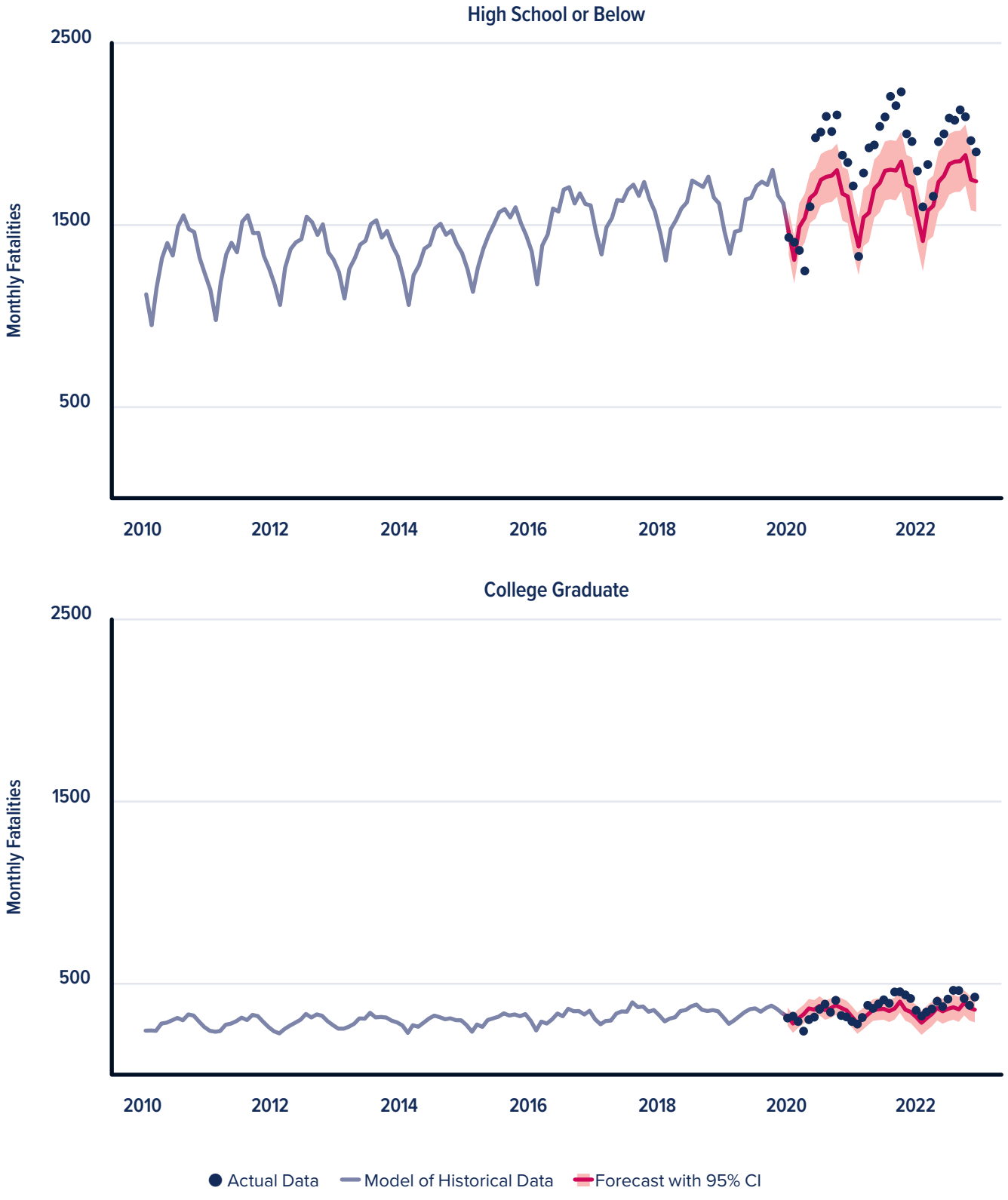

Figure 4. Monthly traffic fatalities in relation to educational attainment among adults aged 25 years and older, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

Increases in fatalities relative to corresponding forecasts were statistically significant for bicyclists in 2020 and 2022 but not in 2021; an increase in pedestrian fatalities relative to the corresponding forecast was statistically significant in 2021 but not in 2020 nor 2022. Notably, however, numbers of fatalities of pedestrians and bicyclists were much higher during the pandemic than in recent pre-pandemic years. Increases in pedestrian and cyclist fatalities relative to the corresponding forecasts were smaller, however, because the forecasts themselves reflected the substantial increasing trends in pedestrian and cyclist fatalities over the entire decade prior to the pandemic (Figure 5).

Times and Places of Crashes

Table 2 (at end of document) shows the number people killed in crashes that occurred in each period relative to corresponding forecasts in relation to the times and places of the crashes. When examined in relation to time of day, the increase in traffic fatalities relative to corresponding forecasts was largest both in absolute terms and on a percentage basis in the late night and early morning hours (10 pm–2 am) in all three periods examined. Large and statistically significant increases were observed in the evening (6 pm–10 pm) and early morning (2 am–6 am) as well. In contrast, increases in numbers of traffic fatalities were much smaller during typical morning

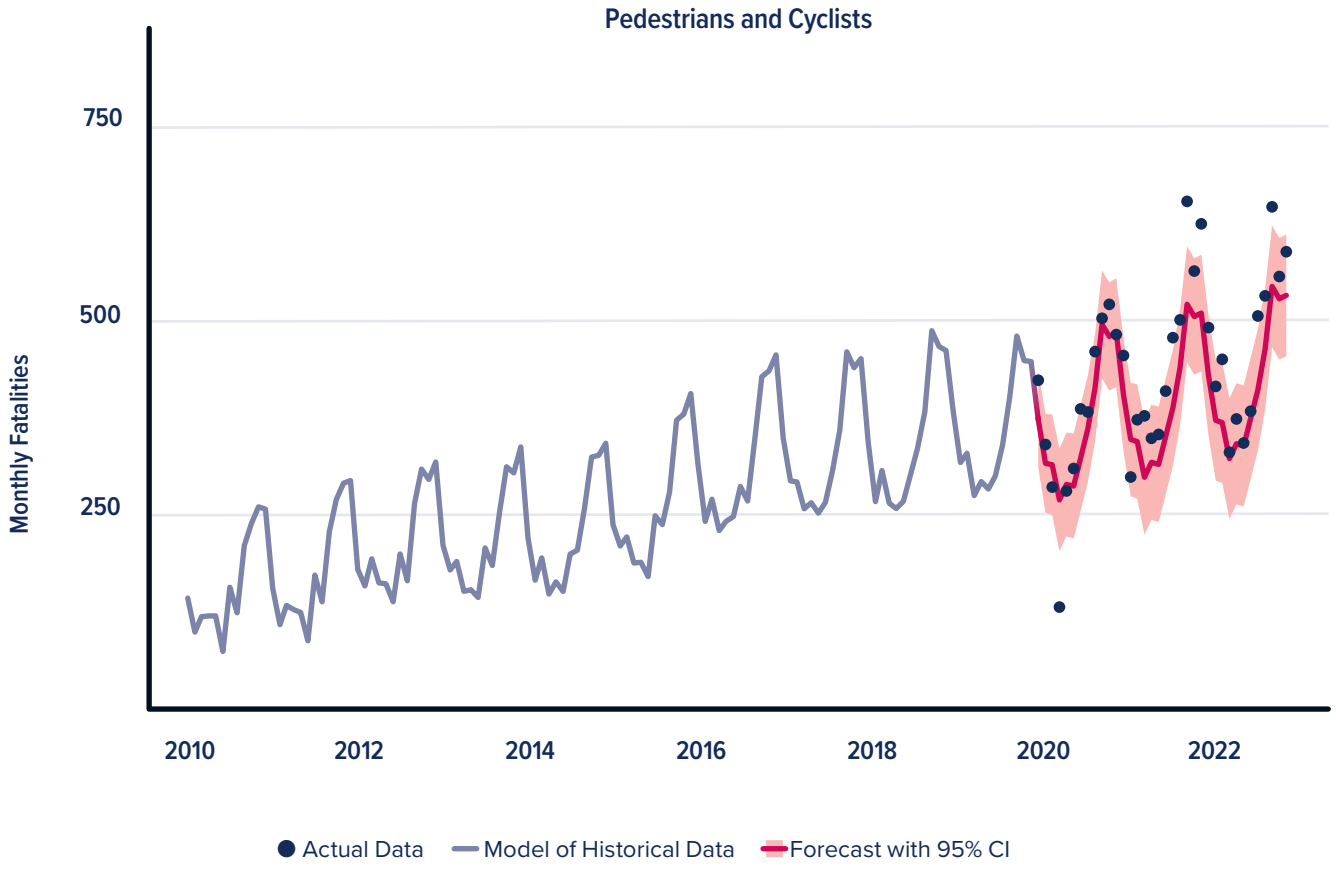

Figure 5. Monthly pedestrian and cyclist fatalities, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

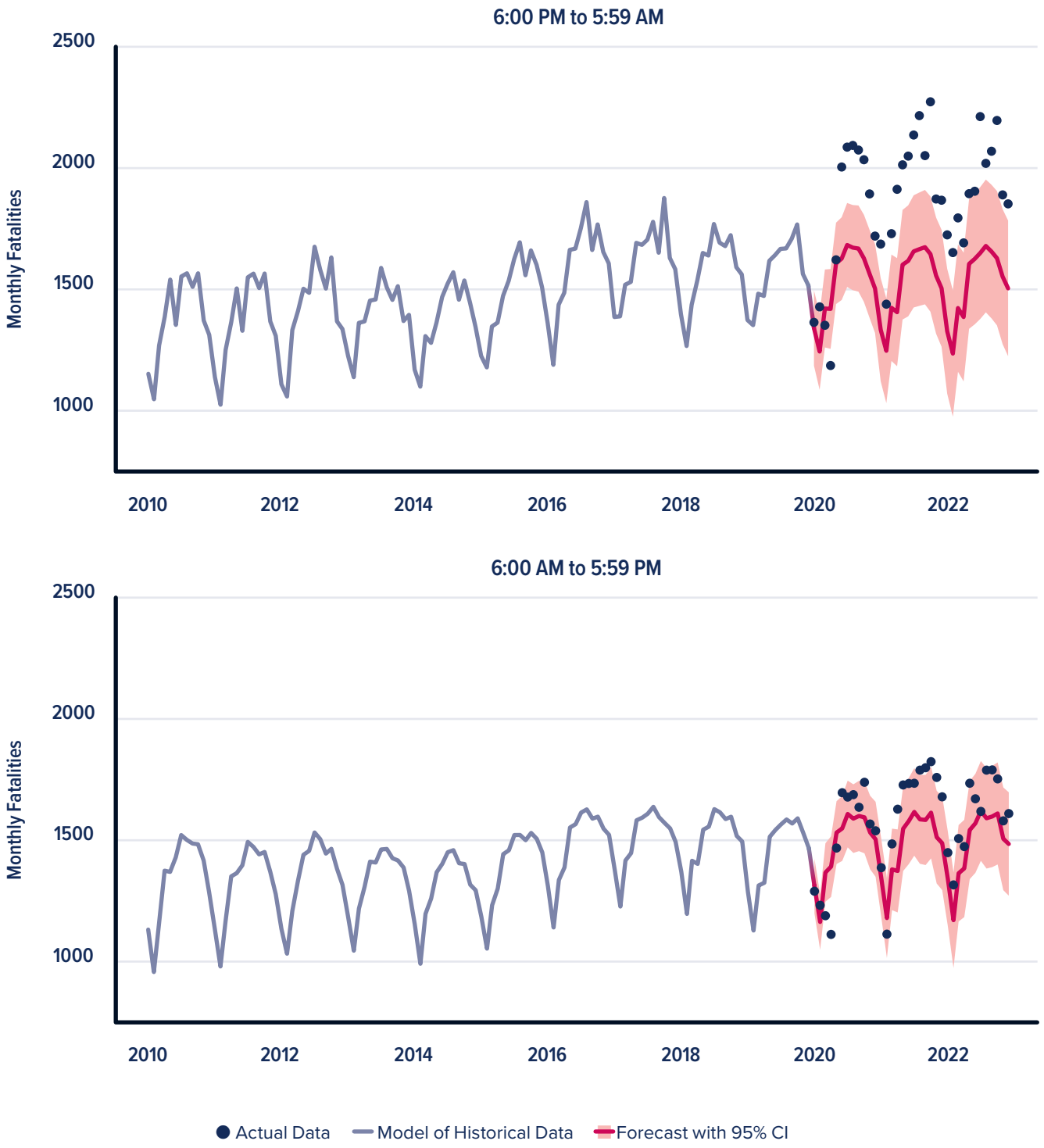

Figure 6. Monthly fatalities in relation to time of day, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

commute, mid-day, and afternoon hours and in many cases were not statistically significant. Overall, the numeric increase in traffic fatalities between 6 pm and 5:59 am was more than twice as large as that between 6 am and 5:59 pm in all three periods examined (Figure 6).

The increase in traffic fatalities relative to pre-pandemic trends was by far the largest in percentage terms on urban Interstate highways and freeways, with increases ranging from 26% to 41% across the three periods examined. Fatalities on urban arterials exceeded corresponding forecasts by 13%-17% in all three periods; however, these roads accounted for the largest numeric increase as far more fatalities occur on urban arterials than other road types overall.

The increase in fatalities on urban arterials relative to the forecast was not statistically significant in 2021 or 2022 as the forecast itself reflected a significant long-term increasing trend that began several years before the pandemic (Figure 7). Fatalities on collectors and local roads had been trending downward prior to the pandemic but increased significantly during all three periods examined, with increases similar in magnitude in both urban and rural areas. Numbers of traffic fatalities did not differ significantly from corresponding forecasts on rural Interstate highways nor on rural arterials during any of the periods examined.

When examined in relation to the CDC's Social Vulnerability Index, county-level increases in

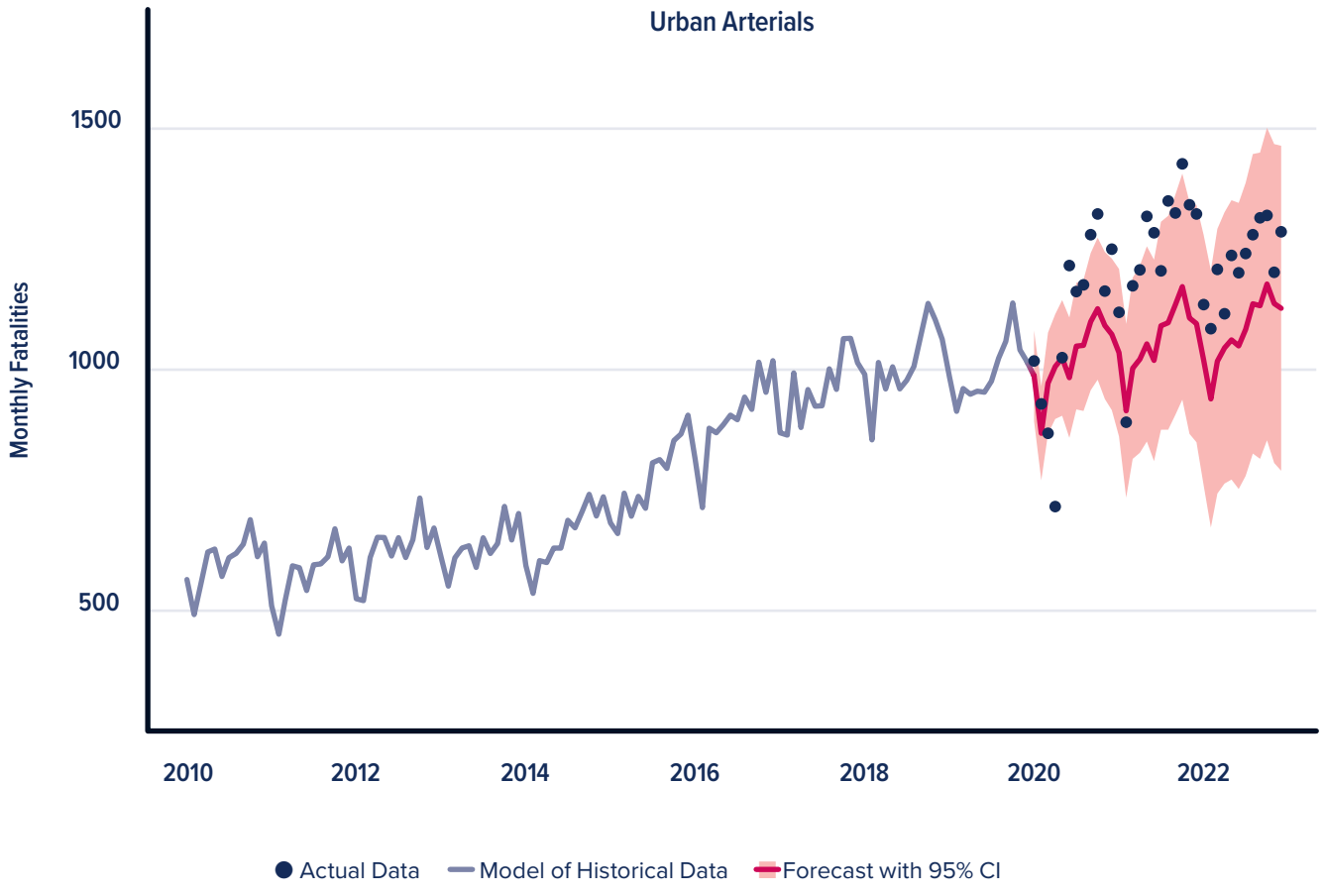

Figure 7. Monthly fatalities on urban arterial roads, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

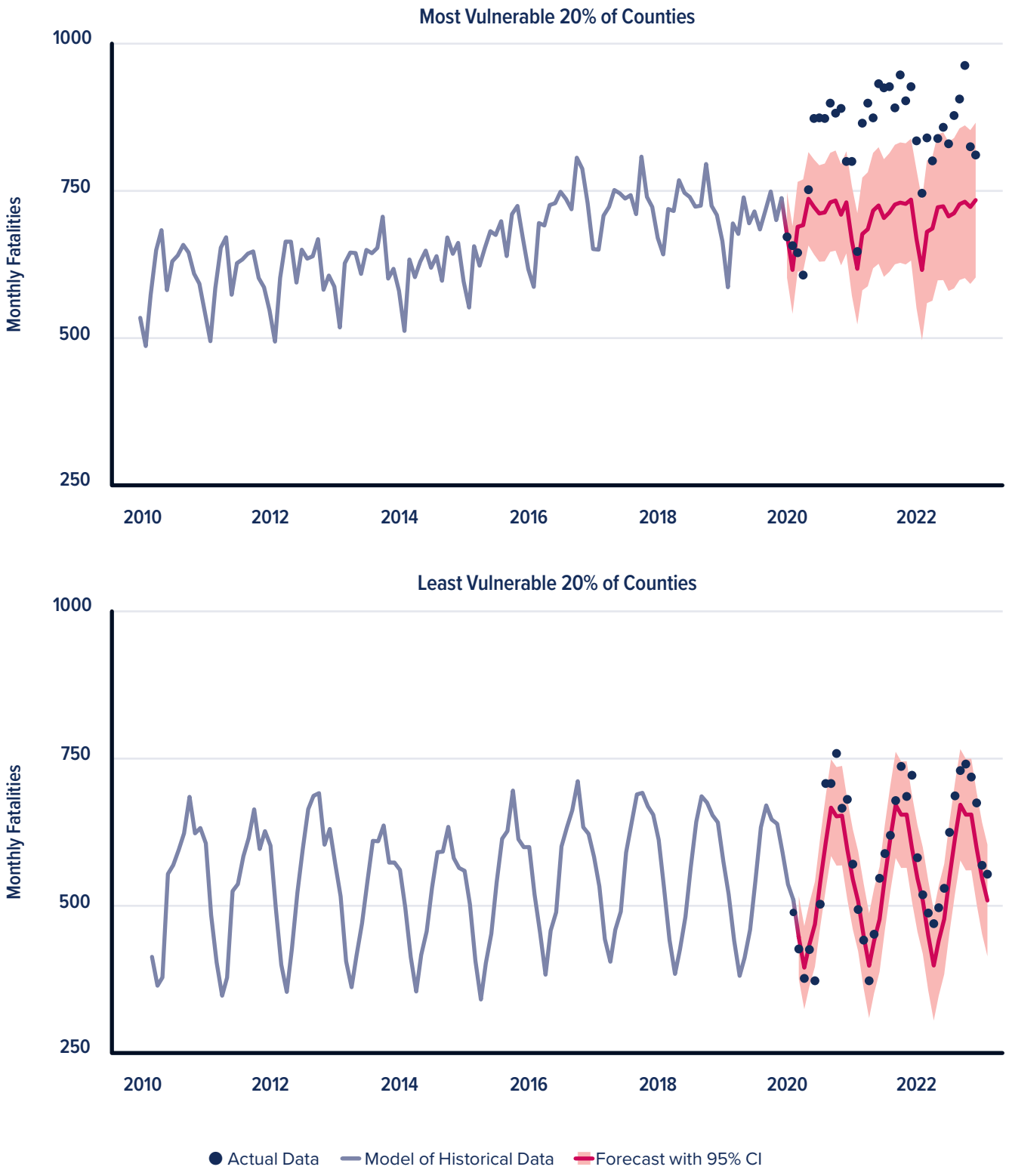

Figure 8. Monthly fatalities in the 20% of counties with highest and lowest levels of vulnerability as measured using the CDC Social Vulnerability Index, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

traffic fatalities were roughly proportional to this measure of vulnerability, with larger increases in traffic fatalities in counties with higher levels of vulnerability. In 2020 and 2021, the 20% of counties with the lowest levels of vulnerability did not experience statistically significant increases in traffic fatalities, although in 2022 they did. Also notably, the numeric increases in traffic fatalities were more than twice as large in the 20% of counties with highest levels of vulnerability than in the 20% with the lowest levels of vulnerability in all three periods examined (Figure 8).

Characteristics and Behaviors of Drivers

Table 3 (at end) shows the number of drivers involved in fatal crashes that occurred in each period relative to corresponding forecasts in relation to selected driver characteristics. In general, the percentage increases in fatal crash involvement in all periods varied inversely with driver age, with the largest percentage increases among the youngest drivers and minimal increases among older drivers. The increase in fatal crash involvement in 2020 was almost entirely among men, with only a very small and statistically non-significant increase among women. In 2021, fatal crashes of both men and women increased significantly, though the numeric increase was much larger among men than among women. In 2022, the number of fatal crashes of men was again much greater than the corresponding forecast. The number of fatal crashes among women in was also substantially larger than the corresponding forecast in 2022, however, the difference was not statistically significant.

The number of fatal-crash-involved drivers who held valid licenses was not significantly greater than the corresponding forecast in 2020, and most of the increase in fatal crash involvement was among drivers without valid licenses, which include drivers whose licenses were suspended or revoked as well as drivers who had never been licensed. The very large increases in fatal crashes of drivers without valid licenses continued in 2021 and 2022 as well. The annual number of fatal crash involvements of never-licensed drivers had been trending upward throughout the pre-pandemic period, thus the model-based forecasts anticipated that the increasing trend would continue, yet the numbers of never-licensed drivers involved in fatal crashes exceeded those forecasts by 38%–53% in all three periods examined (Figure 9). While increases in fatal crash involvements were far larger on a percentage basis for drivers without valid licenses, the number of fatal crashes of validly-licensed drivers also increased significantly in 2021 and 2022 and accounted for the majority of the numeric increase in fatal crashes in both years.

The number of drivers in fatal crashes that police reported as speeding exceeded corresponding forecasts by 24%–28% in all three periods examined. In 2020, the increase in police-reported speeding drivers in fatal crashes actually accounted for the majority of the overall increase in fatal crashes. In contrast, in 2021 and 2022, while the percentage increase in fatal crash involvements of speeding drivers was much larger than the corresponding increase among non-speeding drivers, the numeric increase in fatal crash involvements of non-speeding drivers was larger than that of speeding drivers.

Increases in fatal crashes relative to corresponding forecasts were largest in percentage terms for drivers with blood alcohol concentration (BAC) of 0.08 g/dL or higher. Fatal crashes of drivers with non-zero BACs below 0.08 g/dL also increased significantly in all three periods examined. The increase in the number of fatal crashes of drivers with no detectable alcohol (BAC=0.00) was substantial in all three periods but was statistically significant only in 2021. Also of note, 2022 was the only year examined in which drivers with BACs of 0.08+ accounted for the majority of the numeric increase in fatal crash involvements.

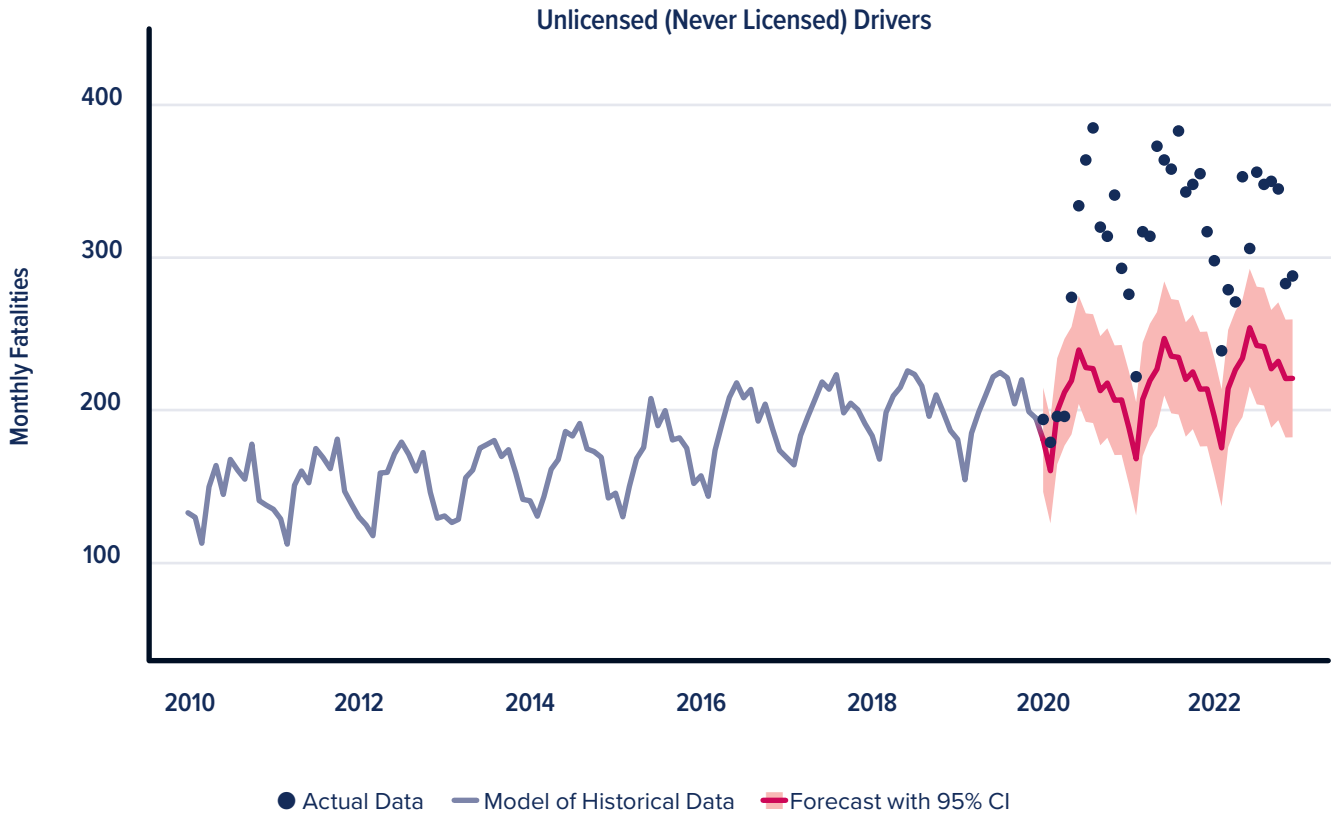

Figure 9. Monthly unlicensed (never licensed) drivers involved in fatal crashes, United States, 2010–2022, and forecast of number expected in 2020–2022 based on model of data from 2010–2019.

DISCUSSION

The COVID-19 pandemic has impacted many aspects of life in the U.S. and globally, with impacts extending well beyond the effects of the disease itself. Among these impacts has been a substantial increase in U.S. traffic fatalities. Previous research by the AAA Foundation found that after decreasing during the first months of the pandemic while much of the population was subject to stay-at-home orders, traffic fatalities surged in the latter part of 2020 to their highest levels in over a decade (Tefft & Wang, 2022). The current study finds that this increase in traffic fatalities continued throughout 2021 and 2022, resulting in 114,528 traffic fatalities from May 2020 through December 2022, an estimated 16,771 (17%) more than would have been expected over the same period had the pandemic not occurred and pre-pandemic trends continued.

Early in the pandemic, many studies and experts suggested that the increase in traffic fatalities was due in large part to reduced traffic volumes, associated with factors such as government stay-at-home orders and increased remote work, which enabled drivers to travel at speeds that had been precluded by congestion prior to the pandemic (e.g., Governors Highway Safety Association, n.d.; Hughes et al., 2022; Stiles et al., 2021; Yasin et al., 2021). While this may have been the case early in the pandemic, results of the current study strongly suggest

that the sustained increase in fatalities is attributable in large part to other factors besides pandemic-associated reductions in traffic volumes. Although total vehicle-miles of travel in the U.S. fell to levels as low as 39% below pre-pandemic levels in April 2020, they had returned to within 2% of pre-pandemic levels by 2022 (Federal Highway Administration, 2024), yet the current study estimates that there were still 18% more fatalities in 2022 than would have occurred without the pandemic. Furthermore, the current study finds that the largest increases in traffic fatalities occurred during the late night and early morning hours—times during which speeding generally would not have been precluded by congestion even before the pandemic.

Although the findings of the current study suggest that the "speeding-enabled-by-reduced-traffic" hypothesis is at best incomplete, fatal crashes involving speeding nonetheless increased significantly during the pandemic. Fatal crashes involving other aberrant driving behaviors such as alcohol-impaired driving, non-use of seatbelts, and unlicensed driving increased as well, suggesting that reasons for the increases in speeding might include but clearly are not limited to reduced traffic congestion. One survey of self-reported risky driving behaviors of U.S. and Canadian drivers during versus before the pandemic found that while most drivers said they did not change their behavior and some reported driving more safely, a small subset of drivers admitted that they exceeded speed limits and drove after drinking alcohol more frequently during the pandemic than they did before (Vanlaar et al., 2021). Relatedly, a previous AAA Foundation survey of U.S. drivers found that differential changes in driving exposure may have played a role. Tefft et al. (2022) found that while most drivers reported doing less driving in the fall of 2020 than they did prior to the pandemic, a small subset of the population reported driving more than they did before, and this group tended to be riskier on average both demographically (i.e., younger, higher proportion male) and behaviorally (e.g., higher prevalence of risky behaviors, even after accounting for demographic characteristics). It is possible that some of these behaviors could be manifestations of more general pandemic-associated behavior changes not specific to transportation. For example, another study found that homicides and drug overdoses of U.S. teens and young adults increased during the pandemic, in addition to motor vehicle traffic fatalities (Rossen et al., 2024).

The current study also highlights the disproportionate impact of the pandemic on disadvantaged populations, exacerbating disparities that already existed. Black and Hispanic Americans were over-represented in traffic fatalities even before the pandemic (Raifman & Choma, 2022); however, the pandemic widened these disparities. Comparing the actual numbers of people who died in crashes versus the number of deaths that would have been expected without the pandemic, Black Americans, who comprise approximately 12% of the U.S. population (U.S. Census Bureau, 2024a), accounted for approximately 34% of the entire increase in traffic fatalities, and Hispanic Americans (19% of U.S. population) accounted for approximately 25% of the increase. Disparities in traffic fatalities in relation to educational attainment—a proxy for socioeconomic status—have also been documented previously (Harper et al., 2015). The current study finds that the pandemic widened these disparities as well. Among adults aged 25 years and older, those with no education beyond high school account for 37% of the population (U.S. Census Bureau, 2024b) but accounted for 75% of the increase in traffic fatalities, whereas college graduates account for 34% of the population but only 8% of the increase in traffic fatalities. A previous study using different methodology showed that the pandemic-associated widening of disparities in traffic fatality rates across levels of educational attainment was greatest among Black Americans but occurred to a significant degree among Hispanic Americans and non-Hispanic Whites as well (Tefft & Steinbach, 2024). Results of analyses at the

county level reveal similar patterns, as the 20% of counties deemed most vulnerable according to a composite measure of social vulnerability and disadvantage experienced nearly three times the numeric increase in traffic fatalities as the 20% of counties deemed least vulnerable.

Finally, it is important to note that not all increases in traffic fatalities that have occurred since the onset of the pandemic are attributable to the effects of the pandemic. Fatalities on urban arterial roads and pedestrian fatalities provide two salient examples. Although traffic fatalities in urban areas increased significantly in association with the pandemic, urban traffic fatalities already had been trending upward for several years before the pandemic, especially on urban arterial roads (Kim et al., 2022). Similarly, after reaching a historic low in 2009, the number of pedestrians killed on U.S. roads each year increased by an average of 4.3% annually over the decade that followed, all before the pandemic. While the actual numbers of pedestrian fatalities in 2020–2022 were slightly higher than would have been expected based on pre-pandemic trends, they were largely within the range of what would have been expected without the pandemic based on pre-pandemic trends. Moreover, a simple continuation of the pre-pandemic trend in pedestrian fatalities still would have resulted in the deaths of more pedestrians on U.S. roads in 2022 than in any other year since 1982. While the pandemic may have led to additional increases in traffic fatalities on urban arterial roads and among pedestrians, it is important to understand and address the reasons why they were increasing so rapidly even before the pandemic.

Limitations

This research has several limitations that should be noted. The general approach of the study was to compare the number of traffic fatalities that occurred during the pandemic to an estimate of how many would have occurred without the pandemic based on models of data from the preceding decade. While this general approach is used widely in epidemiologic research (Chandra et al., 2024; Faust et al., 2021; Todd & Scheeres, 2022), and the specific forecasting method used in the current study performed well when used to "forecast" fatalities in pre-pandemic years for validation purposes, results could be biased if other factors besides the pandemic led to significant changes in traffic safety during the pandemic period. In the context of the current study, this is not a major concern. Results can still be interpreted as quantifying the extent to which the number of fatalities that occurred during the pandemic differed from what would have been expected based on previous trends, irrespective of whether the pandemic itself caused the differences. Another limitation is that some risk factors of interest could not be examined due to lack of reliable data. For example, a study of drug presence among crash victims treated in trauma centers before and during the pandemic found substantial drug prevalence (Thomas et al., 2022); however, data on drug involvement in the data examined in the current study were not examined because they are known to be unreliable (Berning et al., 2022). Relatedly, the study was unable to account for changes in exposure such as the amount of driving done by various groups or under particular conditions. While some aggregate data on total miles driven nationwide exist (e.g., Federal Highway Administration, 2024), they lack the level of detail required to incorporate formally into the current study. Finally, some details of crashes were often unknown (e.g., whether a driver was speeding, whether a victim was wearing a seatbelt), thus, the current study may underestimate the magnitudes of changes in the representation of these factors in traffic fatalities.

Conclusions & Implications

This research finds that the COVID-19 pandemic has continued to adversely impact traffic safety in the United States through at least the end of 2022. Many findings confirm results reported previously based on data from 2020. Aberrant behaviors including speeding

and alcohol-impaired driving have continued to contribute to far greater numbers of fatal crashes than they did in recent pre-pandemic years. The increase in fatalities of vehicle occupants was almost entirely among those not wearing seatbelts. Increases in involvement in fatal crashes both as drivers and as victims has been significant for drivers and victims of all ages up to roughly 55 and has been much greater for men than for women. Contrary to hypotheses that the increase in fatalities was attributable to reduced traffic congestion facilitating speeding, the increase in fatal crashes was largest in the late night and early morning hours, not at times when roads were heavily congested before the pandemic.

Results also highlight the disproportionate impact of the pandemic on disadvantaged populations, exacerbating disparities that already existed before the pandemic. The increase in the rate of fatal crashes was greatest in counties facing high levels of social vulnerability and was experienced disproportionately Blacks, Hispanics, and adults with no education beyond high school. These results highlight the importance of working to provide equitable access to safe transportation for vulnerable and disadvantaged populations, as many measures that improve the safety of these groups will benefit all transportation system users.

Finally, results also provide a reminder that not all increases in traffic fatalities during the pandemic are attributable to the pandemic. While pedestrian fatalities and fatalities on urban arterial roads increased during the pandemic, a substantial proportion of their observed increases could have been anticipated based on pre-pandemic trends. This suggests that more holistic and more general approaches to traffic safety (i.e., not focused specifically on identifying and reversing what transpired specifically due to or during the pandemic) will be necessary to address these trends, whose contributions to the overall increase in traffic fatalities in recent years have been substantial. The framework of the Safe System approach (Michael et al., 2023) can help to address these adverse trends in traffic safety.

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ABOUT THE AAA FOUNDATION FOR TRAFFIC SAFETY

The AAA Foundation for Traffic Safety is a 501(c)(3) nonprofit, publicly supported charitable research and education organization. It was founded in 1947 by the American Automobile Association to conduct research to address growing highway safety issues. The organization's mission is to identify traffic safety problems, foster research that seeks solutions, and disseminate information and educational materials. AAA Foundation funding comes from voluntary, tax-deductible contributions from motor clubs associated with the American Automobile Association and the Canadian Automobile Association, individual AAA club members, insurance companies and other individuals or groups.

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Table 1. People killed in crashes during COVID-19 pandemic relative to forecasts based on models of monthly traffic fatalities in 2010–2019, in relation to characteristics of the people who died.

	May–Dec 2020			2021			2022		
	Actual	Relative to Pre-Pandemic Trend		Actual	Relative to Pre-Pandemic Trend		Actual	Relative to Pre-Pandemic Trend	
		N	%		N	%		N	%
Total People Killed	**28,784**	**+3,224**	**+13%**	**43,230**	**+7,076**	**+20%**	**42,514**	**+6,471**	**+18%**
Age (years)									
<16	**995**	**+134**	**+16%**	**1,397**	**+206**	**+17%**	1,336	+130	+11%
16–19	1,709	+277	+19%	**2,626**	**+684**	**+35%**	**2,406**	**+515**	**+27%**
20–24	**3,088**	**+649**	**+27%**	**4,319**	**+1,039**	**+32%**	**4,140**	**+1,092**	**+36%**
25–39	**8,122**	**+1,521**	**+23%**	**12,108**	**+2,720**	**+29%**	**11,625**	**+2,261**	**+24%**
40–54	**5,918**	**+703**	**+13%**	**8,988**	**+1,593**	**+22%**	**8,869**	**+1,487**	**+20%**
55–69	5,555	+175	+3%	8,330	+489	+6%	8,312	+272	+3%
70+	**3,269**	**−432**	**−12%**	5,245	−60	−1%	5,626	+226	+4%
Gender									
Male	**20,902**	**+2,572**	**+14%**	**30,964**	**+4,928**	**+19%**	**30,669**	**+4,462**	**+17%**
Female	7,804	+385	+5%	**12,135**	**+1,560**	**+15%**	11,737	+1,199	+11%
Race/Ethnicity[a]									
White (Non-Hispanic)	**17,695**	**+909**	**+5%**	**26,424**	**+2,312**	**+10%**	26,103	+1,799	+7%
Black (Non-Hispanic)	**5,711**	**+1,485**	**+35%**	**8,354**	**+2,141**	**+34%**	**7,658**	**+1,400**	**+22%**
Hispanic (Any Race)	**4,965**	**+594**	**+14%**	**8,019**	**+1,491**	**+23%**	**8,344**	**+1,596**	**+24%**
Other/Multiple Races	1,332	+24	+2%	**2,295**	**+401**	**+21%**	**2,356**	**+457**	**+24%**
Educational Attainment[a,b]									
High School or Below	**15,536**	**+1,796**	**+13%**	**23,384**	**+3,276**	**+16%**	**23,105**	**+2,543**	**+12%**
Some College/2Yr Degree	5,056	+279	+6%	**7,814**	**+822**	**+12%**	**7,714**	**+592**	**+8%**
Bachelor's Degree or Higher	2,765	−162	−6%	**4,597**	**+459**	**+11%**	**4,734**	**+556**	**+13%**
Role in Crash									
Vehicle Occupant	**18,064**	**+1,635**	**+10%**	**27,593**	**+3,905**	**+16%**	**26,639**	**+3,057**	**+13%**
Motorcyclist	**4,570**	**+653**	**+17%**	**6,139**	**+1,137**	**+23%**	**6,223**	**+1,213**	**+24%**
Pedestrian	4,597	+115	+3%	**7,470**	**+648**	**+9%**	7,522	+440	+6%
Bicyclist/Other Cyclist	**734**	**+66**	**+10%**	976	+37	+4%	**1,105**	**+141**	**+15%**
Seatbelt Use (vehicle occupants)[c]									
Yes	7,823	−117	−1%	12,335	+805	+7%	11,849	+313	+3%
No	**8,263**	**+1,291**	**+19%**	**12,350**	**+2,289**	**+23%**	**11,851**	**+1,836**	**+18%**

Note: Sums across categories may not equal the total because different models were used for each category and because the total includes cases with other or unknown values of the category variables.
Values in **bold** differ significantly at 95% confidence level from forecasts based on pre-pandemic data.
[a] Data from Centers for Disease Control and Prevention Mortality Multiple Cause of Death database
(all other data in table are from National Highway Traffic Safety Administration's Fatality Analysis Reporting System).
[b] Educational attainment was examined only for people aged 25 years and older.
[c] Based on vehicle occupants only; occupants with unknown seatbelt use were excluded.

Table 2. People killed in crashes during COVID-19 pandemic relative to forecasts based on models of monthly traffic fatalities in 2010–2019, in relation to the times and places of the crashes.

	May–Dec 2020			2021			2022		
	Actual	Relative to Pre-Pandemic Trend		Actual	Relative to Pre-Pandemic Trend		Actual	Relative to Pre-Pandemic Trend	
		N	%		N	%		N	%
Total People Killed	**28,784**	**+3,224**	**+13%**	**43,230**	**+7,076**	**+20%**	**42,514**	**+6,471**	**+18%**
Time of Day									
6 am – 9:59 am	3,089	−182	−6%	5,014	+167	+3%	**5,265**	**+344**	**+7%**
10 am – 1:59 pm	4,121	+206	+5%	**6,119**	**+610**	**+11%**	5,801	+285	+5%
2 pm – 5:59 pm	**5,801**	**+465**	**+9%**	**8,527**	**+1,076**	**+14%**	8,227	+770	+10%
6 pm – 9:59 pm	**6,887**	**+929**	**+16%**	**10,136**	**+1,368**	**+16%**	**9,841**	**+861**	**+10%**
10 pm –1:59 am	**5,316**	**+981**	**+23%**	**7,737**	**+1,723**	**+29%**	**7,671**	**+1,673**	**+28%**
2 am – 5:59 am	**3,321**	**+375**	**+13%**	**5,369**	**+1,152**	**+27%**	**5,383**	**+1,176**	**+28%**
Type of Road									
Interstate/Freeway—Urban	**3,253**	**+666**	**+26%**	**5,327**	**+1,548**	**+41%**	**5,133**	**+1,347**	**+36%**
Interstate/Freeway—Rural	1,511	-103	-6%	2,356	+71	+3%	2,351	+49	+2%
Arterial—Urban	**9,595**	**+1,097**	**+13%**	14,965	+2,220	+17%	14,626	+1,698	+13%
Arterial—Rural	5,323	+333	+7%	7,575	+655	+9%	7,446	+503	+7%
Collector/Local—Urban	**3,558**	**+498**	**+16%**	**5,444**	**+1,068**	**+24%**	**5,224**	**+848**	**+19%**
Collector/Local—Rural	**5,375**	**+687**	**+15%**	**7,374**	**+1,325**	**+22%**	**7,361**	**+1,563**	**+27%**
County Social Vulnerabilty Index[a]									
Least Vulnerable 20%	5,074	+321	+7%	6,924	+382	+6%	**7,261**	**+716**	**+11%**
Second Lowest 20%	4,854	+268	+6%	**7,243**	**+813**	**+13%**	**7,147**	**+736**	**+11%**
Middle 20%	**5,670**	**+554**	**+11%**	**8,506**	**+1,207**	**+17%**	**8,487**	**+1,181**	**+16%**
Second Highest 20%	**6,334**	**+958**	**+18%**	**10,013**	**+2,252**	**+29%**	**9,472**	**+1,711**	**+22%**
Most Vulnerable 20%	**6,843**	**+1,054**	**+18%**	**10,537**	**+2,113**	**+25%**	**10,132**	**+1,701**	**+20%**

Note: Sums across categories may not equal the total because different models were used for each category and because the total includes cases with other or unknown values of the category variables.
Values in **bold** differ significantly at 95% confidence level from forecasts based on pre-pandemic data.
[a] Counties weighted by population and divided into quintiles of CDC Social Vulnerability Index.

Table 3. Drivers involved in fatal crashes during COVID-19 pandemic relative to forecasts based on models of monthly traffic fatalities in 2010–2019, in relation to driver characteristics and behaviors.

	May–Dec 2020			2021			2022		
	Actual	Relative to Pre-Pandemic Trend		Actual	Relative to Pre-Pandemic Trend		Actual	Relative to Pre-Pandemic Trend	
		N	%		N	%		N	%
Total Drivers	**40,145**	**+4,045**	**+11%**	**61,406**	**+10,280**	**+20%**	**60,078**	**+9,110**	**+18%**
Age (years)									
<16	**164**	**+70**	**+74%**	**199**	**+58**	**+41%**	**211**	**+70**	**+50%**
16–19	**2,425**	**+333**	**+16%**	**3,746**	**+822**	**+28%**	3,491	+551	+19%
20–24	**4,569**	**+621**	**+16%**	**6,856**	**+1,315**	**+24%**	6,520	+1,042	+19%
25–39	**12,525**	**+1,680**	**+15%**	**18,887**	**+2,759**	**+17%**	18,054	+1,346	+8%
40–54	**8,832**	**+732**	**+9%**	**13,620**	**+2,083**	**+18%**	**13,520**	**+1,988**	**+17%**
55–69	7,098	−84	−1%	**10,897**	**+348**	**+3%**	10,746	−125	−1%
70+	**3,313**	**−425**	**−11%**	5,314	−116	−2%	5,651	+58	+1%
Gender									
Male	**29,480**	**+3,365**	**+13%**	**44,359**	**+7,474**	**+20%**	**43,582**	**+6,783**	**+18%**
Female	9,535	+286	+3%	**15,260**	**+2,033**	**+15%**	14,719	+1,502	+11%
Driver License Status									
Valid	31,843	+1,426	+5%	**49,415**	**+6,320**	**+15%**	**49,014**	**+6,028**	**+14%**
Suspended/Revoked	**3,188**	**+840**	**+36%**	**4,330**	**+1,008**	**+30%**	3,814	+501	+15%
Expired	**780**	**+356**	**+84%**	**1,054**	**+428**	**+68%**	**851**	**+215**	**+34%**
Never Licensed	**2,625**	**+867**	**+49%**	**3,970**	**+1,369**	**+53%**	**3,716**	**+1,031**	**+38%**
Other/Unknown	**119**	**+52**	**+78%**	**190**	**+88**	**+86%**	**205**	**+103**	**+101%**
Police-Reported Speeding									
Speeding	**7,750**	**+1,507**	**+24%**	**11,430**	**+2,525**	**+28%**	**11,113**	**+2,211**	**+25%**
Not speeding	30,183	+1,444	+5%	**46,432**	**+4,910**	**+12%**	45,418	+3,213	+8%
Blood Alcohol Concentration[a]									
0.00 g/dL	30,189	+1,781	+6%	**45,940**	**+4,688**	**+11%**	44,636	+2,667	+6%
0.01–0.07	**1,636**	**+208**	**+15%**	**2,440**	**+439**	**+22%**	**2,471**	**+449**	**+22%**
0.08+	**8,317**	**+1,414**	**+20%**	**13,018**	**+3,188**	**+32%**	**12,964**	**+3,186**	**+33%**

Note: Sums across categories may not equal the total because different models were used for each category and because the total includes cases with other or unknown values of the category variables. Values in **bold** differ significantly at 95% confidence level from forecasts based on pre-pandemic data.

[a] Based on values multiply imputed by National Highway Traffic Safety Administration (Rubin et al., 1998) in cases where actual concentrations were unknown.