Comparing Fatal Crashes in the United States During the COVID-19 Pandemic to Forecasts Based on Pre-Existing Trends

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Previous research showed that speeding, enabled by reduced traffic congestion, increased severe crashes during the COVID-19 pandemic. Our research identifies several previously overlooked factors that also played major roles in increasing traffic fatalities.

Background

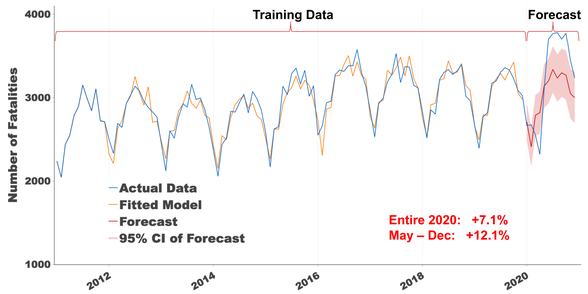
- COVID-19 pandemic decreased vehicle travel worldwide.
- Most high-income countries had fewer traffic fatalities in 2020 than in recent pre-pandemic years.[1]
- U.S. reported substantially more deaths in 2020 than in 2019 despite reduced driving.
- Previous research has focused on speeding enabled by reduced traffic volumes as the explanation.[2]
- Current study sought to examine involvement of various crash/vehicle/driver factors in fatal crashes in May – December 2020 (after "stay-at-home" orders were lifted) relative to forecasts based on pre-pandemic data.

Methods

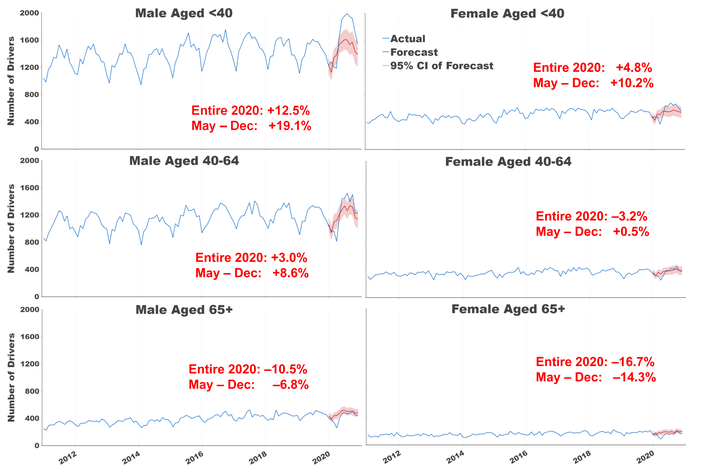
- Examined data from National Highway Traffic Safety Administration's Fatality Analysis Reporting System (FARS) database.
  - Includes all fatal crashes in U.S.
  - Detailed data on drivers, vehicles, environmental variables, etc.
  - Data from Jan. 1, 2011 – Dec. 31, 2020.
- **Seasonal Autoregressive Integrated Moving Average (SARIMA)** models of monthly counts (e.g., number of drivers in fatal crashes each month) were developed using data from 2011 – 2019.
- SARIMA models were used to forecast the numbers of fatal crashes, vehicles/drivers involved, and fatalities that would have been expected in 2020 without COVID-19 pandemic.
- **Main Outcome Measures:**
  - **Difference (Actual – Forecast)**
  - **Ratio (Actual / Forecast)**
- Used same method to "forecast" results for 2019 based on data from 2010 – 2018 as validation.

Results

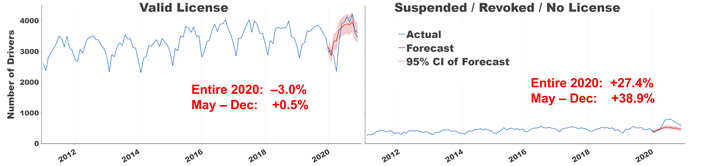
Forecasting Monthly Traffic Fatalities in 2020 Using SARIMA Model Trained on Data from 2011–2019



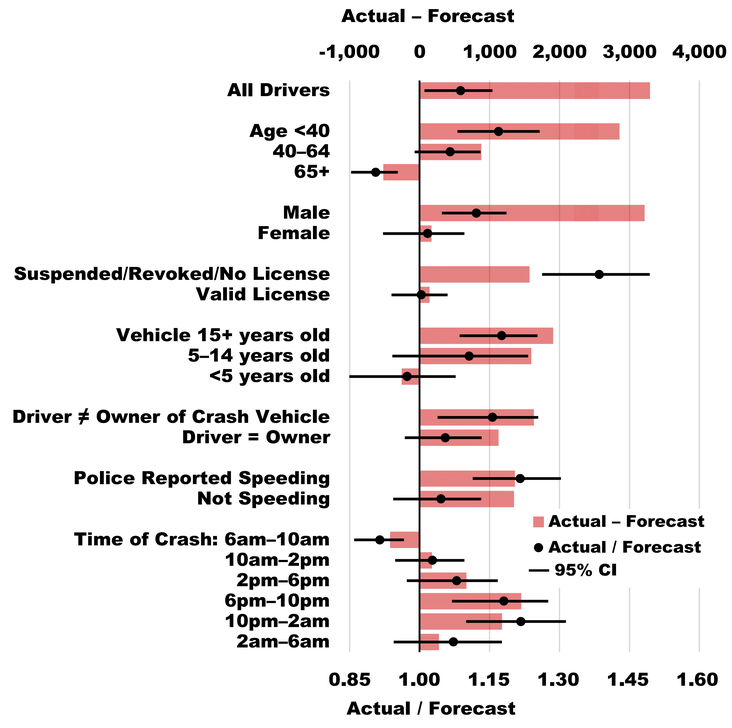
Monthly Fatal Crashes Relative to Forecast by Driver Age and Gender



Monthly Fatal Crashes Relative to Forecast by Driver License Status



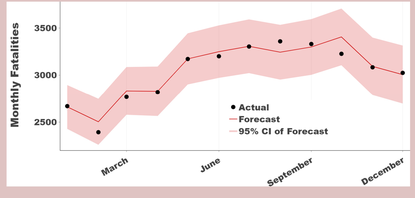
Number of Drivers Involved in Fatal Crashes Relative to Forecasts Based on SARIMA Models: United States, May–December 2020.



Model Validation: "Forecast" of Monthly Traffic Fatalities in 2019 Based on SARIMA Model of Data from 2010–2018.

Total Fatalities in 2019:

- Actual: 36,355
- Forecast: 36,607
- Difference: 252 (0.7%)



- 70 of 75 (93.3%) of subgroup forecasts in study (age, gender, time of day, etc.) did not differ significantly from actual 2019 values.

Discussion & Conclusions

- 38,824 people died in crashes on U.S. roads in 2020; 2,570 (7.1%) more than forecast.
  - January & February: similar to forecast.
  - March & April: well below forecast.
  - May – December: 3,083 (12.1%) more fatalities than forecast.
- Largest increases during late evening/night/early morning hours.
  - Suggests factors beyond pandemic-related traffic reduction enabling speeding.
- Disproportionate increases among drivers in oldest vehicles and non-owned vehicles.
  - Likely correlated with socioeconomic status,[3] reflects disparate impact of pandemic (ability to telework, stress, etc.)
- Men under 40 accounted for >70% of entire increase in driver fatal crash involvements.
  - Consistent with past AAA Foundation research on changes in driving exposure during pandemic.[4]
- Pandemic-related DMV closures may partially explain increase among unlicensed drivers, but…
  - Most unlicensed drivers in fatal crashes are older than typical new drivers.
  - Does not explain increase among drivers with suspended/revoked licenses.
- Preliminary data shows fatalities remained elevated through at least first half of 2022.[5]
  - More research needed to understand mechanisms, identify countermeasures.

References

1. International Transport Forum. (2021). *Road Safety Annual Report 2021: The Impact of Covid-19*. OECD Publishing, Paris.
2. Hughes J. E., Kaffine D., & Kaffine L. (2022). Decline in congestion increased crash severity in the wake of COVID-19. *Transportation Research Record.*
3. Metzger, K. B., Sartin, et al. (2020). Vehicle safety characteristics in vulnerable driver populations. *Traffic Injury Prevention.*
4. Tefft, B. C., Villavicencio, L., et al. (2022). *Self-Reported Risky Driving in Relation to Changes in Amount of Driving During the COVID-19 Pandemic* (Research Brief). AAA Foundation for Traffic Safety, Washington, DC.
5. National Center for Statistics and Analysis. (2022). *Early estimate of motor vehicle traffic fatalities for the first half (January-June) of 2022*. National Highway Traffic Safety Administration.