

# Relationship of Weather-Related Car Crashes with Casualties, Time, Crash Density, & Storm Type

## **Exit 1: Background/Introduction**

The relationship between weather and traffic accidents is fairly well researched. Some researchers look specifically at US Highways (Pisano et al). Others look not just at precipitation, but temperature as well (Andreescu and Frost, 1998). One article even discussed road conditions (Goodwin, 2002) and another article discussed pedestrian accidents and fatalities (Yannis and Karlaftis). This research will include all of this, except for road conditions, pedestrian variables, and temperature. However, this research will look at where the hotspots of these weather-related accidents occur and look at what year, month, and hour these accidents occur to give a future basis on traffic mitigation. This research also looks at the type(s) of storm system(s) (like mid-latitude cyclones or singular celled thunderstorms) that causes the most accidents based on the day with the highest number of rain-related car crashes and snow-related car crashes.

### **Exit 2: Data and Methodology**

- Franklin County is a county in the center of Ohio, a state in the NE quadrant of the United States.
- Franklin County has a population of 1.32 million people, which is about 11% of Ohio's total population and where Ohio's capital, Columbus, is located (as shown in Figures 1 and 2).
- This study covers 5 years of car crash data from The Columbus Police Department for this county from Jan 1<sup>st</sup>, 2018, through December 31<sup>st</sup>, 2022.
- This data was obtained through the Ohio Traffic Data Crash Statistics website, where people can pick the county and the source of the data. In this case, Franklin County and the Columbus Police Department were chosen respectively.
- Using Excel, this data was cleaned and formatted to better translate the dataset into charts, graphs, and ArcMaps.
- The weather conditions were defined as "rain", "snow", and "other conditions", which encompasses "blowing sand; soil; dirt; snow", "fog; smog; smoke", "freezing rain or freezing drizzle", "severe crosswinds", and "sleet; hail".
- The datasets were plotted onto ArcMaps where all the data files had to be coordinated. Features like the county and road boundaries and the Light Gray Canvas Map were clipped to fit the county boundary.
- Kernel Density was added to ArcMaps to signal where the highest concentrations of weather-related car crashes occur. This was used to compare rain and snow-related car crashes to each other.



Elijah J. Paciorek<sup>1</sup>, Ewan T. Newbold<sup>2</sup>, Ricardo Nogueira<sup>3</sup> **Collaborative REU Site: Northeast Partnership for Atmospheric and Related Sciences** 1-Ohio University, 2-St. Cloud State University, 3-Plymouth State University









- 30.54%) or fatally injured (0.38% > 0.14%) than snow-related car crashes.
- The weather-related car crashes decreased from 2018 (~3,700 crashes) to 2022 (~1,900 crashes).
- Two notable peaks in the hourly frequency of weather-related car crashes, 6-8 am EST/EDT and from 3-7 pm EST/EDT, the latter of which having the highest frequency.
- Mid-latitude cyclones are the type of storm system present for the highest daily number of both rain-related car crashes and snow-related car crashes.
- CrashAnalysis2001.pdf "U.S. Highway Crashes In Adverse Road Weather Conditions" by Paul A. Pisano, Lynette C. Goodwin, and Michael A. Rossetti: <u>133554.pdf</u> "Weather and traffic accidents in Montreal, Canada" by Mircea-Paul Andreescu and David B. Frost (1998): <u>c009p225.pdf</u>

Weather Effects on Daily Traffic Accidents and Fatalities: A Time Series Count Data

https://www.wpc.ncep.noaa.gov/archives/web\_pages/sfc/sfc\_archive\_maps.php?arcdate=01/

https://www.academia.edu/554568/Weather\_Effects\_on\_Daily\_Traffic\_Accidents\_and\_Fataliti

'Analysis of Weather-Related Crashes on U.S. Highways" by Lynette C. Goodwin (2002)

Surface Analysis Map 1/12/2019 at 21Z:

es\_Time\_Series\_Count\_Data\_Approach

2/2019&selmap=2019011221&maptype=all

Approach" by George Yannis and Matthew G. Karlaftis: