Examining the relationship between Extreme Heat and Workplace Accidents in the Northeast US

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I. Introduction

With extreme heat occurrences on the rise, understanding the impacts of extreme heat is critical. Very little research has been conducted on workplace accidents, let alone with relation to extreme heat. **This study completes a regional analysis of the relationship between extreme heat, specifically the Heat Index, and workplace accidents in the Northeast United States.**

II. Data + Methods

- Data was collected from the Occupational Safety and Health Administration (OSHA) from Jan 2015 to Oct 2023. Data include information on day of accident(s), location of accident (Lat/Lon), and brief description of type of injury.
- Major metropolitan areas in the Northeast were identified with associated weather stations. All workplace accidents that occurred in the summer months (June, July, August) and were within a 25 US Survey Mile radius of each weather station were included in this study and assigned to their respective Injury Zones. There were 12 Injury Zones in total **(Fig. 1)**.
- Hourly weather variables came from the ISD (Integrated Surface Database) and the LCD (Local Climatological Dataset); both obtained from the NCEI. These data were cross-referenced with the OSHA data.
- The Heat Index was calculated using the NWS algorithm; equation and corrections found in Rothfusz (1990).
- Accident data was categorized by month and by year, and the normalized by the approximate population of each Injury Zone using US Census Zip Code data. Zip Codes included in the normalization had their geographical centers within the Injury Zones.

Fig. 1 Accident Locations with Injury Zones (JJA 2015-2023)

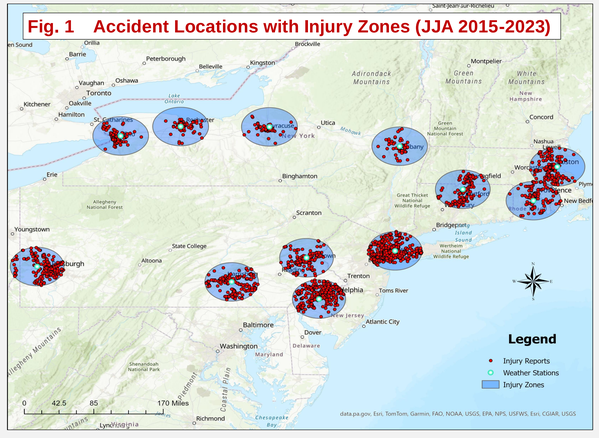
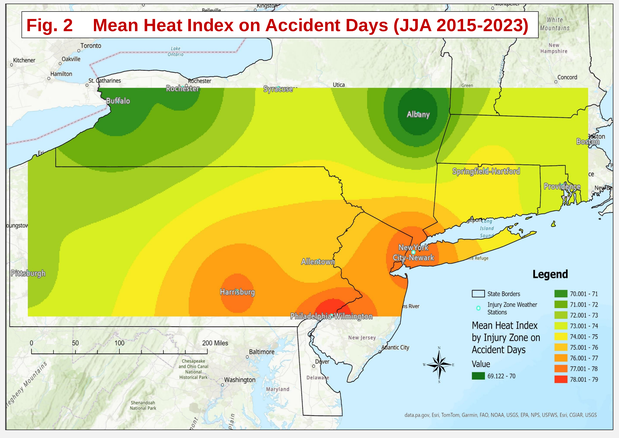


Fig. 2 Mean Heat Index on Accident Days (JJA 2015-2023)



III. Injury Zone Statistics

- New York City-Newark had both the greatest number of accidents (599) during the nine summers and the greatest population (14,661,040) of any Injury Zone.
- Syracuse had both the fewest accidents (59) during the nine summers and the smallest population (601,837).
- Philadelphia-Wilmington had the warmest mean heat index on accident days (78.7 °F) **(Fig. 2)**
- Albany had the coolest heat index on accident days (69.1 °F) **(Fig. 2)**
- Harrisburg had the largest population adjusted accident rate (21.3 accidents / 100k people)
- New York City-Newark had the smallest population adjusted accident rate (4.1 accidents / 100k people)

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References & Acknowledgements:

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Rothfusz, et al. (1990). The heat index equation. *Fort Worth, Texas: NOAA/NWS, Office of Meteorology*, *9023*, 640.

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IV. Case Study: Philadelphia-Wilmington Weather on Accident / Preceding Days

Fig. 3

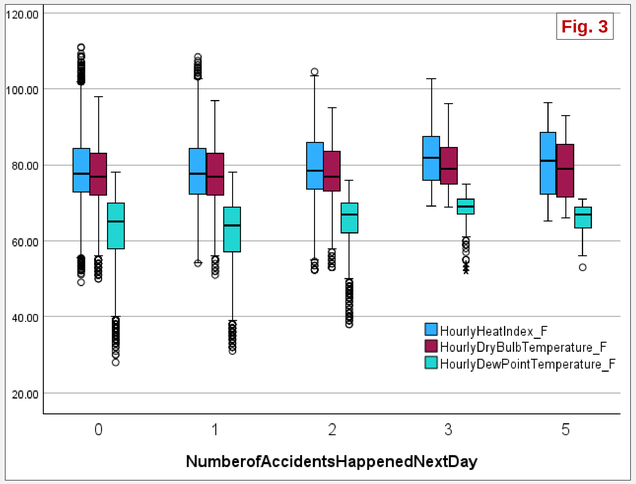
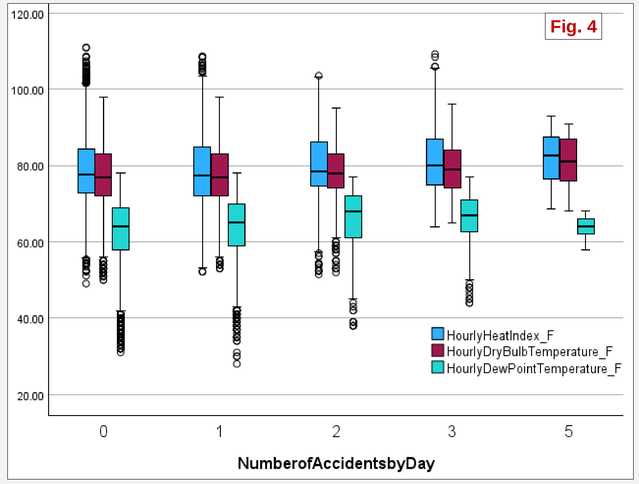


Fig. 4



Preceding Days (Fig. 3)

- Number of accidents increased as the preceding-day heat index increased
- Number of accidents increased as both the preceding-day air temperature and dewpoint temperature increased

Accident Days (Fig. 4)

- Number of accidents increased as heat index on day of accidents increased
- Number of accidents increased as both the air temperature and dewpoint temperature on the day of accidents increased

V. Regional Regression Analysis for all Injury Zones

- **Regardless of the timeframe (Month, Year, Total), as the mean Heat Index on accident days increases, the number of accidents increases.**
- Heat Index increase of 11.1 °F would result in an increase of one accident each month per 100k people **(Fig. 5)**.
- Heat Index increase of 25 °F would result in an increase of one accident each Summer per 100k people **(Fig. 6)**.
- Heat Index increase of 1.9 °F would result in an increase of one accident for the nine-year timeframe per 100k people **(Fig. 7)**.
- Annual number of accidents had the most significant relationship (p = 0.06)

Fig. 5: Monthly Number of Accidents

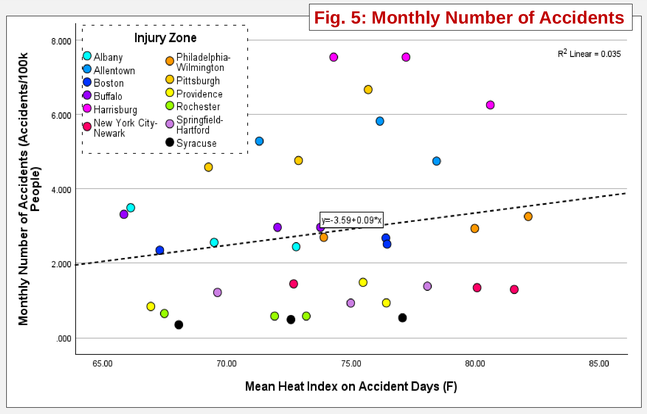


Fig. 6: Annual Number of Accidents

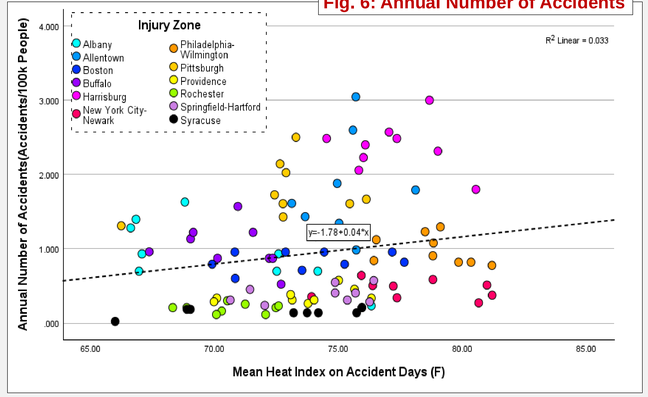


Fig. 7: Total Number of Accidents

