The Effects of Natural Disasters on Human Health as a Product of Climate Change

By Ariel Tzamarot

Abstract

- Climate change is one of the largest threats to human and public health
- Natural disasters, or extreme weather events are now more frequent, intense, and wide spread
- The number of extreme weather events and the numbers of associated deaths, injuries, and the total number of people affected increased from 1980-2000 and 2001-2020
- Findings provide support for the claim that climate change has an increasing impact on human health
- It is crucial that we continue to study the associated human health effects while also adapting to our changing climate
- Becoming solely reliant on renewable energy sources and adopting more environmentally-friendly behaviors will be most beneficial for the future health of ourselves and our planet

Objectives

- This study compares the counts of associated health effects with natural disasters in North America between the time periods of 1981-2000 and 2001-2020 using the EM-DAT dataset
- Objective is to determine whether the difference in these counts is significant

Methods

- Emergency Events Database (EM-DAT)
  - Contains information on over 22,000 mass disasters that have occurred since 1900
- Data on all meteorological, hydrological, climatological, and biological disasters from 1980-2000 and 2001-2020 downloaded
  - Exposure: Time period
  - Outcomes: Natural Disaster Events
- Analysis on SPSS and Excel
  - Descriptive statistics
  - Mortality, injury, and affected rates, cause-specific Mortality rate
    - Total population at midpoint year of each time period
  - Comparison test for Poisson counts

Images

Left: Destruction left by Hurricane Dorian in the Bahamas in September 2019. It was the strongest hurricane to ever hit this region since record keeping began.
Right: Bodies of the 2004 Indian Ocean tsunami victims in 2005 at Ban Muang Temple.

Table 1

Natural Disaster-Associated Counts for the Time Periods of 1981-2000 and 2001-2020. All counts increased from first to second time period.

	Total Deaths	Total Injured	Total Affected
1981-2000	6,187	5,566	6,077,652
2001-2021	7,602	10,481	109,569,570

Table 3

Counts of Cause-Specific Deaths for the Time Periods of 1981-2000 and 2001-2020. All increased from first to second time period with the exception of extreme temperature.

	Epidemic Deaths	Extreme Temperature Deaths	Flood Deaths	Storm Deaths	Wildfire Deaths
1981-2000	138	1,591	522	3,873	60
2001-2021	260	617	593	5,726	290

Table 6

Table 6: Comparison Test for Poisson Counts for Natural-Disaster Related Deaths Comparing the Time Periods of 1981-2000 and 2001-2020. There is a statistically significant difference for each count.

	Z-Score	P-Value
Total Deaths	12.05	p<0.0001
Epidemic Deaths	6.12	p<0.0001
Extreme Temperature Deaths	20.73	p<0.0001
Flood Deaths	2.13	0.02
Storm Deaths	18.91	p<0.0001
Wildfire Deaths	12.29	p<0.0001

Table 7

Table 7: Comparison Test for Poisson Counts for Natural-Disaster Related Injuries Comparing the Time Periods of 1981-2000 and 2001-2020. There is a statistically significant difference for each count.

	Z-Score	P-Value
Total Injuries	38.80	p<0.0001
Epidemic Injuries	N/A	N/A
Flood Injuries	13.45	p<0.0001
Storm Injuries	32.72	p<0.0001
Wildfire Injuries	13.00	p<0.0001

Results

- Between 1981-2000 and 2001-2020, the total number of deaths, injuries, and the total amount of people affected by natural disasters in North America increased.
- Comparisons of the counts of total deaths, total injuries, and cause-specific deaths and injuries showed a statistically significant difference for every count, demonstrating that there has been a statistically significant increase in all natural disaster-related deaths and injuries, regardless of the type of natural disaster, over time
- All together, these results suggest that the impact of natural disasters, and thus climate change, has worsened during our lifetimes

Discussion/Conclusion

- Between 1980-2000 and 2001-2020, the total number of deaths, injuries, and the total amount of people affected by natural disasters in North America increased
- Natural disasters can cause epidemics by exacerbating the risk factors of communicable disease outbreaks by displacing populations
  - Overcrowding affects water quality and sanitation
- Climate change change plays a role in the emergence and spread infectious diseases by increasing temperatures in climates that would otherwise not be suitable for vectors like mosquitoes
- Cannot draw comparisons between epidemics between two time periods due to the heterogeneity of each event due to the differing nature of events and the differing nature of the associated vectors
- Due to the increasing and more widespread effects of climate change, places like NYC must start to incorporate resilient infrastructure not only because of high density living, but also because we must adapt to these changes since it is impossible that the impacts of climate change will be solved any time soon
- **Future Research:**
  - Could help us predict occurrence and likely impacts of extreme weather events
  - Provide direction on how to best prepare for disasters
  - Multivariable adjusted models
    - Detailed adjustment for total population, location, time of year, and other factors that could have exacerbated negative outcomes
- Climate change is the single greatest threat to international human and public health
  - Must continue to study and adapt to its impacts and engage in more environmentally behaviors to mitigate the effects of climate change on humans and all other living species around the world

Faculty Advisor

Dr. Megan Hall ScD, MS

Acknowledgement

SUNY Downstate Health Sciences University
School Of Public Health
Department of Epidemiology and Biostatistics