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PPOL 5203
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October 31, 2023

PPOL 5203 Final Project Proposal

Introduction/Problem

Climate change has escalated greatly in recent years and the effects that it has on different areas of the world and specifically the United States varies drastically. In Florida, hurricanes are rampant, but in California wildfires have become abundant. Additionally, some communities are better equipped than others to handle natural disasters and climate change either because of infrastructure or social structures in place. In 2020, the Federal Emergency Management Agency (FEMA) published the National Risk Index (NRI) that identified every US county and census tract's risk to many different types of natural disasters. In this index, FEMA calculated a community's risk to natural disasters based on the community's expected annual economic loss, the community's susceptibility to the adverse effects of natural disasters (social vulnerability), and the community's ability to prepare for disasters (community resilience) ([FEMA](#)).

These upticks in climate change have led to an examination in how individual's health is adversely impacted by living in an area with more likelihood for dramatic natural disasters and whether their community's vulnerability/resilience to these climate risks can exacerbate/mitigate the impact. However, few studies have applied FEMA's National Risk Index in the public health context. For our final project, we will be investigating the relationship between a community's climate risk as defined by the FEMA National Index and its population health outcomes. Furthermore, we will investigate how characteristics of specific community types (such as rural and urban counties) might reveal the extent to which well-being and health is impacted by the communities' ability to handle climate change and natural disasters.

Research Questions

- How does a county's climate risk affect its population's health?
 - Is there a health outcome that is significantly impacted by increased climate risk?
- Are people's health outcomes affected by how their community has been able to handle climate risk?
- Which part of a county's climate risk score – its expected loss, its social vulnerability, or community resilience – most impacts community health outcomes?
 - Does a county's social vulnerability exacerbate impact on community health outcomes?
 - Is community resilience a mitigating factor for community health outcomes?
- How does the impact of climate risk vary by urbanicity?
 - Is the well-being of rural communities more heavily impacted by the communities' ability to bounce back from natural disasters and/or climate change effects?

Data Sources

We will combine the FEMA National Risk Index (NRI) with several other county-level data sets to evaluate and compare the effects of climate change on communities' health in the US. The NRI quantifies the risks of natural disasters and hazards in the US: the higher the county's score, the higher their risk for climate hazards.

We will combine the NRI with the [County Health Rankings National Data](#) from the University of Wisconsin Population Health Institute. This data examines dozens of public health measures at the county level for all US counties. Using the County Health Rankings data improves our ability to compare the effects of climate change on urban and rural areas. To further evaluate public health in urban and rural areas, we will use two other datasets that measure public health indicators. We will use the [City Health Dashboard](#) published by New York University's Langone Health Medical Center. The data includes over 40 variables that measure public health across nearly 1000 cities in the US are included in the dataset. Additionally, we will use a data set from the [Rural Data Explorer](#) published by the Department of Health and Human Services to further measure public health in rural areas. This dataset examines similar measures of public health indicators as the City Health source, but only observes rural areas in the US, which is defined as areas with less than 50,000 people.

Combining these datasets with the FEMA NRI will provide an effective base for examining the effects of climate change on different areas of the US. All of the datasets are publicly available, having been posted by academic, government, and non-profit organizations.

Methods

We plan to merge the datasets by county. Because the urban/rural categorical variables do not exist in all datasets, we are going to create variables to label urban and rural areas. We will define these variables based on how the Census Bureau defines these areas in the other datasets. After we have merged the datasets, we will clean the data so that the final dataset used in our analysis includes only the variables pertinent to our research questions. As part of this process, we will have to decide the specific variables that we want to include in our analysis. We anticipate that we will have a clearer idea of these variables once we consult literature on climate change and public health outcomes.

For visualizing our data, we want to use GIS mapping to visualize our findings; we believe this to be appropriate given the geographical component of our research questions. We may also use charts, scatterplots, or regression models to display relationships between two or more specific variables.

Successful Project Outcomes

For our final project, a successful project would be that we are able to discern and visualize the nuances in the impact of climate risk on an individual's health. As previously mentioned, while public health agencies have studied the relationship between climate risk and individual health, there has been minimal research connecting the FEMA NRI to community health outcomes. We suspect that rural areas are impacted differently than urban or suburban areas, but we would find it a success to be able to back up that claim with evidence in the data. A surprising finding would be that there is a minimal relationship between climate risk, urbanicity, and health outcomes.

Another success in the project would be that we are able to highlight a particular facet of the relationship and learn whether one of the aspects of a community's climate risk – its social vulnerability to disasters, its expected annual loss, or its resilience to disasters – drives the effect on health outcomes.