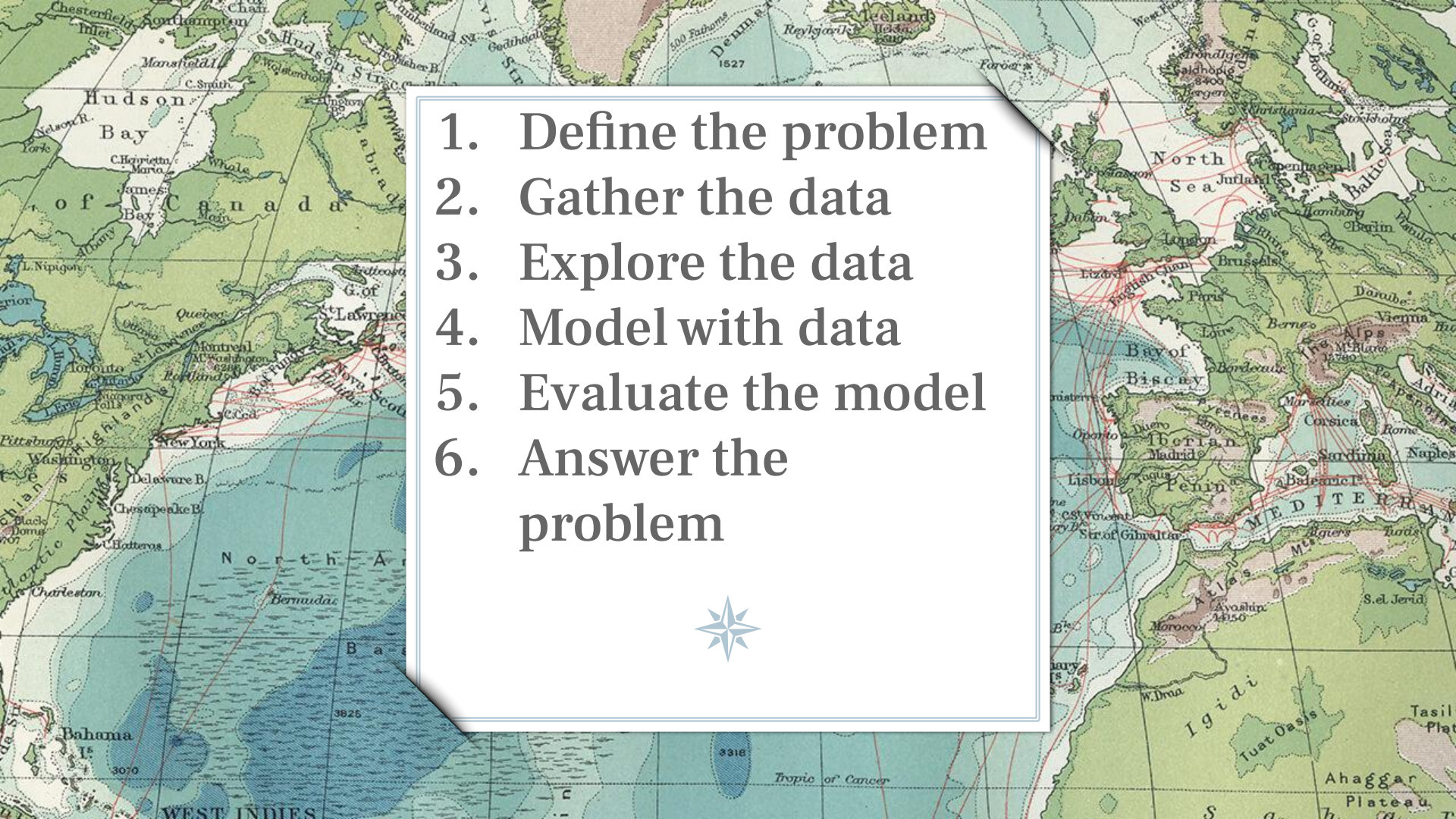


Risk Assessment Model

by: Micah Luedtke,
Mia Martin, &
Kurt Wemhoener



- 
- A background map showing North America and Europe. Red lines connect various cities, suggesting travel routes. In North America, routes connect New York to London, London to Paris, Paris to Rome, and Rome to Athens. In Europe, routes connect London to Paris, Paris to Rome, Rome to Athens, and Athens to Jerusalem. Other cities shown include New York, Washington, Boston, Montreal, Quebec, Toronto, and various European cities like London, Paris, Rome, Athens, Jerusalem, and Cairo. The map also shows the Atlantic Ocean, the North Atlantic, and the Mediterranean Sea.
1. Define the problem
 2. Gather the data
 3. Explore the data
 4. Model with data
 5. Evaluate the model
 6. Answer the problem



PROBLEM STATEMENT



- **Where should FEMA first deploy resources in a disaster?**
- **Specifically, which Massachusetts census tracts should they focus on?**

APPROACH TO THE PROBLEM



- Build a risk assessment model
$$\text{Risk} = \text{Vulnerability} - \text{Resources}$$
- Visualize risk on census tract map of MA

GATHER THE DATA

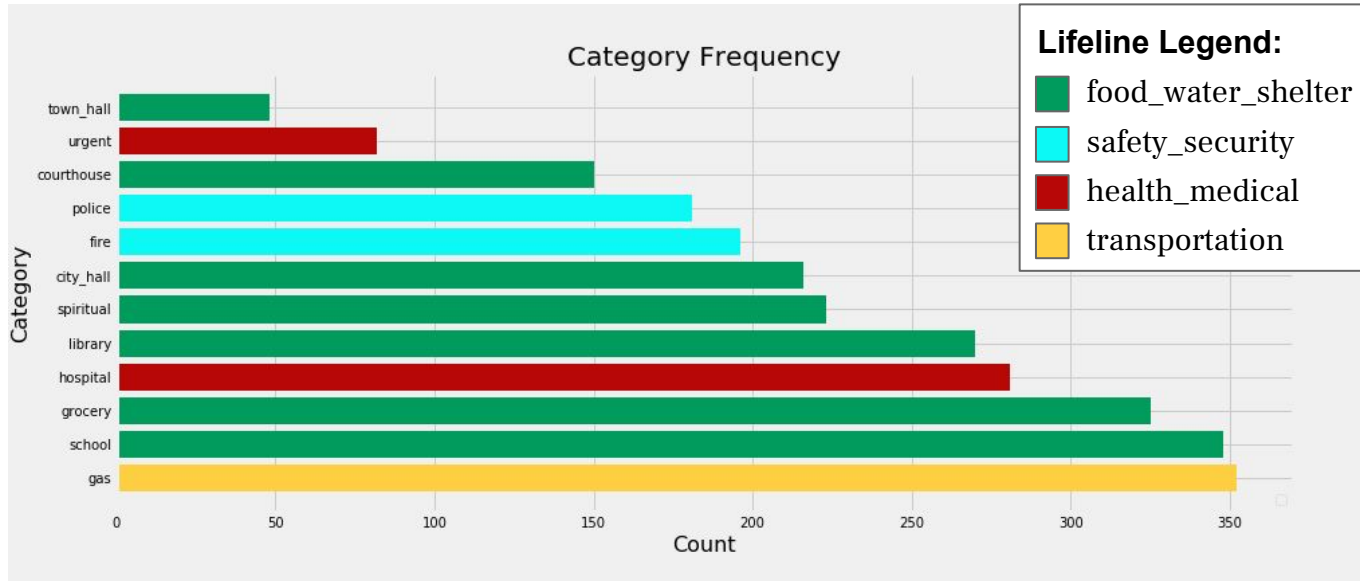


- **Vulnerability:** CDC social vulnerability data
- **Resources:** social media webscraping
 - Initially Yelp API
 - Changed to Foursquare API

EXPLORE THE DATA

Overall Vulnerability	Socioeconomic Status	Below Poverty
		Unemployed
		Income
		No High School Diploma
	Household Composition & Disability	Aged 65 or Older
		Aged 17 or Younger
		Civilian with a Disability
		Single-Parent Households
	Minority Status & Language	Minority
		Speak English "Less than Well"
	Housing & Transportation	Multi-Unit Structures
		Mobile Homes
		Crowding
		No Vehicle
		Group Quarters

EXPLORE THE DATA



EXPLORE THE DATA



Challenges:

- Foursquare limitations
- Combining lifeline and vulnerability dataframes in Geopandas

EVALUATE THE MODEL



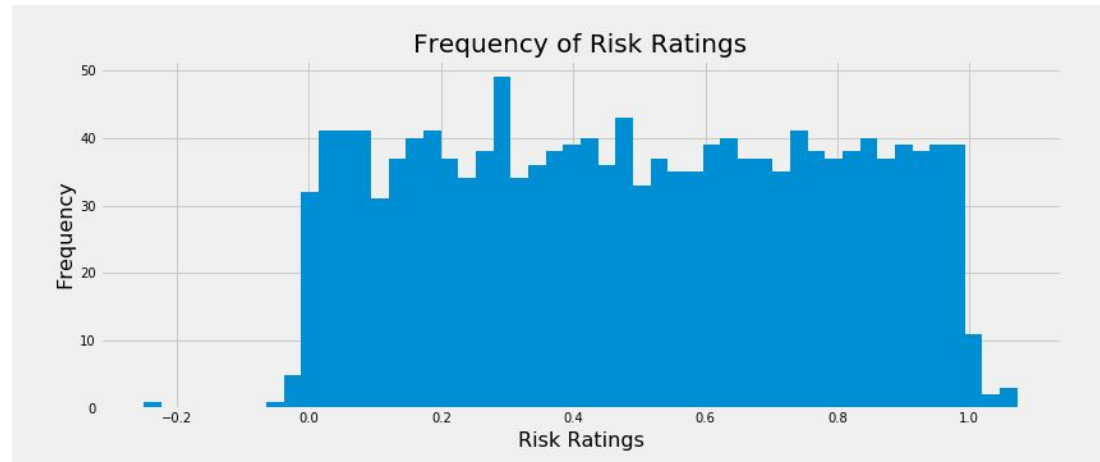
➤ Assessing the riskiest census tracts

Risk Rank	County	Total Risk	=	Social Vuln.	-	Safety & Security	-	Food, Water & Shelter	-	Health & Medical	-	Trans.	+	Hazardous Waste
1	Hampden	1.072		0.839		0.016		0.000		0.000		0.000		0.250
2	Middlesex	1.060		0.810		0.000		0.000		0.000		0.000		0.250
3	Hampden	1.056		0.813		0.000		0.002		0.000		0.003		0.250
4	Norfolk	1.027		0.779		0.001		0.000		0.000		0.000		0.250
5	Berkshire	1.023		0.774		0.000		0.000		0.000		0.000		0.250

ANSWER THE PROBLEM



➤ Distribution of risk ratings



FUTURE RESEARCH



- Higher weighting to resource metrics
- Expanding lifeline data and measuring categories impact on risk
- Building distance-based rather than census tract-based model

RESOURCES

- <https://svi.cdc.gov/A%20Social%20Vulnerability%20Index%20for%20Disaster%20Management.pdf>
- <https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2018&layergroup=Census+Tracts>
- <https://svi.cdc.gov/data-and-tools-download.html>
- <https://developer.foursquare.com/>
- <https://www.mass.gov/guides/hazardous-waste-facilities-recyclers>
- <https://hifld-geoplatform.opendata.arcgis.com/datasets/electric-power-transmission-lines/data?geometry=-73.3%2C41.958%2C-69.626%2C42.669&page=7>