# FEMA data for Improving Disaster Resilience project

August 30, 2023 Rhonda Fischer (rkfische@iu.edu)

# CODE AND DATA WORKFLOW: Initial findings in Oct 2022

#### R Notebook:

#### censusFEMA distributions v4.rmd

Goal: answer whether disasters are increasing faster than a county's ability to respond

Data Input: Census API feed

Population (B01001\_001) by county Median income (B19013\_001) by county

Data Input: Consumer price index

Consumer price index file downloaded from:

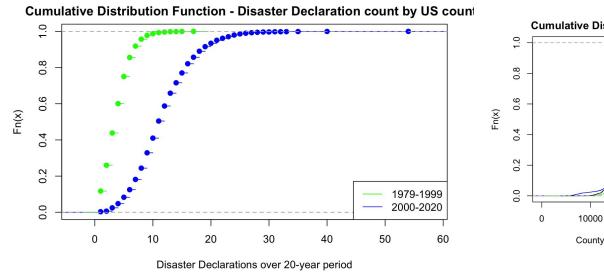
https://www.bls.gov/cpi/data.htm

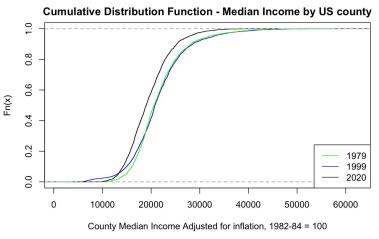
Data Input: FEMA Disaster Declarations https://www.fema.gov/api/open/v2/DisasterDec larationsSummaries?"

### Data Output

Comparing disaster declaration and normalized median income from 1979 - 2000 versus 2001 -2021. Median income within a county has been relatively stable with a statistical difference in higher disaster declaration counts by county across those two decades.

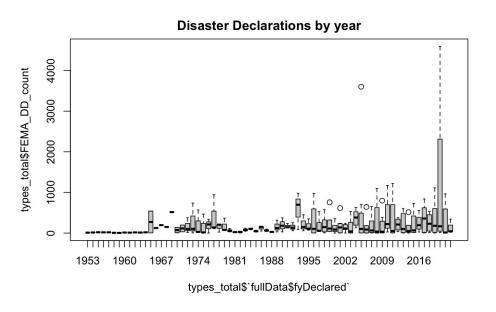
# More disaster declarations not more income\* per county Comparing two decades: before and after 2000

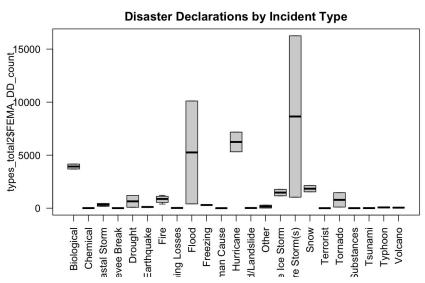




<sup>\*</sup>inflation adjusted median income per county

# Example output





## CODE AND DATA WORKFLOW: Applies clusters to quantify expected disaster \$ costs

Notebook: CountyCluster

Goal is predicting weather related damage costs by county

Data Input: FEMA assistance details

PublicAssistanceFundedProjectsDetails.csv

HousingAssistanceOwners.csv

HousingAssistanceRenters.csv

Data Input:: Census resilience metrics

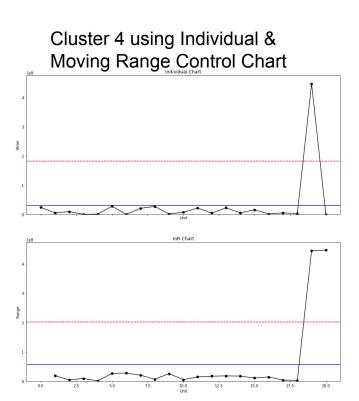
Cre2.csv

Data Input: NOAA events consolidated and counted for clustering like counties NOAA\_Clusters\_All\_Counties.csv'

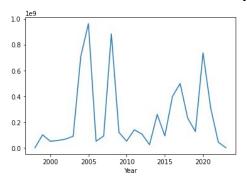
Data Output

Control charts for each cluster of counties showing 1998 - 2023 to-date annual Disaster Declaration Project \$, with control limits marking expected value range and frequency of outliers.

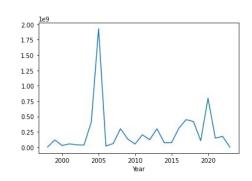
# Using clusters to estimate annual county level disaster costs



Cluster 10: includes Bartholomew County, IN



Cluster 5: includes Monroe County, IN



# CODE AND DATA WORKFLOW: Using cluster averages to examine outliers

Notebook: **CountyWeatherCostPrediction**Goal is predicting weather related damage costs by county

Data Input: FEMA assistance details PublicAssistanceFundedProjectsDetails.csv HousingAssistanceOwners.csv HousingAssistanceRenters.csv

Data Input:: Census resilience metrics Cre2.csv

Data Input: NOAA events consolidated and counted for clustering like counties NOAA\_Clusters\_All\_Counties.csv'

### **Data Output**

Comparing \$ ratios within sets of counties with similar weather patterns and demographics

List of counties with **higher** FEMA \$ per weather event than normal for their cluster (cluster contains counties with like number of weather events and demographics)

List of counties with **lower** FEMA \$ per weather event for their cluster

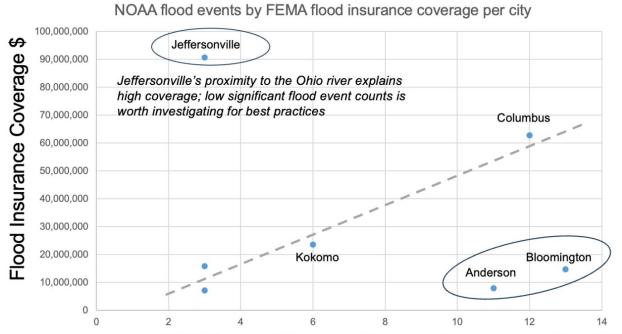
# Example counties with FEMA \$ higher than their cluster average

```
{ 'ANDROSCOGGIN, MAINE',
'ARLINGTON, VIRGINIA',
'BREMER, IOWA',
'BURLEIGH, NORTH DAKOTA',
'CASS, NEBRASKA',
'CATTARAUGUS, NEW YORK',
'CHENANGO, NEW YORK',
'CHITTENDEN, VERMONT',
'DELAWARE, NEW YORK',
'DICKINSON, KANSAS',
'DODGE, NEBRASKA',
'DOUGLAS, NEBRASKA',
'FRANKLIN, ALABAMA',
'GUILFORD, NORTH CAROLINA',
'HAMILTON, TENNESSEE',
'HENNEPIN, MINNESOTA',
'JOHNSON, IOWA',
'JOHNSON, KENTUCKY',
'KENNEBEC, MAINE',
'LEHIGH, PENNSYLVANIA',
'LUZERNE, PENNSYLVANIA',
'MADISON, ILLINOIS',
'MILWAUKEE, WISCONSIN',
'MONROE, NEW YORK',
'MONTGOMERY, OHIO',
 'MORRIS, NEW JERSEY',
'NICHOLAS, WEST VIRGINIA',
'ONONDAGA, NEW YORK',
'ORANGE, NEW YORK',
'OTSEGO, NEW YORK',
'PLATTE, NEBRASKA',
'POTTAWATTAMIE, IOWA',
```

# CODE AND DATA WORKFLOW: Using clusters to find vulnerabilities

Notebook: floodAnalysis Goal: answer how well insured are counties that are susceptible to flooding Data Output Scatter plots showing count of flood Data Input: FEMA Flood Insurance Program events with > \$25,000 property nfip.csv damage and flood insurance coverage by county clusters Data Input:: Census resilience metrics Cre2.csv Data Input: NOAA events consolidated and counted for clustering like counties NOAA Clusters All Counties.csv'

# What's expected flood coverage for a city?

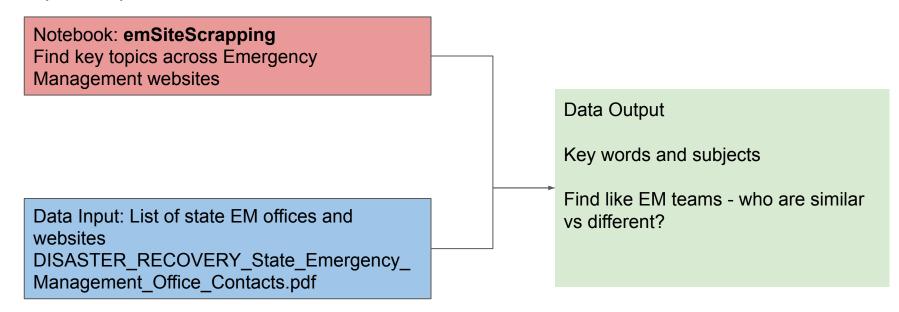


	Flood and	Flood	Insurance
Primary_City	<b>Related Events</b>	cover	age
Bloomington	1	3	14,763,000
Columbus	1	2	62,808,000
Anderson	1	1	7,941,000
Kokomo	10	6	23,507,000
Jeffersonville		3	90,717,000
Warsaw		3	15,768,000
Greenfield		3	7.149.000

Bloomington and Anderson have similar significant flood event counts as Columbus with lower flood insurance coverage

Number of NOAA Flood Events with property damage > \$25,000

CODE AND DATA WORKFLOW: How do county EM websites and communication tools compare to peers?



# **Emergency Management website topics**

- Tools (webeoc) & procedures
- Streaming information on emerging events
- Sign up for updates
- Safety courses & information links
- Operations management planning
- Legal navigation & justice issues

- Funding opportunities
- Feedback
- Exercises
- Disaster declarations
- Customer and end user focus areas
- Crime prevention

Al generated topics with words (using NMF)

Tools (webeoc) & procedures	id	technical	procedures	committee	materials	section	communities	webeoc	threat	tribal
Streaming information on emerging events	tools	severe	emergencies	follow	tornadoes	stream	drought	endstream	obj	endobj
Sign up for updates	address	used	number	sign	statement	updates	message	preferences	photos	instagram
Safety courses & information links	safe	hurricane	force	links	severe	courses	storm	line	task	power
Operations management planning	management	report	mitigation	national	recovery	response	planning	local	federal	operations
Legal navigation	court	united	courts	systems	authority	bureau	staff	administrative	labor	navigation
Justice issues	main	renew	justice	read	number	contacts	systems	issues	informed	alert
Funding opportunities	small	manage	counties	week	areas	watch	wildfire	eligible	sba	secure
Feedback	mobile	phone	green	date	transportation	regulations	foia	feedback	youth	text
Exercises	mobile	арр	cookies	blog	relations	customer	life	case	exercises	join
Disaster declarations	june	declaration	major	september	october	cases	march	december	november	february
Customer and end user focus areas	employees	quality	disabilities	veterans	environmental	energy	professional	care	housing	families
Crime prevention	highway	questions	mission	annual	dps	criminal	conference	prevention	history	crime

#### CODE AND DATA WORKFLOW:

Notebook: EM\_certs\_analysis Goal: determine if counties with professionally certified EMs receive more resources **Data Output** Data Input: Certifications AEM & CEM per Scatter plots showing CEM per capita person and location vs FEMA obligated \$ per capita CEM.pdf Data Input:: State population state\_pop.csv Data Input: FEMA public assistance \$ PublicAssistanceFundedProjectsDetails.csv