An Analysis of Unemployment vs Crime

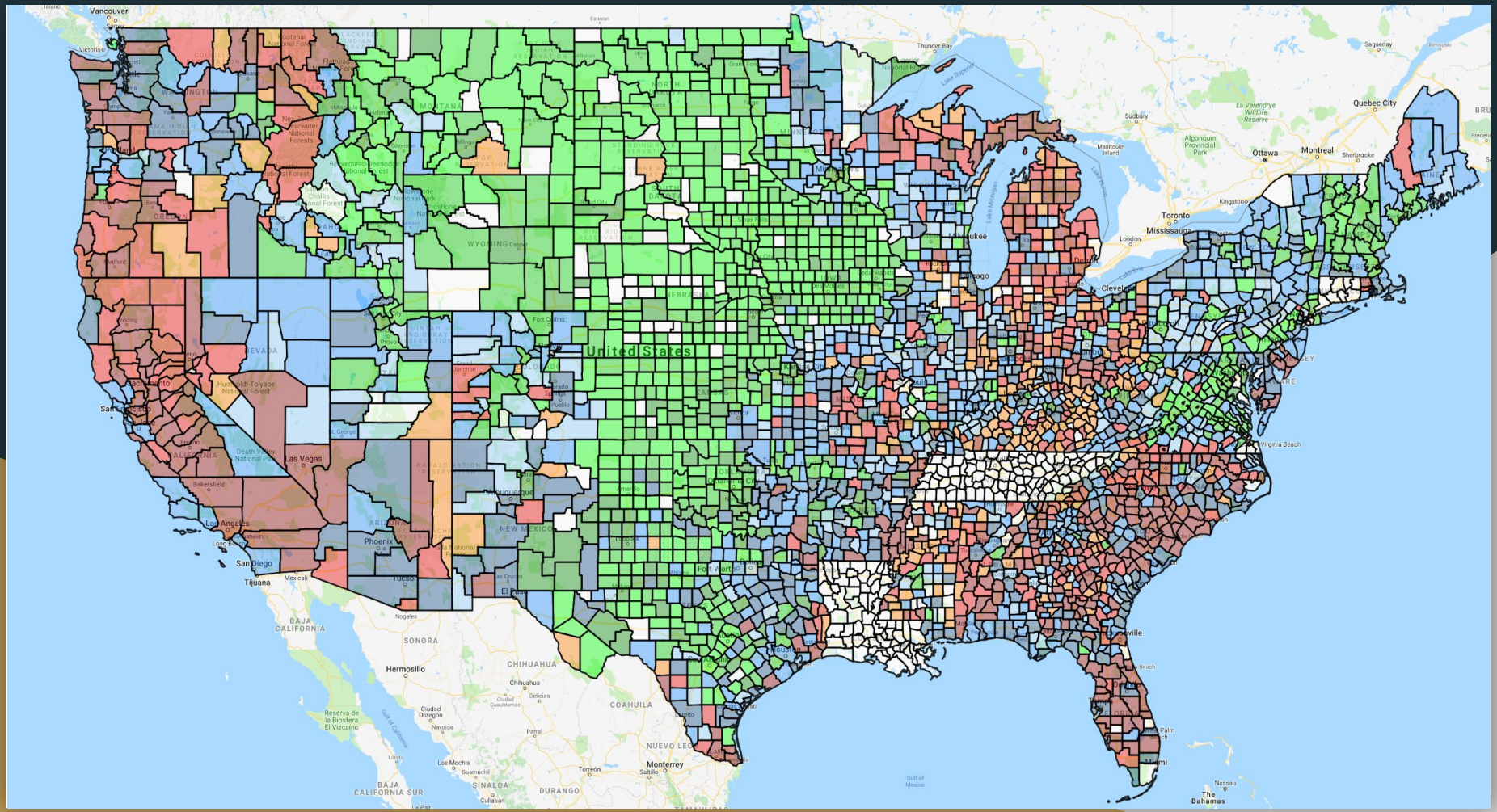
By Dan Laury, Nick Sneed, and Alex Holloway

Motivation & Summary

- In general, America's attitude towards the direction of the country tends to follow the success of the economy. With that in mind we wanted to look at the question of is there a correlation in unemployment rate vs crime rate for a given county?
- Overall, is there a strong correlation between crime rate and unemployment nationwide?
- Does a correlation exist if you look at counties of a certain size?
- Do you see a change in crime rate based on the unemployment rate of the previous year?
- Do you see a short term change in workforce size related to crime rates?
- We did not find a strong correlation between Unemployment Rates vs Crime Rates, based on any of the groupings we analyzed. Data showed that while there is a correlation between Crime Rate and Unemployment rate, a change in unemployment rate is insufficient to explain a change in crime rate for the groupings of data analyzed.
- Due to this, we began to analyze the highest and lowest crime rates to see if they were statistically different from the areas around them. This showed that in an area of 50 miles the area with the highest unemployment had a statically higher crime rate than expected and vice versa.
- This would show, that when taking into account the surrounding area unemployment becomes a better predictor of crime rate.

Questions & Data

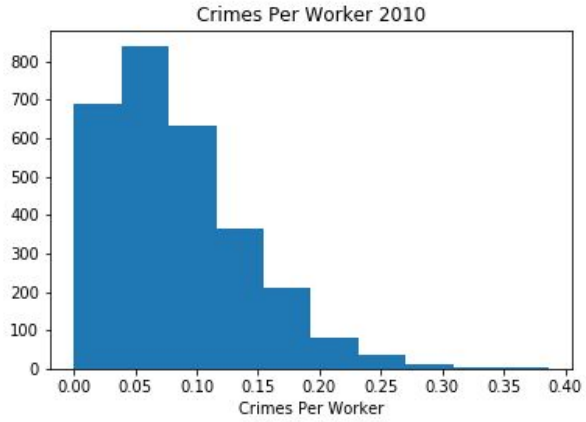
- Is unemployment correlated with crime rate?
- Is there a third variable that is responsible for crime rate?
- Does size of county have an effect on crime rate?
- Is the area responsible for the higher rate of crime?
- Data retrieved from:
  - FBI database: https://api.usa.gov/crime/fbi/sapi/
  - Bureau of Labor Statistics: https://data.bls.gov
  - Google API
- FBI database
  - State, County (multiple precincts reporting), & Number of crimes (totaled from each category)
- Bureau of Labor Statistics
  - State, County, Total Labor Force, Number Unemployed, Percent Unemployed

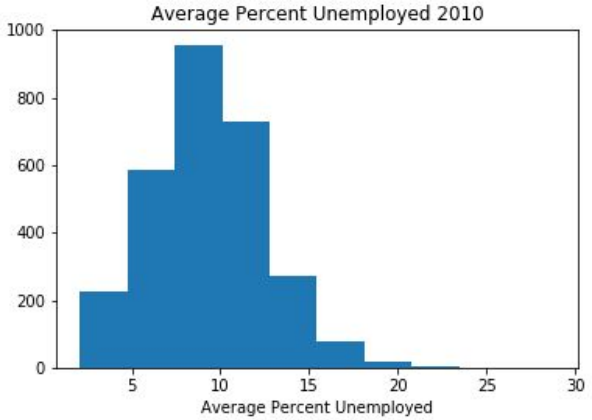


Vancouver
Victoria
Seattle
Portland
Spokane
Boise
Salt Lake City
Denver
Cheyenne
Billings
Helena
Bismarck
Fargo
Minneapolis
Duluth
Thunder Bay
Sault Ste Marie
Sudbury
Toronto
Mississauga
Ottawa
Montreal
Quebec City
Saguenay
Sherbrooke
Kingston
London
Detroit
Cleveland
Pittsburgh
Chicago
Milwaukee
Des Moines
Omaha
Kansas City
Wichita
Oklahoma City
Dallas
Fort Worth
Austin
San Antonio
Houston
Shreveport
Memphis
Nashville
Atlanta
Birmingham
New Orleans
Jacksonville
Orlando
Tampa
Miami
Charleston
Richmond
Norfolk
Virginia Beach
Washington
Philadelphia
New York
Boston
Providence
Hartford
Albany
Buffalo
Rochester
Syracuse
Portland
Sacramento
San Francisco
Fresno
Bakersfield
Los Angeles
Long Beach
San Diego
Las Vegas
Phoenix
Tucson
Albuquerque
El Paso
Santa Fe
Tijuana
Mexicali
Nogales
Hermosillo
Chihuahua
Ciudad Obregón
Navojoa
Los Mochis
Guamúchil
Culiacán
Durango
Torreón
Saltillo
Monterrey
Laredo
Corpus Christi
Fort Worth
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Gulf of Mexico
Gulf of California
Nassau
The Bahamas
United States
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
NEW JERSEY
MARYLAND
DELAWARE
BAJA CALIFORNIA
SONORA
CHIHUAHUA
COAHUILA
NUEVO LEON
SINALOA
DURANGO
BAJA CALIFORNIA SUR

Data Cleanup & Exploration

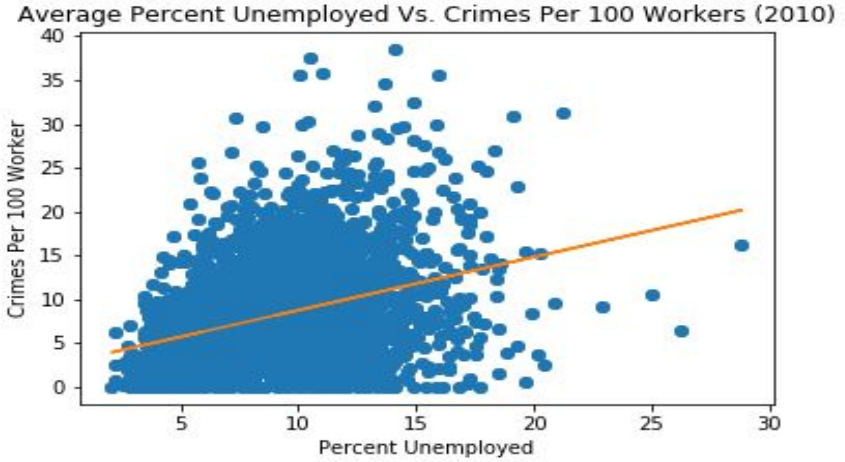
- Combine multiple precincts within counties
- Gather all of the .csv files and format all of the headings to be the same
- Remove county from county names column
- Merge on year, state, and county
- Calculate per capita crime for analysis
- Break the data into years for further analysis
- Noticed duplicate counties
    - E.g. Richardson county and Richards county ⟶ Richards
- Dropped zero
- View Distributions by year

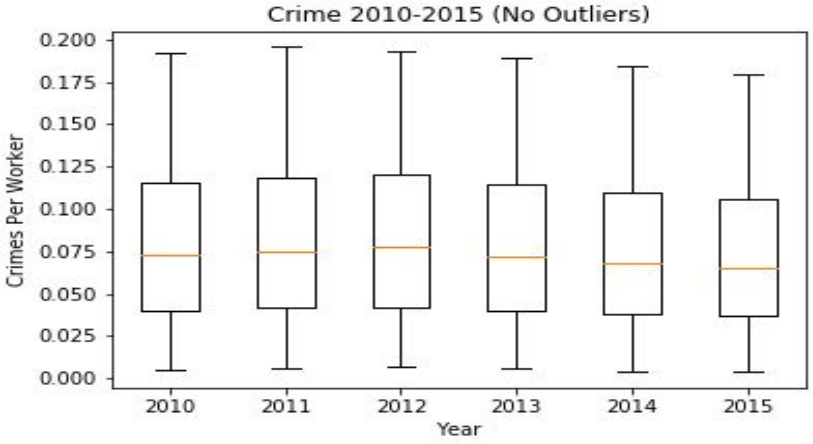


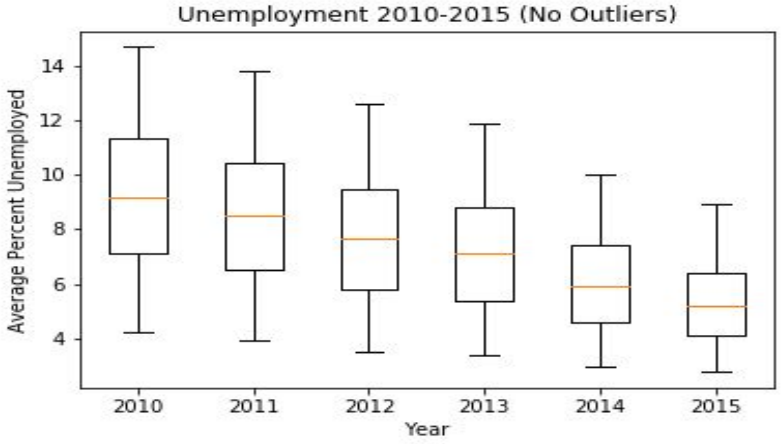


Data Cleanup & Exploration

- Scatter plots of crime vs. unemployment for correlation
- Analyze crime vs. unemployment with box plots



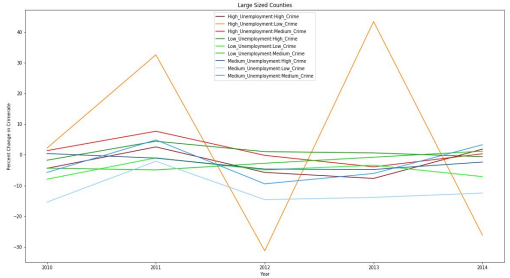


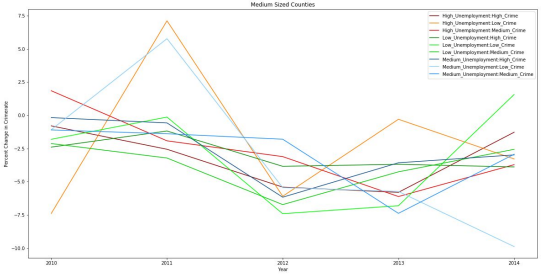


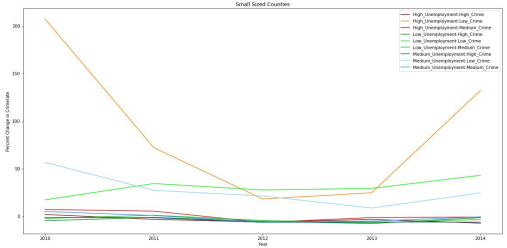
Data Analysis

- Correlation of crime vs. unemployment
  - R values by year: .33, .38, .35, .29, .28, .25
  - P values by year 6.28e-75, 5.12e-98, 1.56e-84, 1.23e-54, 4.95e-43
  - Correlation seems to be going down by year

Analysis of Crime-rate Growth vs Unemployment by County Size



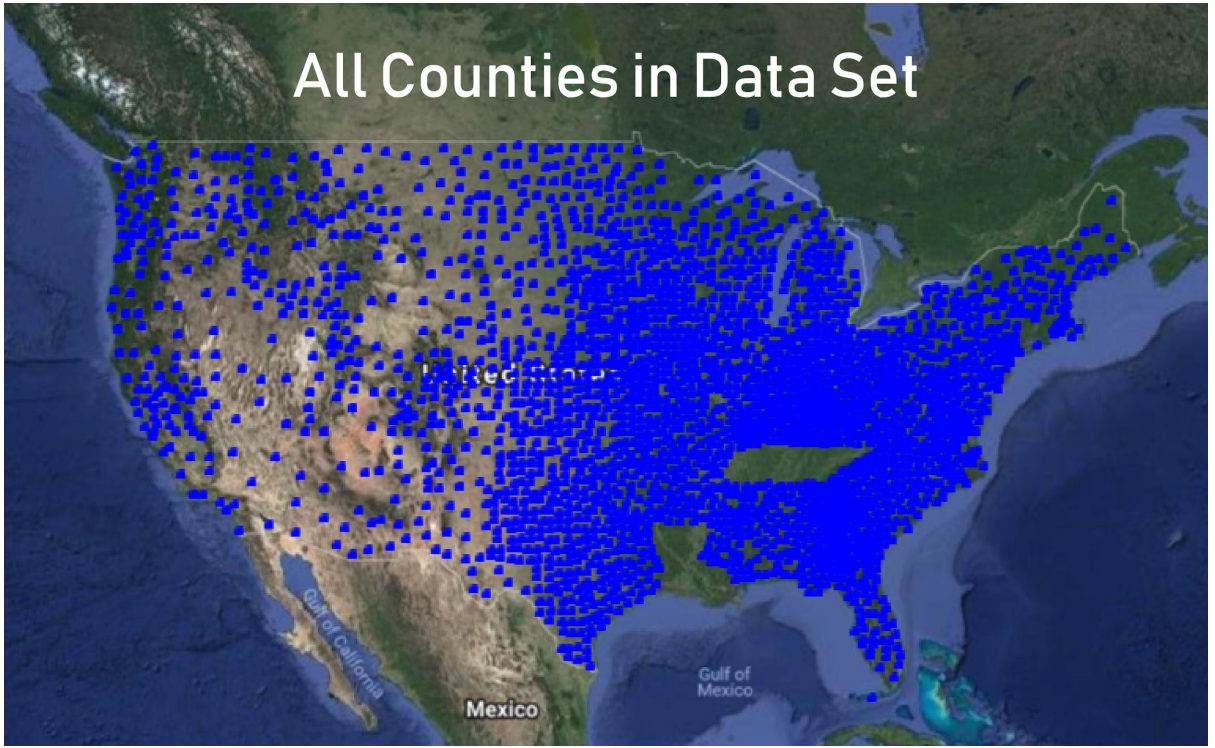


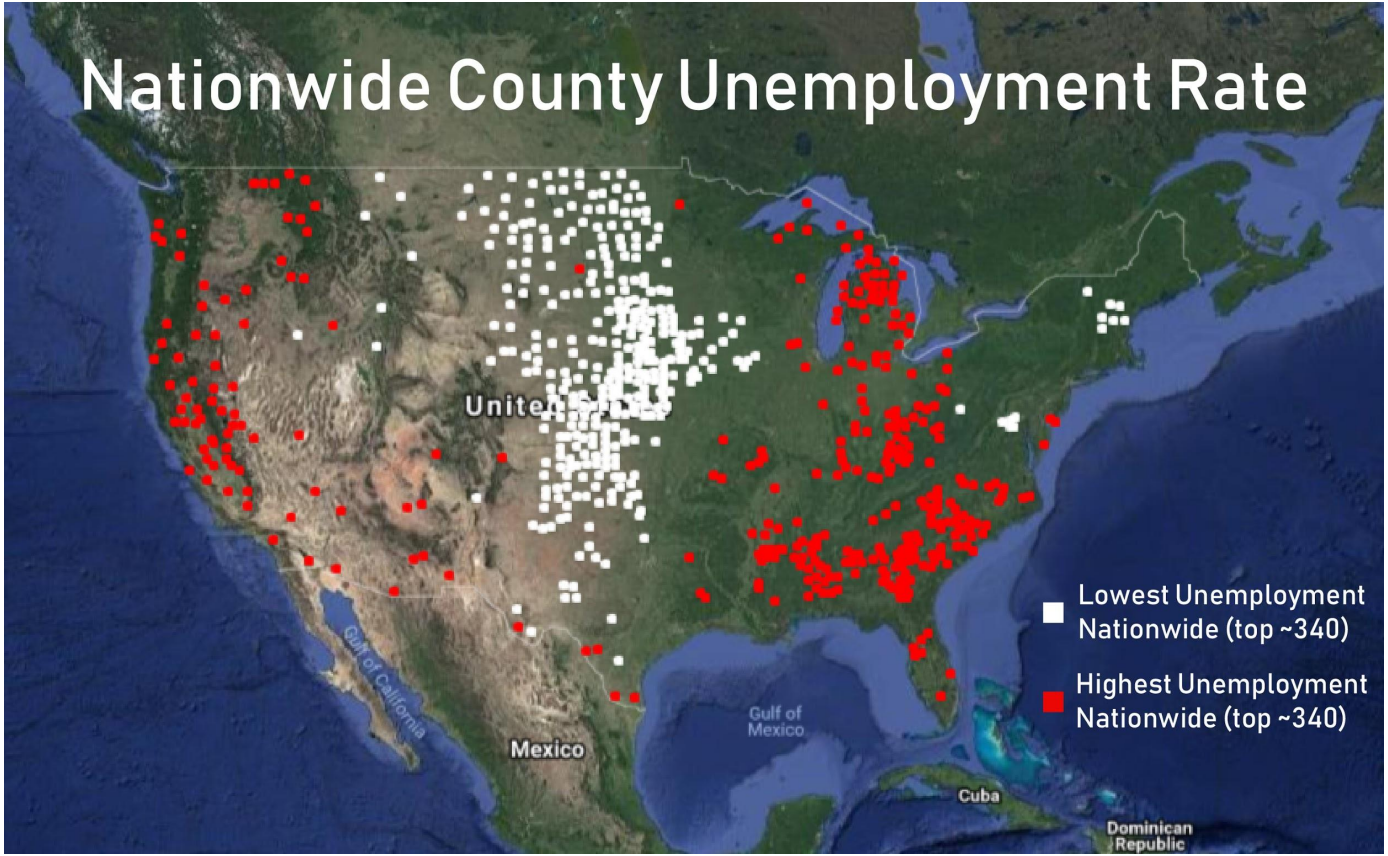


Unemployment level is not an accurate predictor of Crime-rate growth in all sized counties

- Shades of red would consistently be at the top of the charts while shades of green would be at the bottom if it was an accurate predictor

Deeper Dive into Regional Data





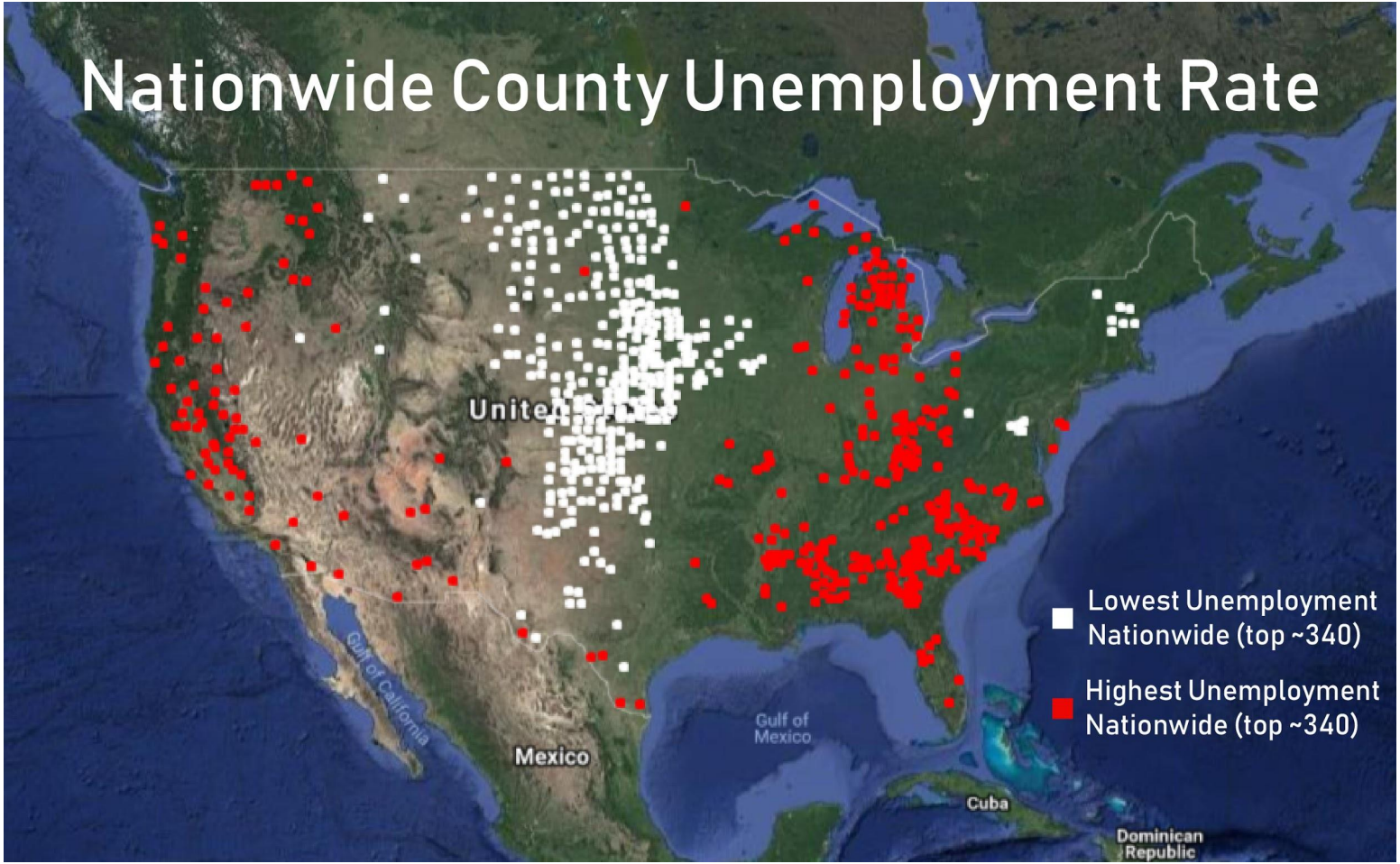
Potential Confounding Variables:
Industry, Culture, Natural Resources, Weather, Politics

Regional Data Analysis - Method

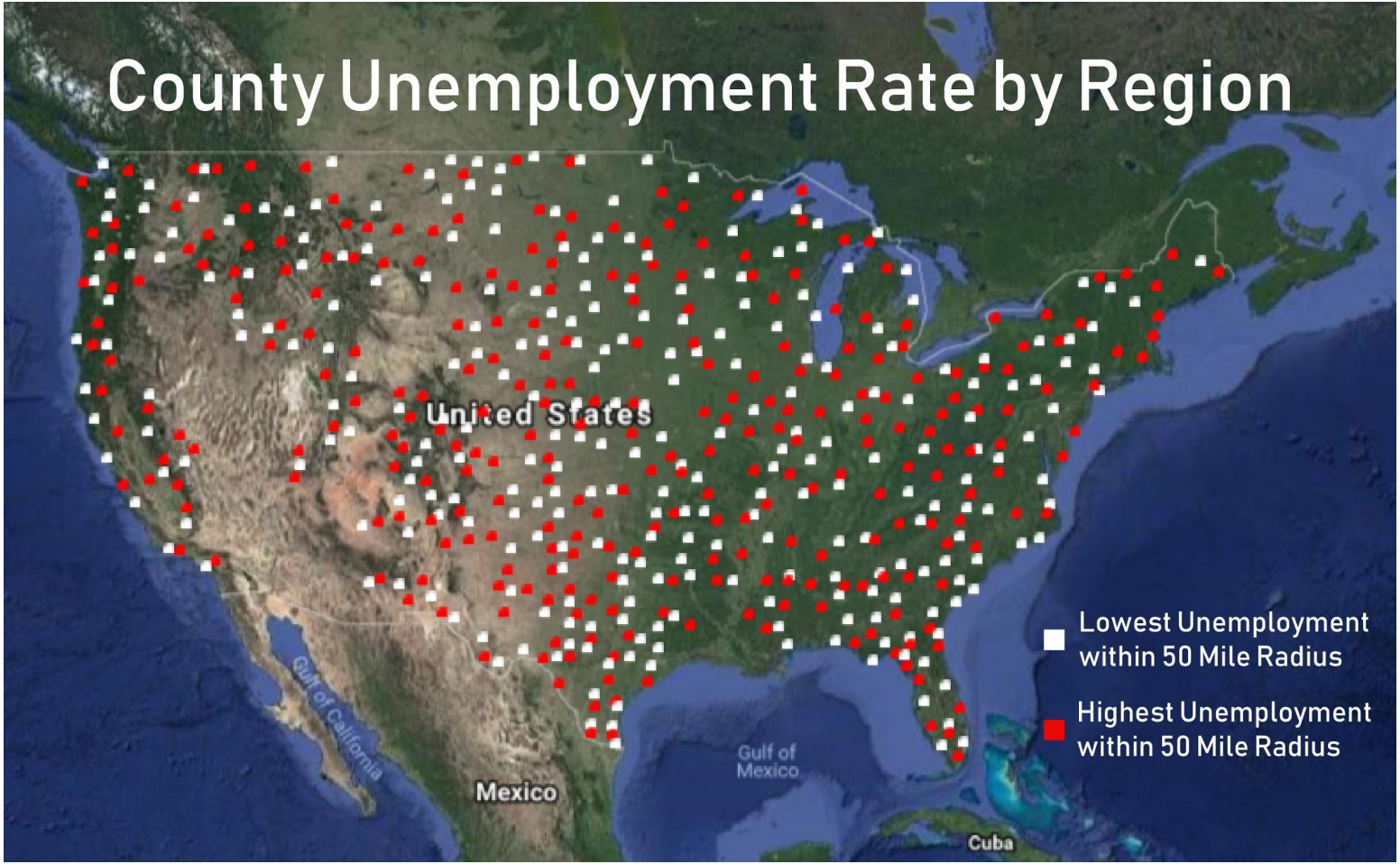
Definition of Region: The set of counties whose center is within a 50 mile radius of the target county.

County Coordinates gathered from Google
Calculated distance between counties with geodesic distance algorithm (geopy)
Create regional data arrays for Crime Rate and Unemployment Rate
Drop Counties that have no regional neighbors
Determine the regional minimum and maximum for each array
Perform Chi Square on County Rate vs Region Mean Rate

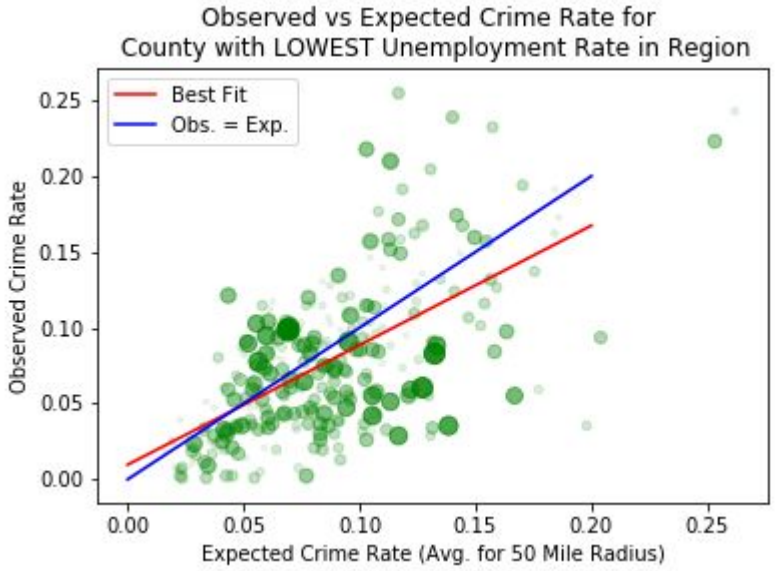
Nationwide County Unemployment Rate



County Unemployment Rate by Region

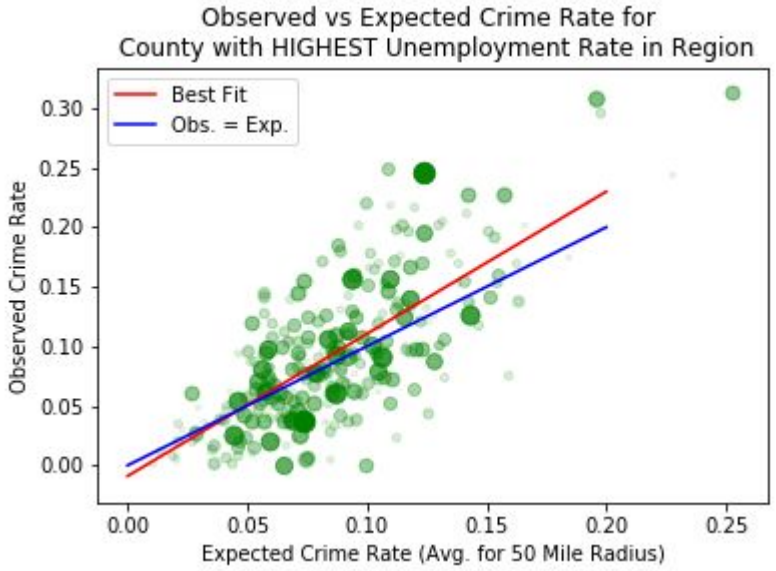


Chi Square analysis for Lowest and Highest County Unemployment Rate in region (50 Mile Radius)



H_0: The crime rate for the county with the <u>lowest</u> unemployment rate will match the region average.

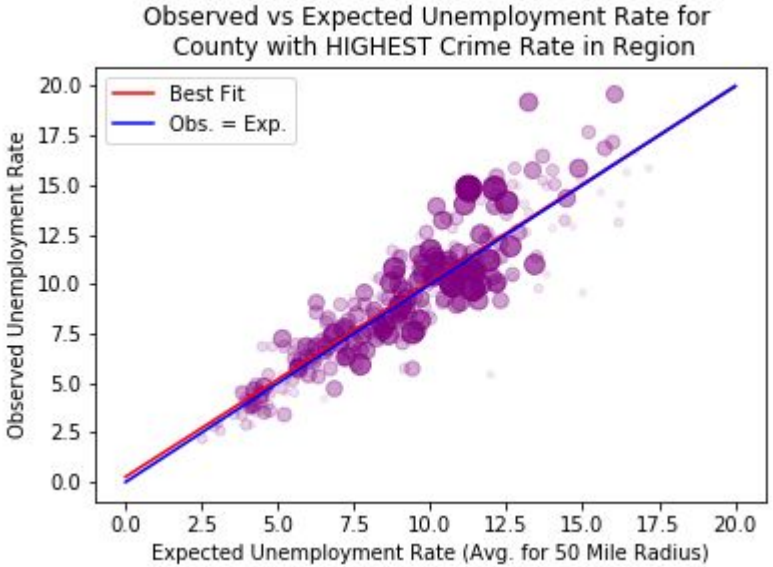
Crit. Value = 4.74 Statistic = 336.88 Slope = 0.79



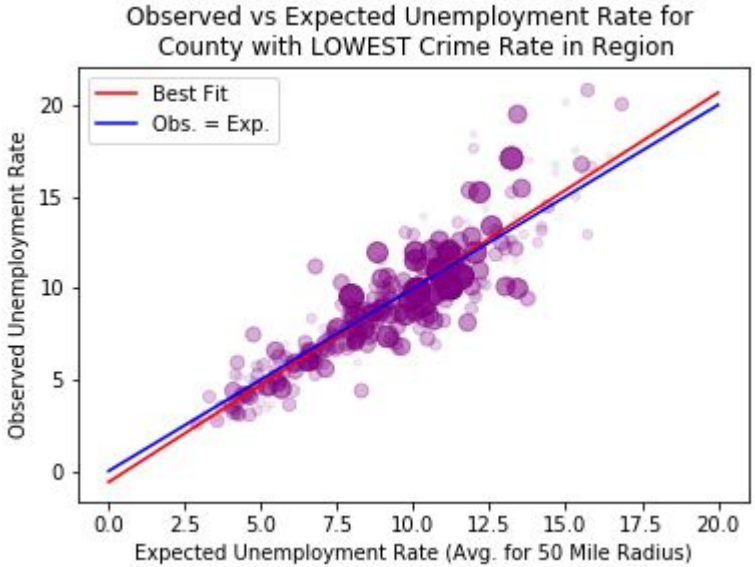
H_0: The crime rate for the county with the <u>highest</u> unemployment rate will match the region average.

Crit. Value = 5.49 Statistic = 343.46 Slope = 1.19

Chi Square analysis for Highest and Lowest County Crime Rate in region (50 Mile Radius)



Crit. Value = 70.31 Statistic = 381.78 Slope = 0.99



Crit. Value = 70.44 Statistic = 355.53 Slope = 1.06

Discussion

- Unemployment does seem to be correlated to crime rate.
- When accounting for surrounding area, it seems to be a better predictor.
- Size of county does not seem to have any correlation with crime rate.
- When examining Unemployment vs Crime rate regionally Unemployment rate is a strong predictor for Crime rate yet Crime rate is not a strong predictor for Unemployment rate.
- While there is a correlation between crime and unemployment, seems to be bivariate at least.
- We did not find exactly what we were expecting.
- Move to the midwest.

Post Mortem

- FBI API calls are limited to 1000 per hour.
  - Alternate keys
  - Split data retrieval across multiple devices
- BLS reports data on a monthly basis Crime Data
- Additional Questions:
  - What could be other confounding variables outside of area? Gender, race, age?
- Additional Research:
  - Break unemployment down and research crime vs. average yearly income
  - See if low income housing affects crime rates.
  - Regional change over time