U.S. Farmers Markets and County Income Analysis

Kristof Toth
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For **Applied Data Science Capstone**

Nutrition and health in the United States

- Chronic diet related diseases have risen
- **Half of all American adults** (117 million individuals) have one or more preventable **chronic diseases**
- Medical costs associated with obesity were estimated to be $147 billion/year
- In 2017, the total estimated cost of diagnosed diabetes was $327 billion in **medical costs** and **loss of productivity**

Farmers Markets

- Access to healthy, safe, and affordable food choices is crucial for an individual to live a healthy lifestyle
- Farmers markets: distribute fresh produce directly to consumers, skipping the costly distribution and packaging step
- **Are farmers markets distributed fairly?**
- **How does economic factors in U.S. counties affect farmers market density?**

Public Health & Business Benefit

- Local municipalities and city councils may use this information to organize and petition for additional farmers markets to meet the needs of their constituents

- New vendors and farmers can find target areas lacking in competition in order to sell to underserved communities.

Public Health   Business
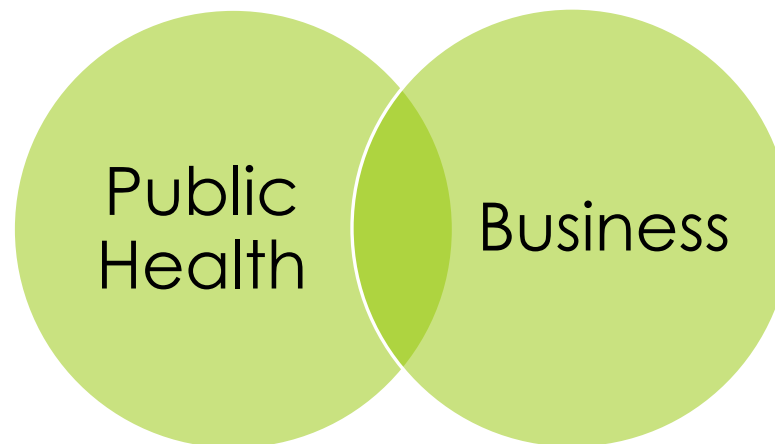
- **2020 USDA Agricultural Marketing Service**
  - Market locations, directions, operating times, product offerings, accepted forms of payment, and more
- **United States counties income analysis**
  - 2009-2013 American Community Survey 5-Year Estimates
  - 2013-2017 American Community Survey 5-Year estimates (Puerto Rico)
  - 2010 U.S. Census
  - Per capita income, median household income, median family income, population, and number of households
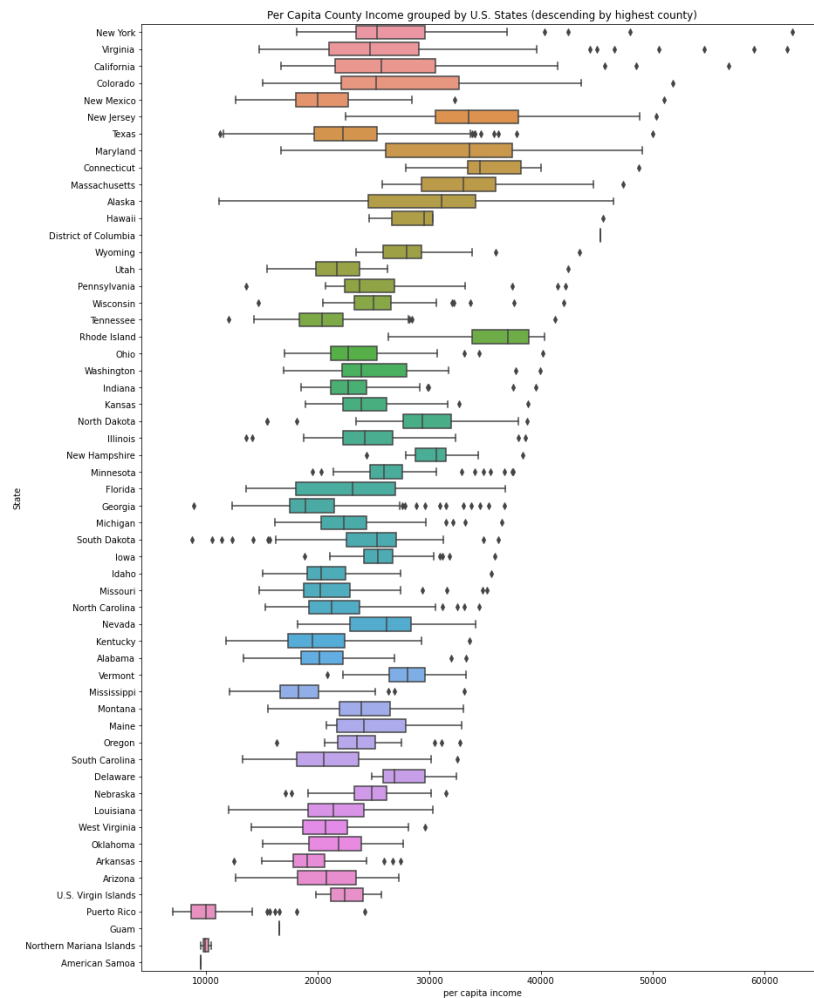
- **Farmers Market Data**
  - 28 rows with NaN for the longitude and latitude coordinates (some are mobile farmers markets)
  - 28 instances of unavailable coordinates represents only 0.3% of the total dataset (8804 farmers markets) so ignored
- **U.S. Economical County Data**
  - 89 permanently-inhabited county-equivalents
  - 8 county-equivalents in the U.S. territories that have zero people were excluded
  - 3 semi-populated county-equivalents in the U.S. Minor Outlying Islands also excluded
- **"County-State"** identifier created from 2 dataframes so that duplicate county names can be handled in analysis

Economic Data

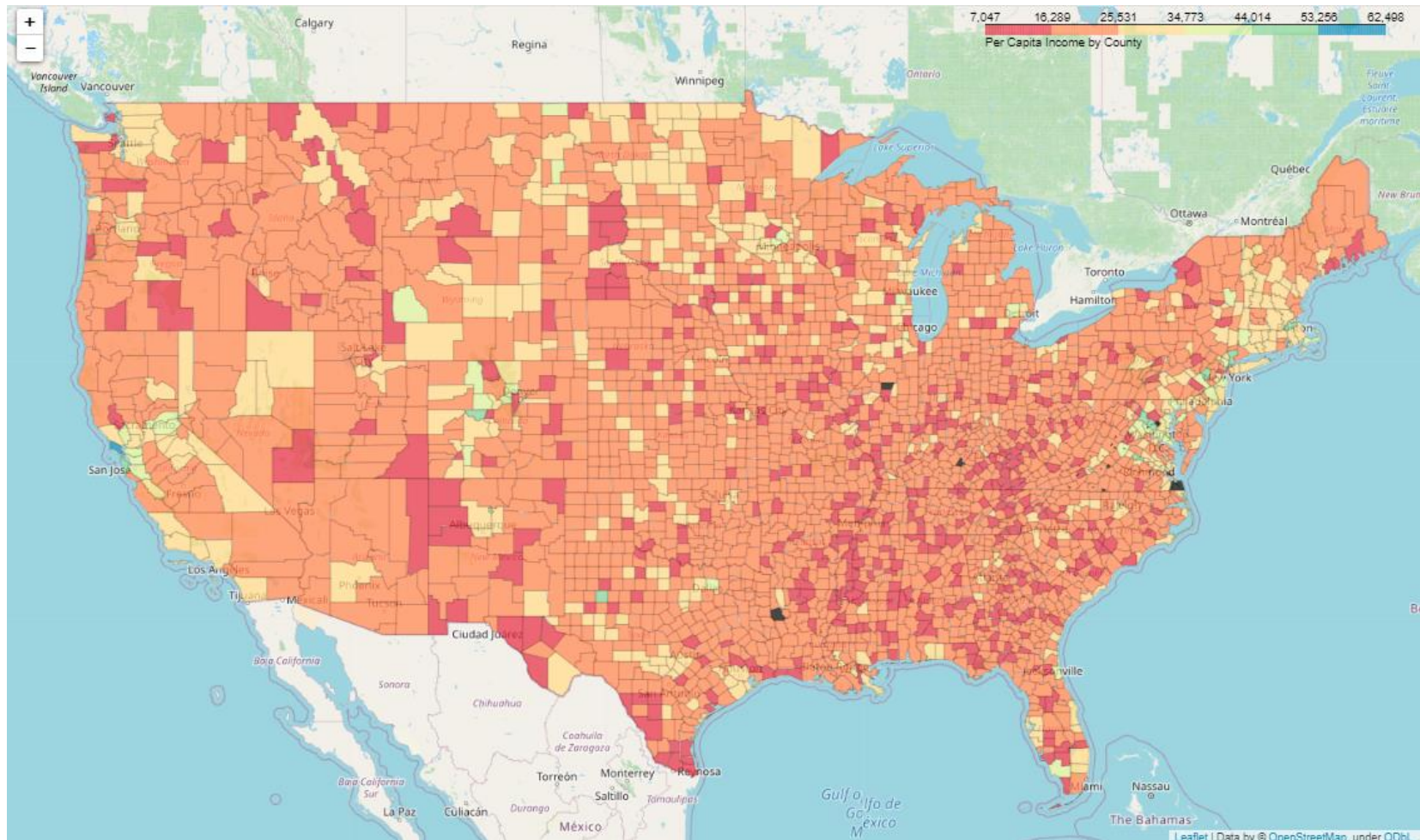Order by highest **per capita income** county for each state
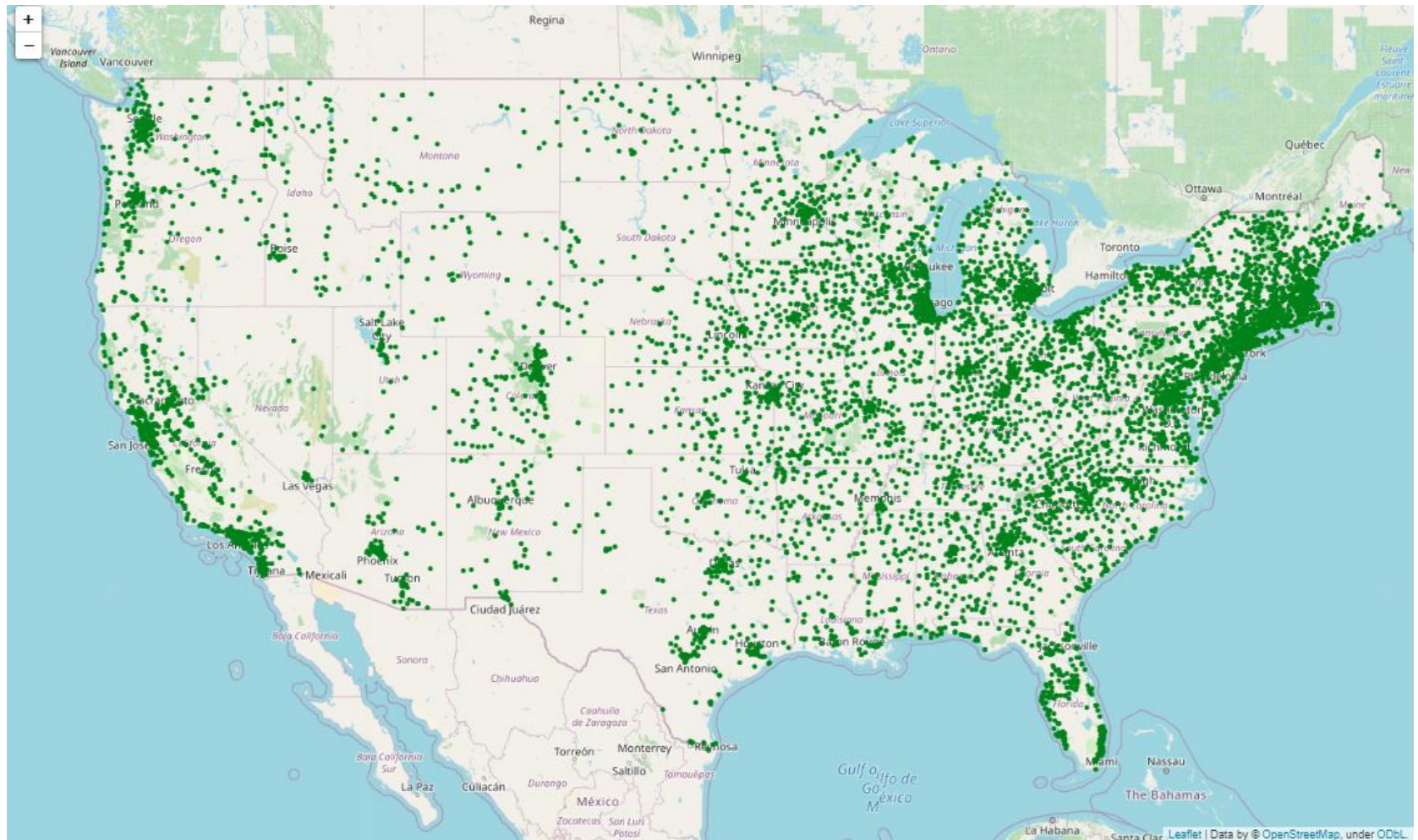
Order by highest median **per capita income** by state
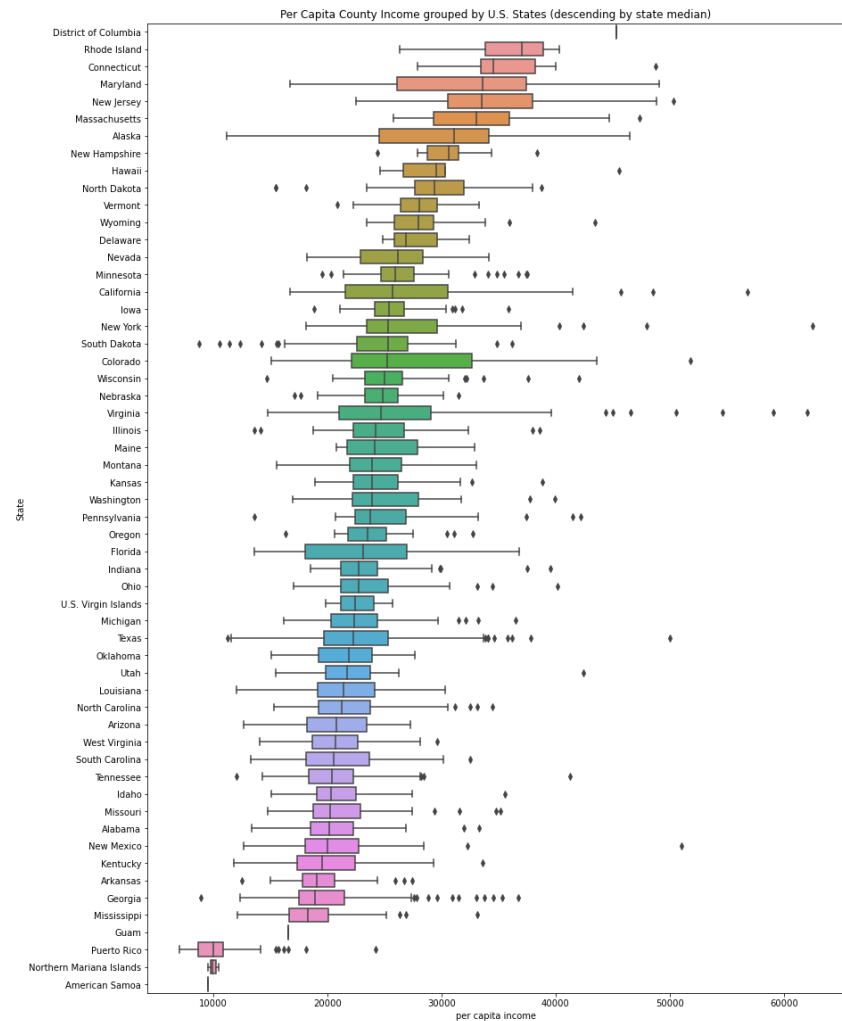
Geographical choropleth map of the U.S. counties color coded by the Per Capita Income. Low is red while high is blue.

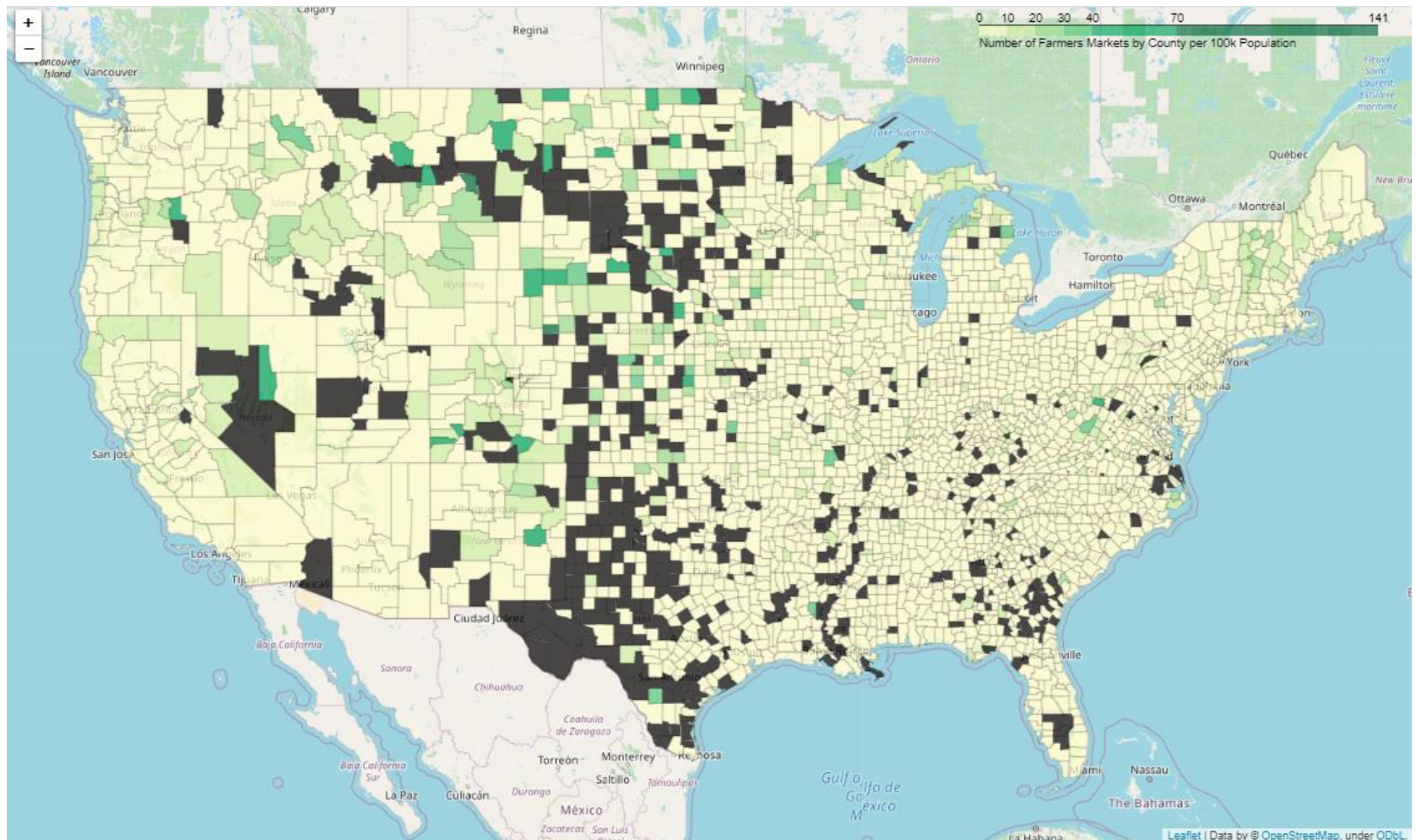Visualization of each farmers market on the U.S. mainland

Visualization of the U.S. showing density of farmers markets in each county per 100k population (dark gray NaN values)

Multiple Regression

- Scikit-learn library: plain Ordinary Least Squares method for multiple regression modeling

- Target variable: 'Farmers Market 100k Density'

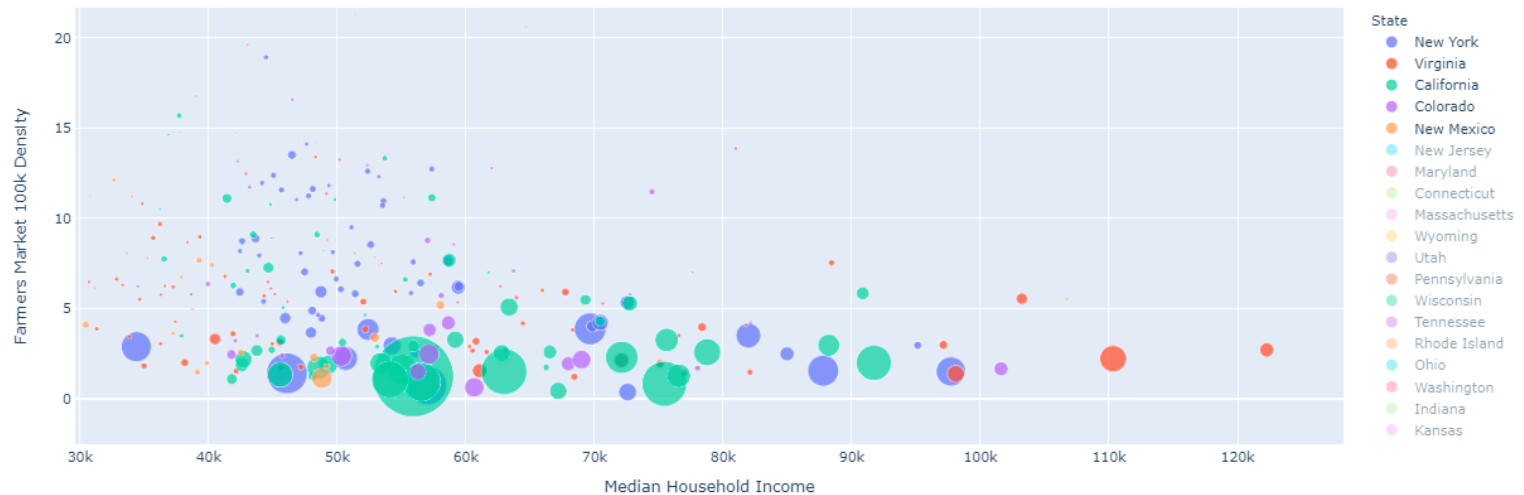| Independent Variables	Regression Coefficient
Per Capita Income	1.5e-03
Median Household Income	-5.7e-04
Median Family Income	-7.3e-05
Population	6.9 e-05
Number of Households	-2.1e-04
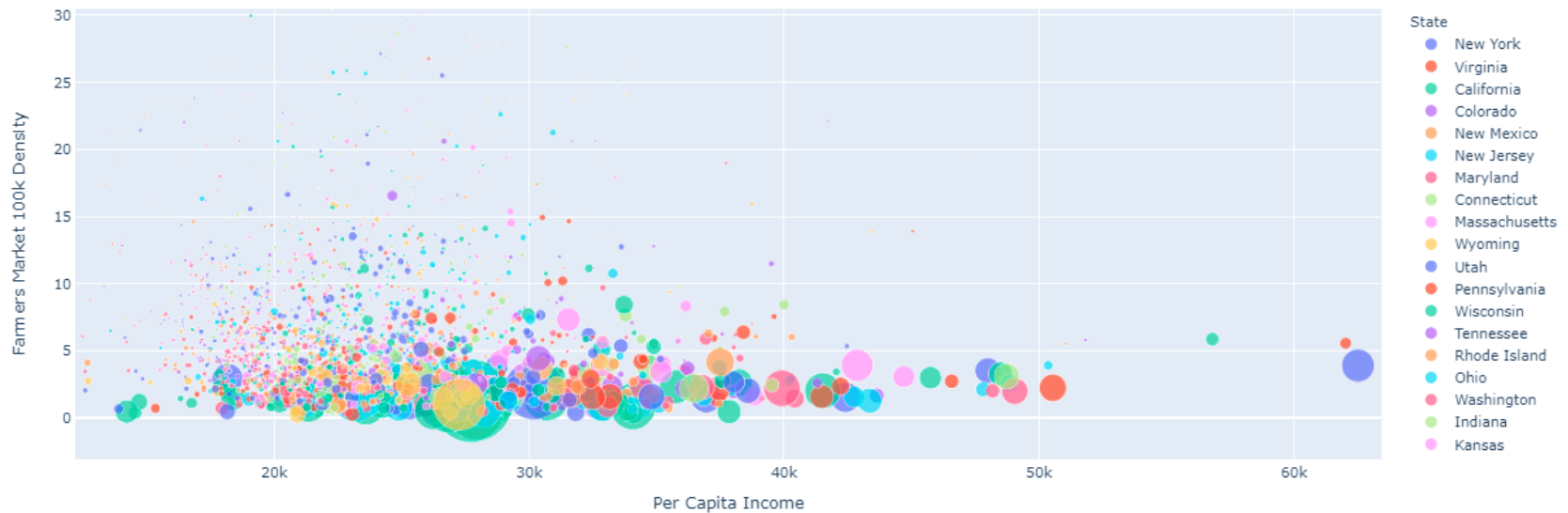
Median Household Income
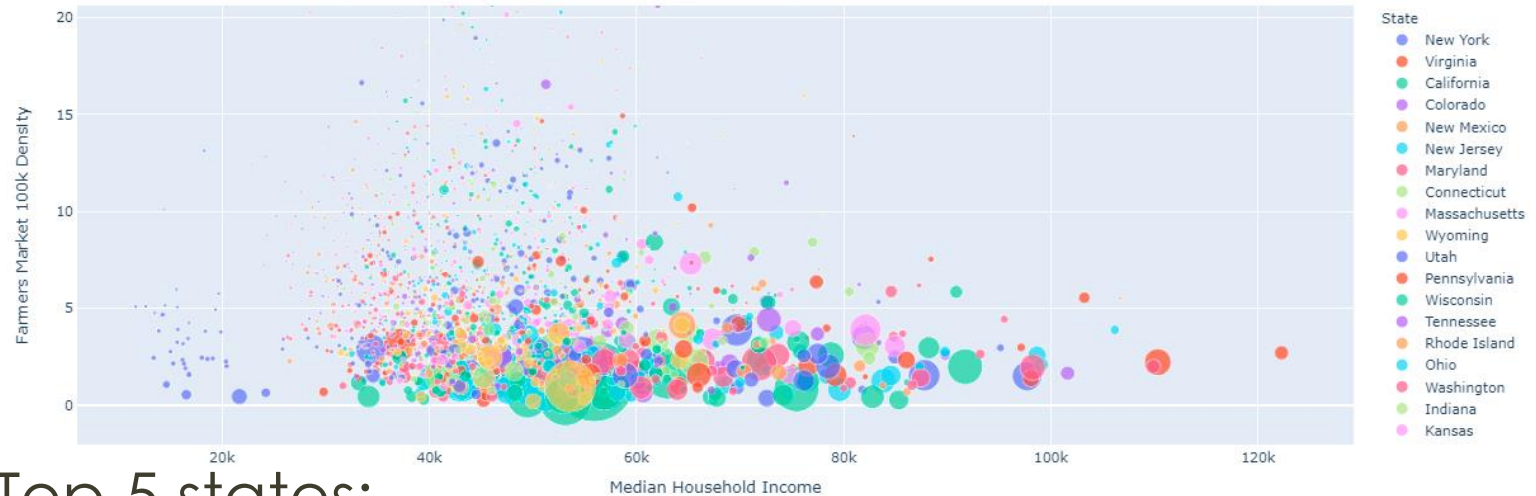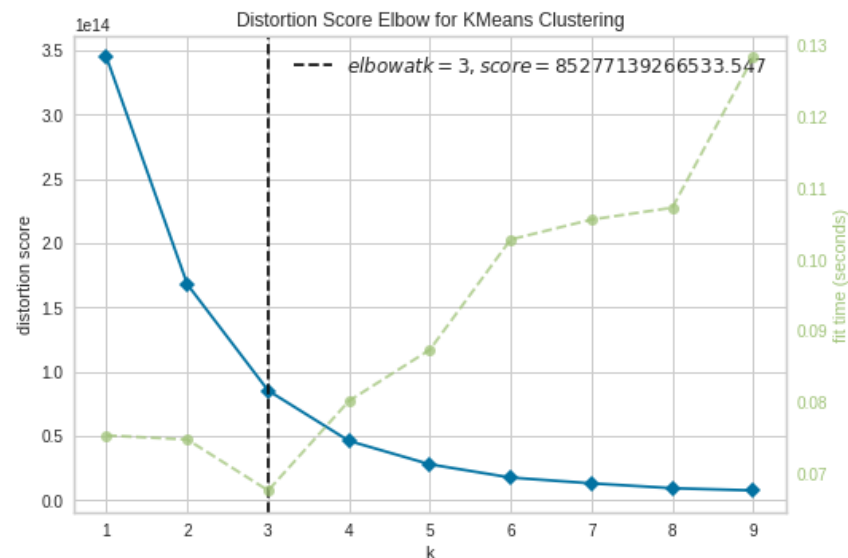

- Top 5 states:

County Segmentation

- Select K value: Elbow method → 3

Cluster	Per Capita Income	Median Household Income	Population	Farmers Market 100k Density
0	23696.388991	46122.554128	7.392068e+04	8.434135
1	31568.339806	60734.495146	1.091298e+06	2.027848
2	28271.750000	54297.500000	5.794325e+06	1.203803

Clusters:

1

Low pop. density
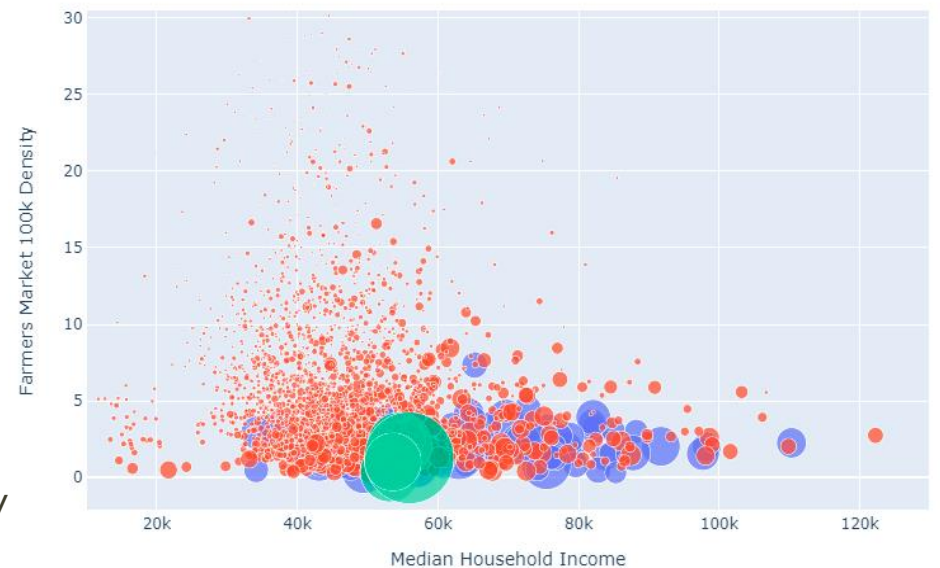$46k median income
$24k/capita income
8.4/100k Markets

2

Medium pop. density
$61k median income
$32k/capita income
2/100k Markets

3

High pop. density
$54k median income
$28k/capita income
1.2/100k Markets

- 4 Counties in Cluster 3
- Greatest business opportunity

Discussion

- U.S. territories tend to be lower than per capita income in the 50 states and District of Columbia
- Highest per capita income is New York County, New York (Manhattan) ($62,498)
- Lowest per capita income is Manu'a District, American Samoa ($5,441)
- Puerto Rico counties much poorer in comparison to the 50 states
- Median family income is higher than median household income because of the composition of households

- **Four counties** (Maricopa County, AZ; Los Angeles County, CA; Harris County, TX; and Cook County, IL) were identified as serving **great potential for new farmers markets** because of the low farmers market density, high population and relatively high median income

- **No substantial evidence on the county level that farmers markets are disproportionately distributed** by per capita and median income

- This analysis does not include individual income, means of transportation, and other issues

  - **Many diverse cities/towns/neighborhoods in a single county!**

References

- [1] U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015 – 2020 Dietary Guidelines for Americans. 8th Edition. December 2015. Available at https://health.gov/our-work/food-and-nutrition/2015-2020-dietary-guidelines/.
- [2] Centers for Disease Control and Prevention (CDC). About Chronic Diseases. October 23, 2019. Available at https://www.cdc.gov/chronicdisease/about/index.htm. Accessed June 23, 2018.
- [3] American Diabetes Association. Economic Costs of Diabetes in the U.S. in 2017. Diabetes Care 2018;41(5):917-928. PubMed abstract
- [4] Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer- and service-specific estimates. Health Aff 2009;28(5):w822-31. PubMed abstract
- [5] https://www.kaggle.com/madeleineferguson/farmers-markets-in-the-united-states
- [6] https://www.ams.usda.gov/local-food-directories/farmersmarkets
- [7] "SELECTED ECONOMIC CHARACTERISTICS 2009-2013 American Community Survey 5-Year Estimates". U.S. Census Bureau. Archived from the original on 2015-01-17. Retrieved 2015-01-12.
- [8] "ACS DEMOGRAPHIC AND HOUSING ESTIMATES 2009-2013 American Community Survey 5-Year Estimates". U.S. Census Bureau. Archived from the original on 2015-01-05. Retrieved 2015-01-12.
- [9] "HOUSEHOLDS AND FAMILIES 2009-2013 American Community Survey 5-Year Estimates". U.S. Census Bureau. Archived from the original on 2020-02-12. Retrieved 2015-01-12.
- [10] U.S. Census Bureau: American FactFinder. 2013-2017 American Community Survey 5-Year Estimates (Puerto Rico) and "Profile of selected economic characteristics: 2010" (American Samoa / Guam / Northern Mariana Islands / U.S. Virgin Islands).