Long term Effects of Food Insecurity on Rates of Chronic Disease

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ABSTRACT

Research was done to evaluate the effects of previous incidents of food insecurity (based on food access measured by income, geographical access, and transportation access) on the current rates of chronic disease within specified U.S. counties. All data was publically available, and data was analyzed and sorted on personal computer within RStudio. Food insecurity data was taken from the year 2010, and chronic disease data was taken from the year 2020. It was found that arthritis, asthma, and cancer proved a slightly positive correlation with food insecurity in the specified populations in 2010. Cancer, asthma, and arthritis co-occurred at significant rates. Stroke, hypertension, diabetes, high cholesterol, kidney disease, and COPD did not prove a correlation.

BACKGROUND

- Food insecure children and youth have a 1.4-2.6 higher risk of developing Asthma (Nagata, 2019).
- Food insecurity is associated with diabetes, and hypertension in young adults (Nagata, 2019).
- Food insecure households may also resort to products that are high in animal fats due to longer shelf life, and such products are associated with an increased risk of several types of cancer (Patel, 2019).
- Food insecure diets are associated with chronic diseases such as depression, hypertension, diabetes, and sleep disorders (Charkhchi, 2018)
- 55% of those receiving cancer care in a NY hospital in a low income area reported to be food insecure (Charkhchi, 2018).

HYPOTHESIS

H1- Past incidents of food insecurity within a specified population have a positive correlation to current chronic disease rates within that population

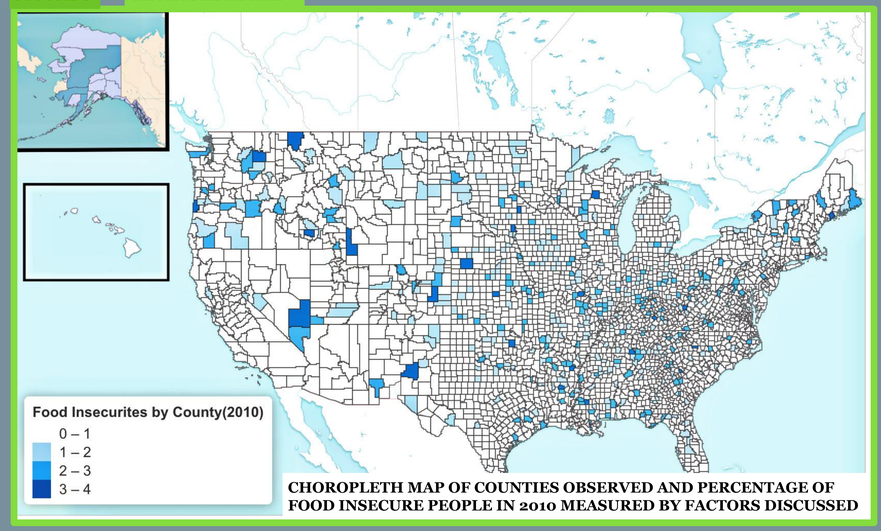
H2- Communities in the west and south of the U.S. experience more severe and continuous food insecurity due to inadequate food access from more ruralized geographies

METHODS

- All data was gathered by publicly available data sets
- Food insecurity was measured by the county's percentage of low income, inadequate access to grocery store based on distance, and lack of vehicle access individuals from data provided by The USDA'S Research Atlas Access Data 2010.
- Age-Adjusted shares of population diagnosed with Arthritis,. Asthma, Cancer, COPD, Diabetes, High Cholesterol, Stroke, and Kidney Disease were taken from CDC's 500 Cities project 2020 and grouped by county
- All irrelevant data was disregarded and all included data was aggregated in R Studio
- Statistical Analysis was used to determine correlations or lack thereof between rates of food insecurity in given U.S. counties in 2010 and the population share of varying chronic ailments and diseases in 2020

	ASTHMA	ARTHRITIS	CANCER
TFI	Cor- 0.05, p-value = 0.003	Cor- 0.08, p-value = 1.107e-05	Cor- 0.10, p-value = 6.268e-08
ASTHMA	-	Cor- 0.78, p-value = 2.2e-16	Cor- 0.20, p-value = 2.2e-16
ARTHRITIS	Cor- 0.78, p-value = 2.2e-16	-	Cor- 0.78, p-value = 2.2e-16
CANCER	Cor- 0.78, p-value = 2.2e-16	Cor- 0.25, p-value = 2.2e-16	-

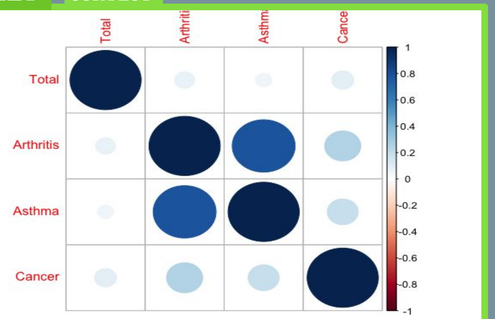
FIGURE 1 CHOROPLETH MAP



CHOROPLETH MAP OF COUNTIES OBSERVED AND PERCENTAGE OF FOOD INSECURE PEOPLE IN 2010 MEASURED BY FACTORS DISCUSSED

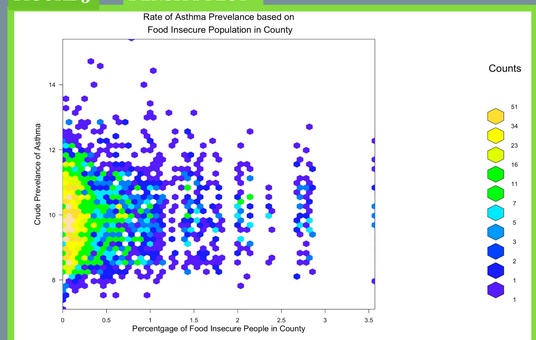
RESULTS

FIGURE 2 COR PLOT



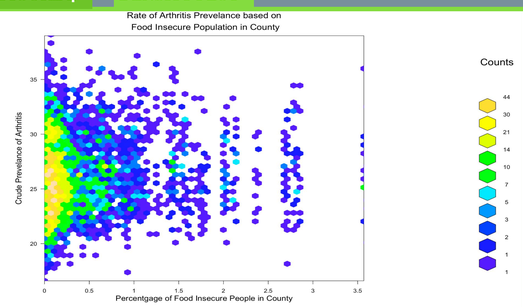
CORRELATION PLOT OF ASTHMA, CANCER, ARTHRITIS, AND TOTAL PERCENTAGE OF FOOD INSECURE PEOPLE PER COUNTY. SIZE AND COLOR OF DOT REPRESENTS CORRELATION

FIGURE 3 DENSITY PLOT



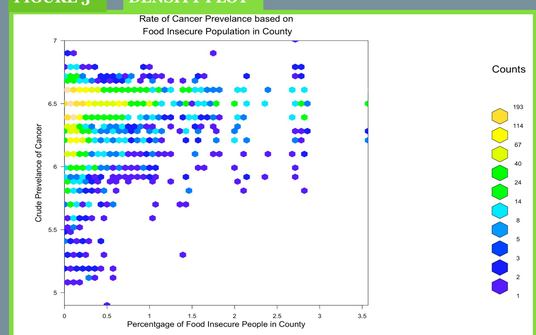
DENSITY PLOT OF ASTHMA PREVALENCE, POLYGON REPRESENTS NUMBER OF COUNTIES WITH ESTABLISHED VARIABLE

FIGURE 4 DENSITY PLOT



DENSITY PLOT OF ARTHRITIS PREVALENCE, POLYGON REPRESENTS NUMBER OF COUNTIES WITH ESTABLISHED VARIABLE

FIGURE 5 DENSITY PLOT



DENSITY PLOT OF CANCER PREVALENCE, POLYGON REPRESENTS NUMBER OF COUNTIES WITH ESTABLISHED VARIABLE

DISCUSSION

1). Populations with a history of inadequate food access appear to experience an increase in overall cancer, asthma, and arthritis rates in the future
Limitation: Limited data could be found that observed food insecurity and chronic disease rates over several years. A longer observation period for both variables would could have shown a more accurate depiction of populations who experienced more severe and continuous food access, and their frequency of chronic disease.

2). Food insecurity determined by food access appears to be more frequent in the northwest, southwest, and southern regions of the U.S.
Limitation: little to no data was found including the chronic disease rates of rural and suburban counties, data only pertained to metropolitan or heavily populated cities/counties. Access to rural and suburban data would provide a more accurate depiction of the portion of those with inadequate food access.

3). Asthma and arthritis cases in 2020 occur at similar rates, most likely pointing to environmental factors that contribute to both conditions, and could possibly be experienced together.

4). Cancer and arthritis, as well as cancer and asthma cases in 2020, occur at moderately similar rates, also pointing to similar environmental contributors.

FUTURE RESEARCH

- Create a methodology to collect data from the USDA of what ethnic groups in the south and west regions have the highest rates of inadequate food access.
- Identify and conduct correlation tests on long term cancer, arthritis, and asthma rates in these regions with food access data grouped by ethnicity and SES status
- Create a methodology that investigates data from the BLS on common working conditions for each socioeconomic class and ethnic group within the western and southern states
- Investigate data from the CDC's NHANES to determine the presence of chemicals due to environmental exposures over time within these regions and their subregions.

REFERENCES

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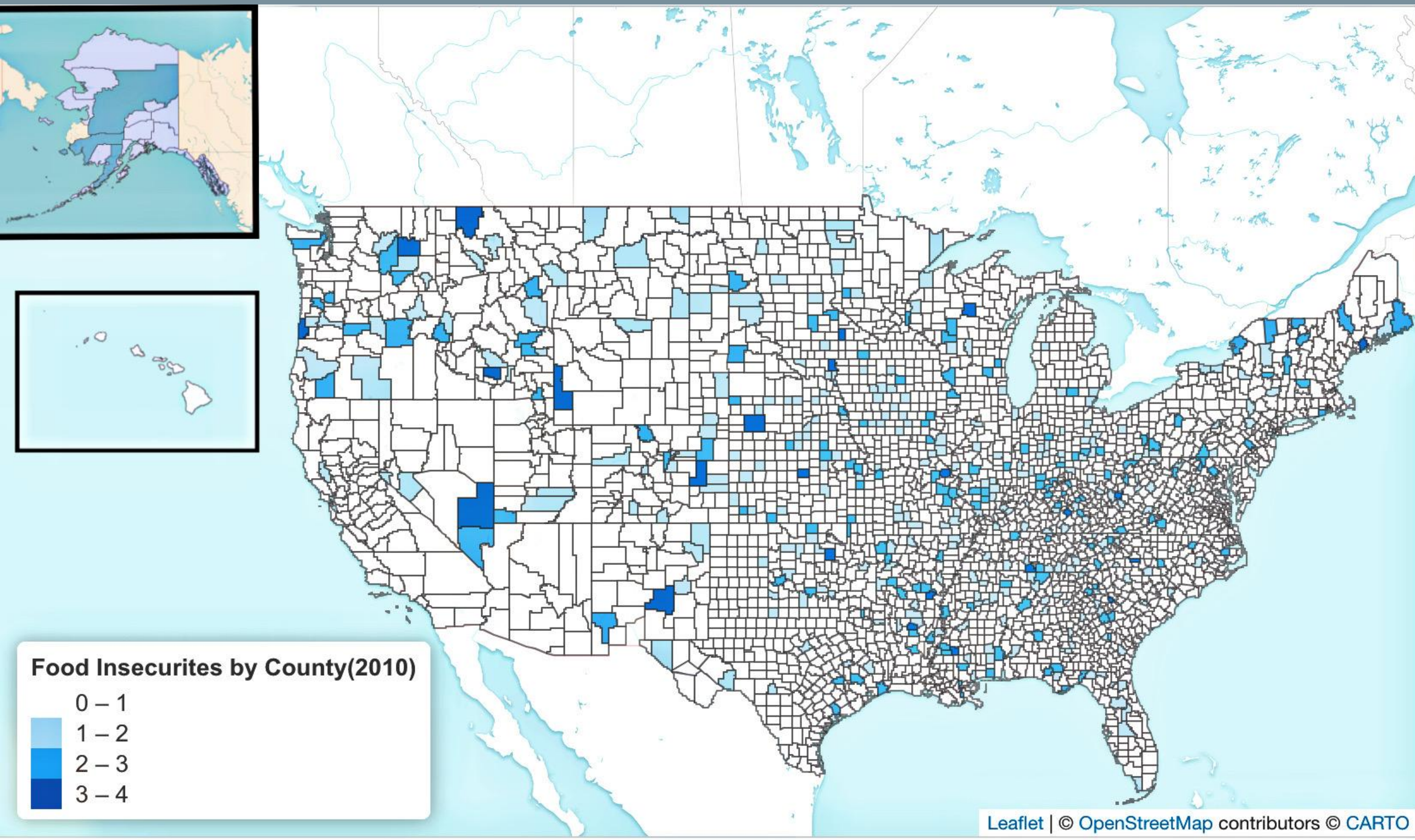
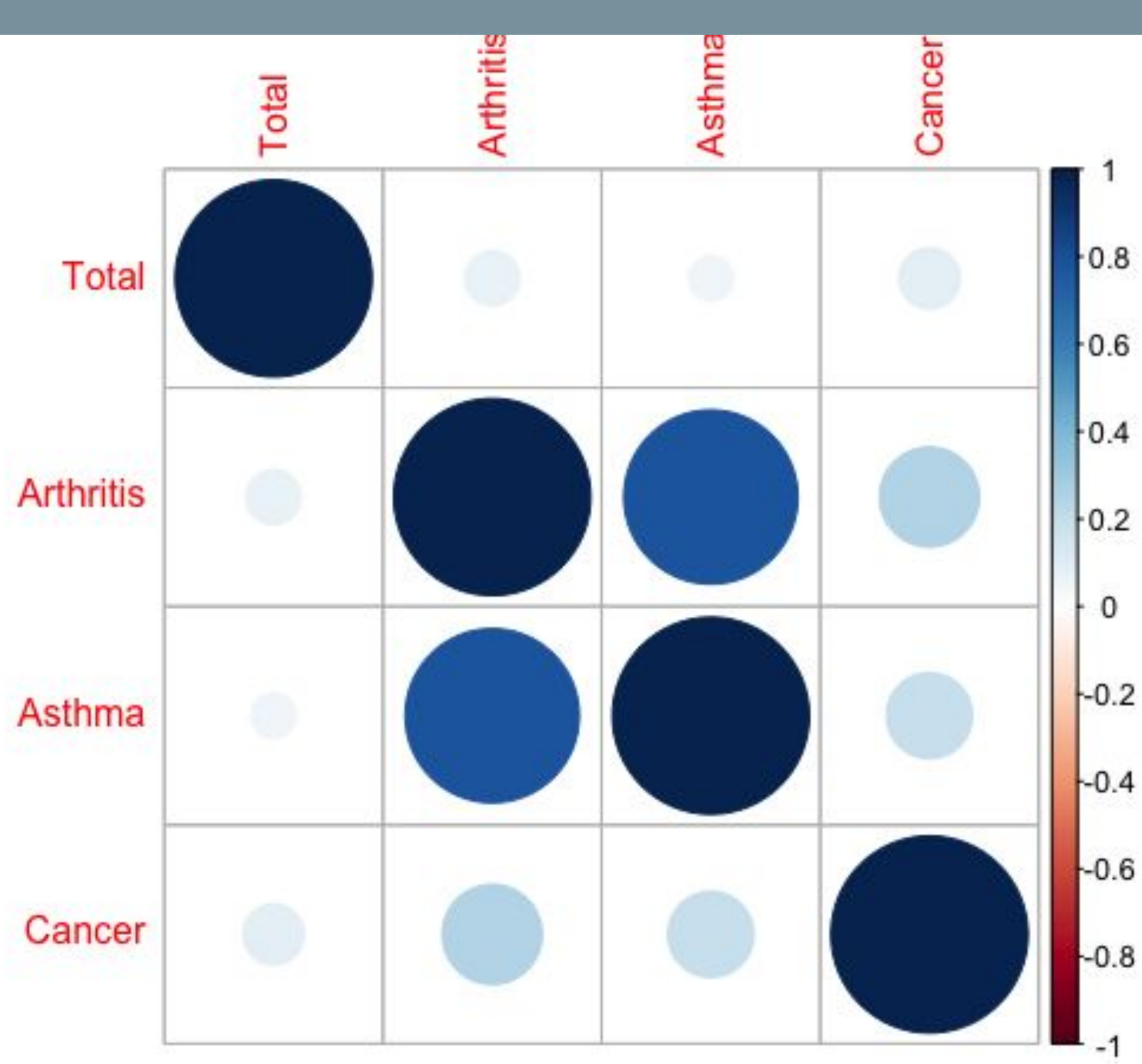
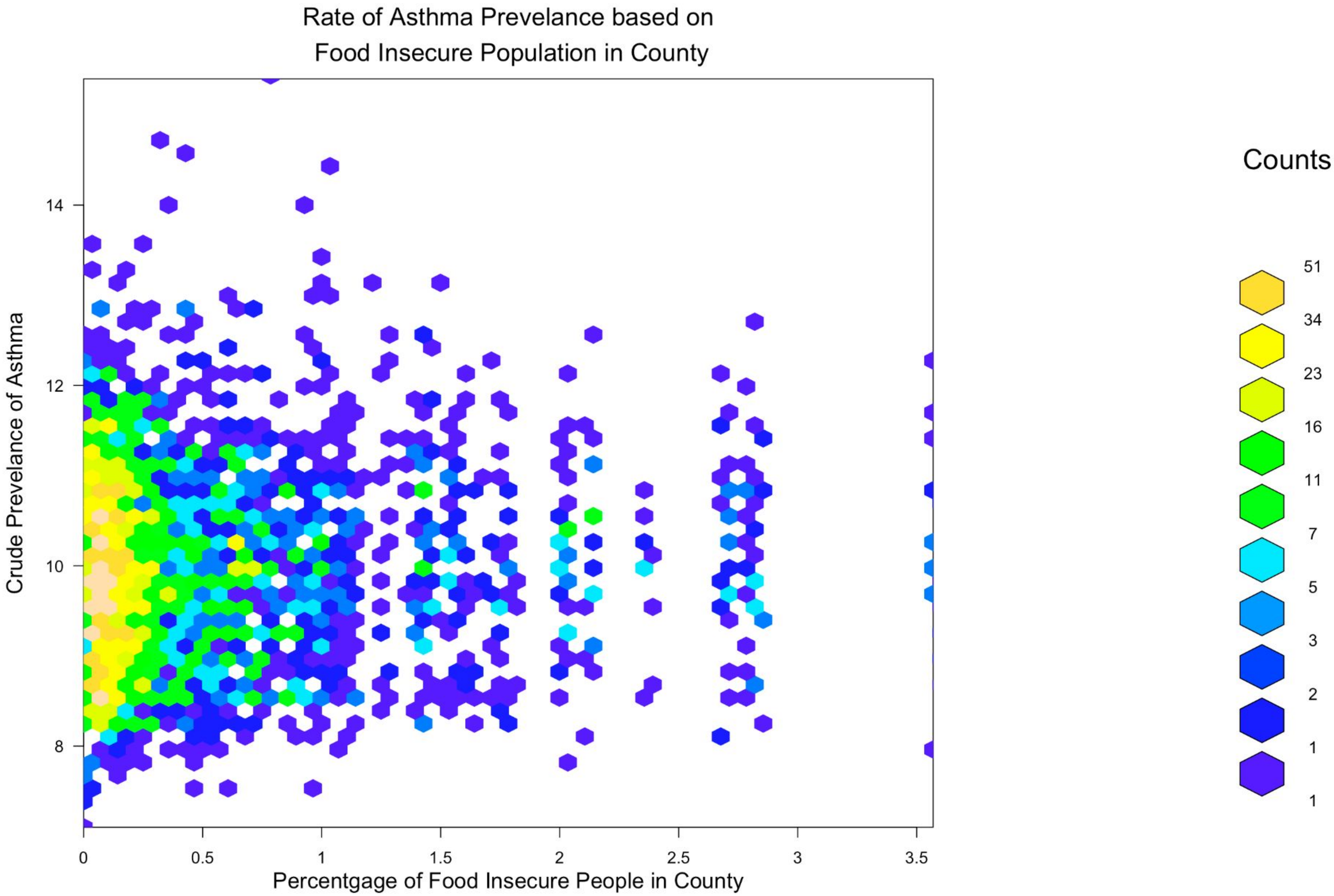
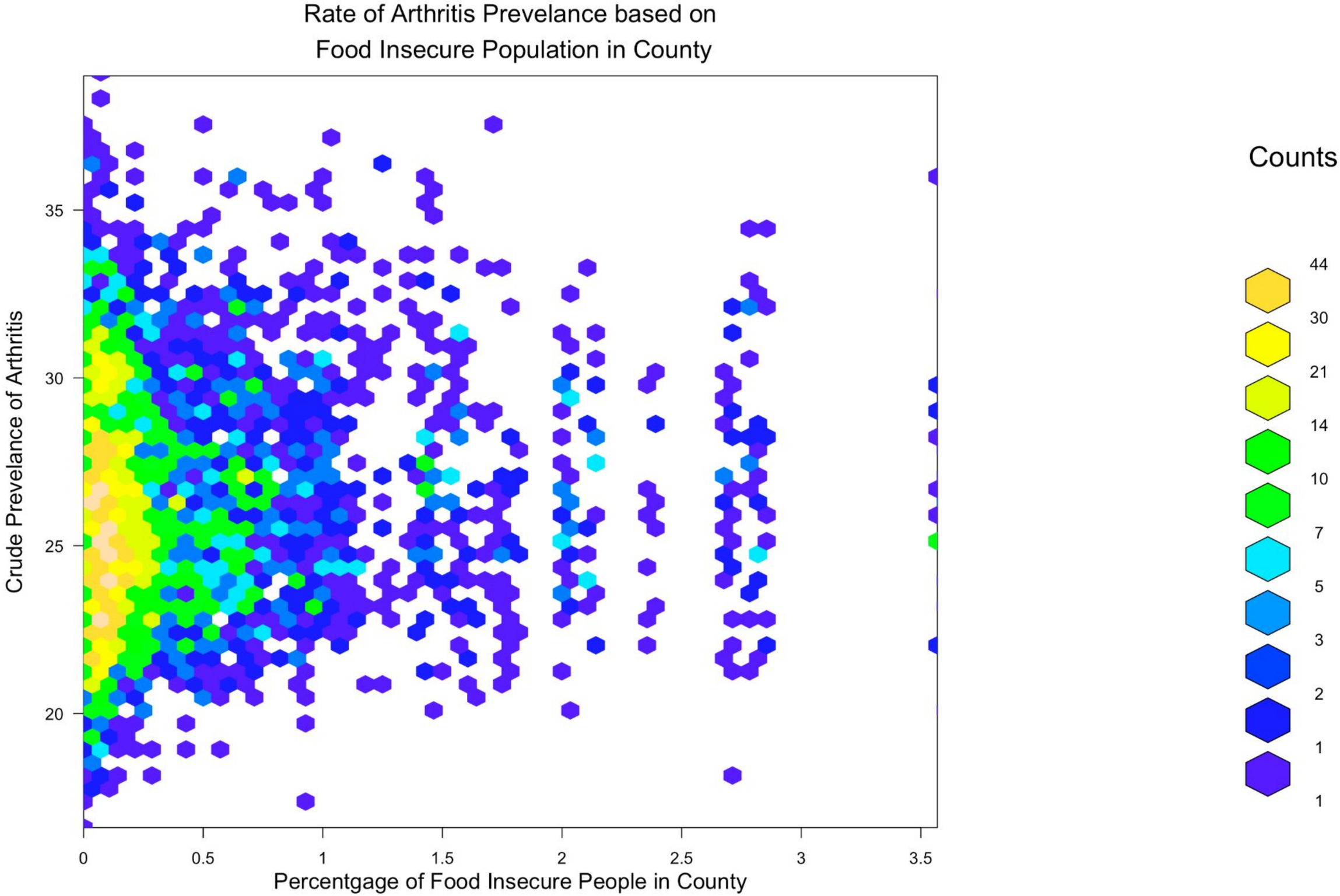
XSEDE Extreme Science and Engineering Discovery Environment

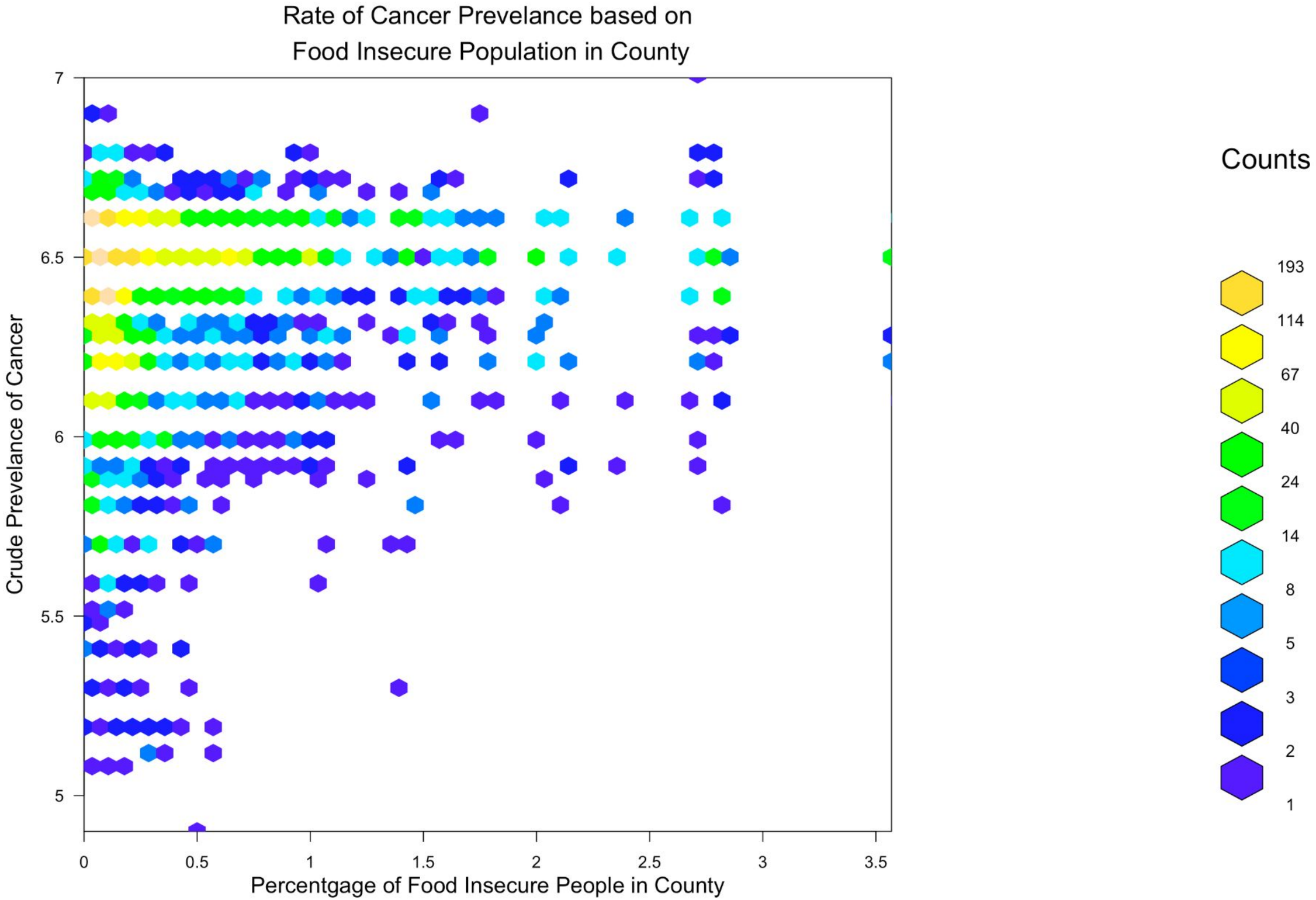
TACC >data science Chaminade University OF HONOLULU SPICE


Food Insecurites by County(2010)
0 – 1
1 – 2
2 – 3
3 – 4
Leaflet | © OpenStreetMap contributors © CARTO


Total
Arthritis
Asthma
Cancer
Total
Arthritis
Asthma
Cancer
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1


Rate of Asthma Prevelance based on
Food Insecure Population in County
Crude Prevelance of Asthma
14
12
10
8
0
0.5
1
1.5
2
2.5
3
3.5
Percentgage of Food Insecure People in County
Counts
51
34
23
16
11
7
5
3
2
1
1


Rate of Arthritis Prevelance based on
Food Insecure Population in County
Crude Prevelance of Arthritis
35
30
25
20
0
0.5
1
1.5
2
2.5
3
3.5
Percentgage of Food Insecure People in County
Counts
44
30
21
14
10
7
5
3
2
1
1


Rate of Cancer Prevelance based on
Food Insecure Population in County
Crude Prevelance of Cancer
7
6.5
6
5.5
5
0
0.5
1
1.5
2
2.5
3
3.5
Percentgage of Food Insecure People in County
Counts
193
114
67
40
24
14
8
5
3
2
1