Introduction

The past ten years have yielded some of the fastest obesity growth rates across the US. With Internet usage, prevalence, and speeds also rapidly increasing, this project explores any possible correlation between Internet speeds and obesity rates.

Therefore, my Null Hypothesis (H_0) is that there is no statistically significant correlation between obesity and internet speeds.

Hypothesis

Null Hypothesis (H_0):

There is no correlation between obesity and internet speeds.

$$\rho_{XY} = 0$$

Alternative Hypothesis (H_a):

There is a significant correlation between obesity and internet speeds.

$$\rho_{XY} \neq 0$$

Extraneous Variables

Confounding Variables
Incorporated into the design of the study

- Income

Lurking Variables
Variables not incorporated into the design of the study

- Age
- Education
- Technical Literacy

Datasets & Methodology

|	Name	Source	Purpose
Pittsburgh	2017 TIGER / Line Shapefiles	US Census Bureau	Matches PA block codes to shapefile metadata. Used for heat map construction.
	Allegheny County Obesity Rates	Western PA Regional Data Center	Provides obesity rates as a percentage of obese in a specific Census block group.
	Pittsburgh ISPs by Block	FCC / Western PA Regional Data Center	Provides maximum advertised consumer and business upload and download speeds by Census block.
	PGH Snap Census Data—Education and Income	Western PA Regional Data Center	Provides median income for Pittsburgh Neighborhoods in 2010.
	PGH Snap Census—Housing	Data.gov	Provides number of occupied housing units per Pittsburgh neighborhood. Used for income normalization.
	PGH Snap Census—Neighborhood Census Data	Data.gov	Provides population per Pittsburgh neighborhood. Used for income normalization.
United States	Adult Obesity in the United States	State of Obesity	Provides adult obesity rates as a percentage of state population.
	United States - Average household size, 2009-2013 by State	Index Mundi	Provides average household size by state. Used for income normalization.
	USA Average Peak Internet Speeds	Fastmetrics	Provides average internet speeds for each state.
	US Median Income—2016	US Census Bureau	Provides median income by state.
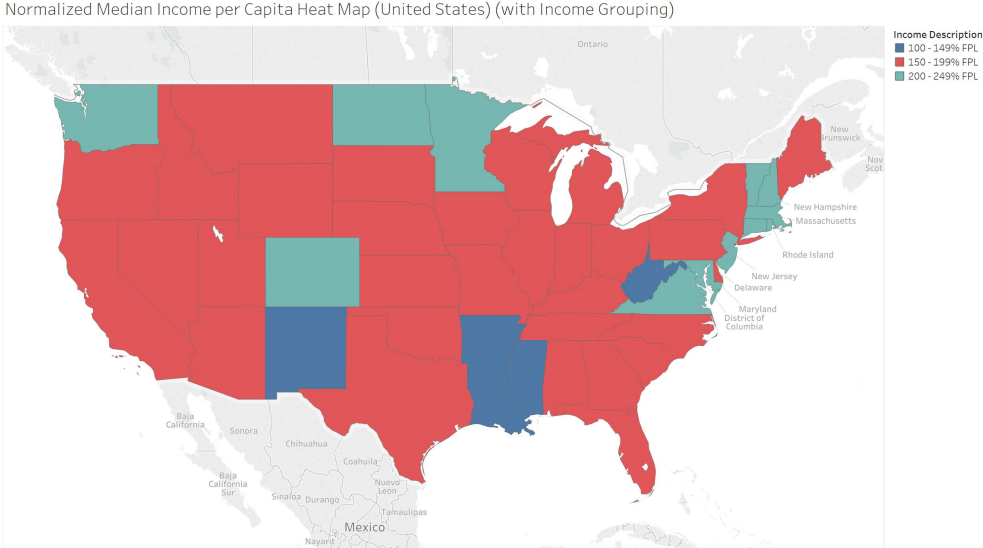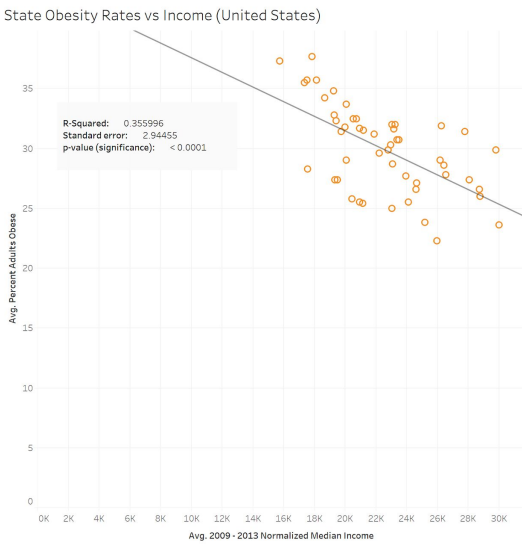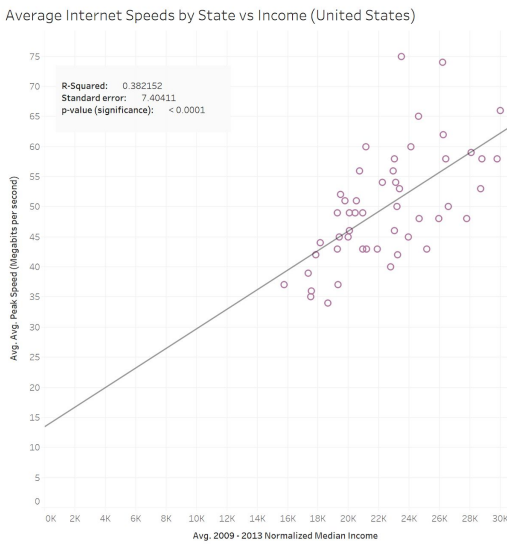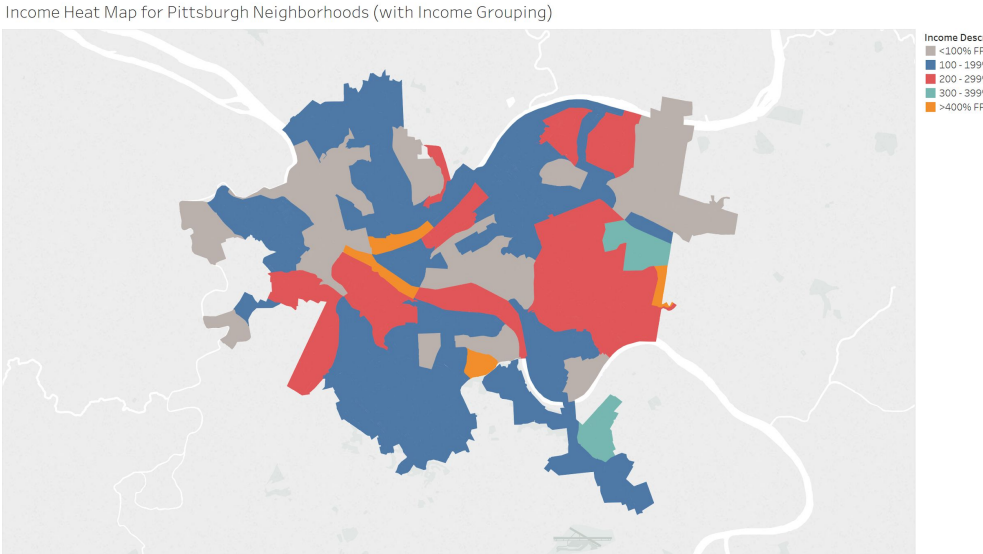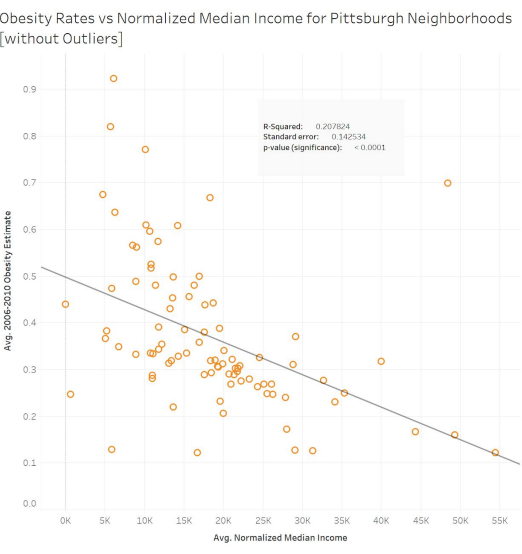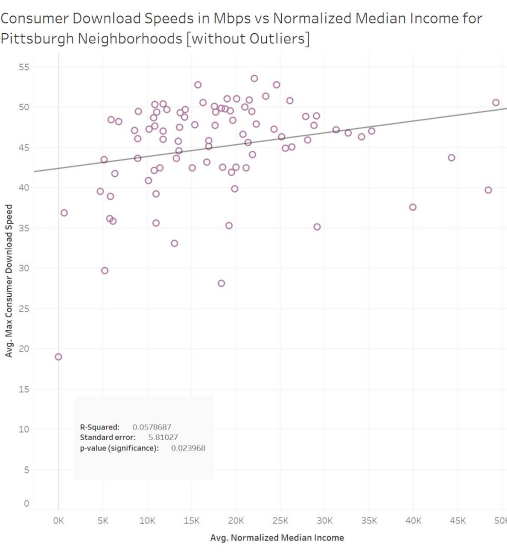
As displayed above, income confounds both obesity rates and internet speeds ($p < 0.05$ for all graphs). As such, we analyzed aggregate data as well as income-grouped data based upon the Federal Poverty Level (FPL), which is established at \$12,060 for a single person household. Median household incomes—for both neighborhoods and states—were divided by their respective average household size to normalize the dataset (i.e. all incomes in the analysis are relative to the FPL of a single person household).

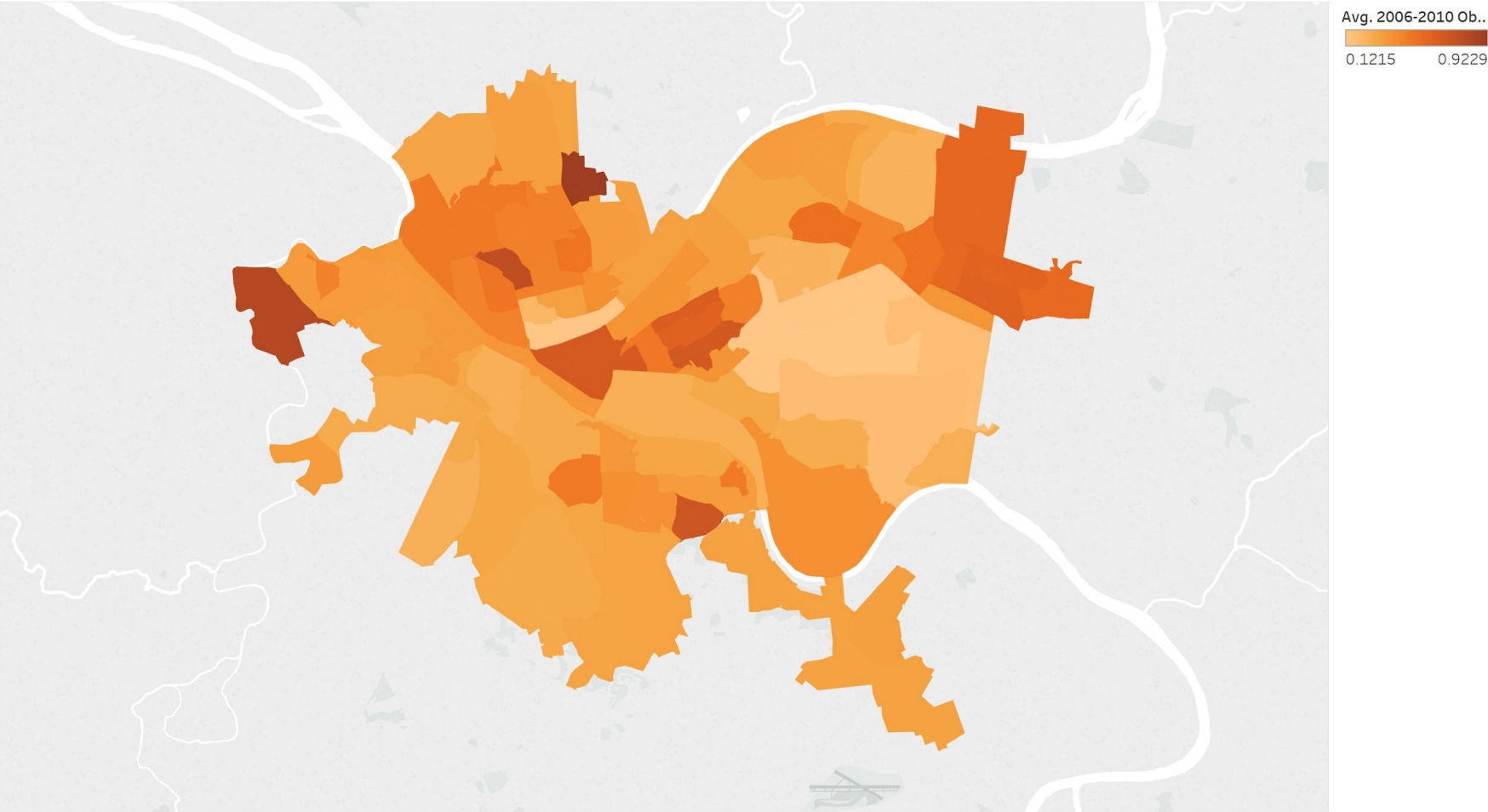# The Correlation Between Internet Speeds and Obesity Rates

Visualizations & Results

Pittsburgh

Consumer Download Speeds (Mbps) Heat Map
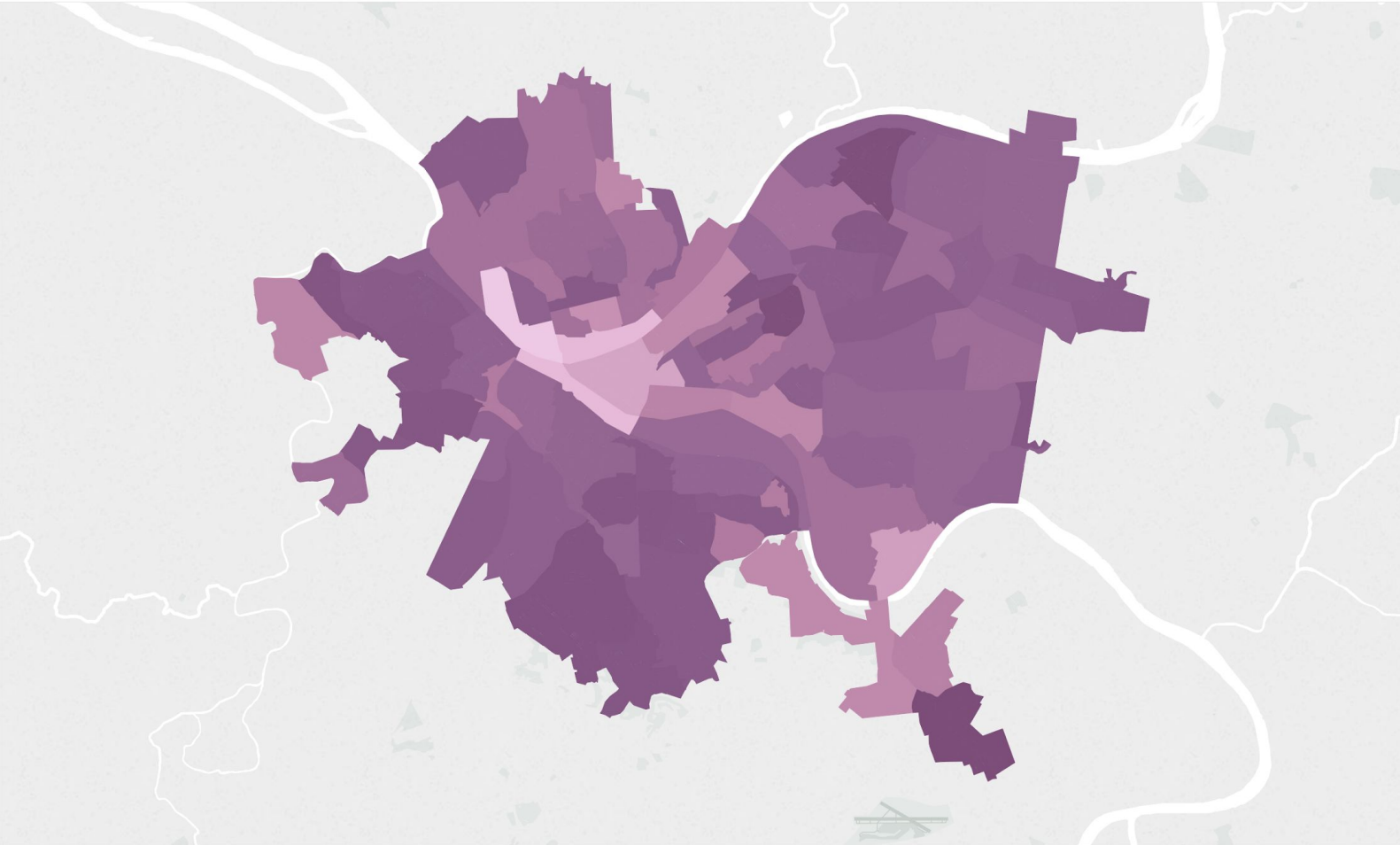
Pittsburgh Neighborhoods Obesity Heat Map

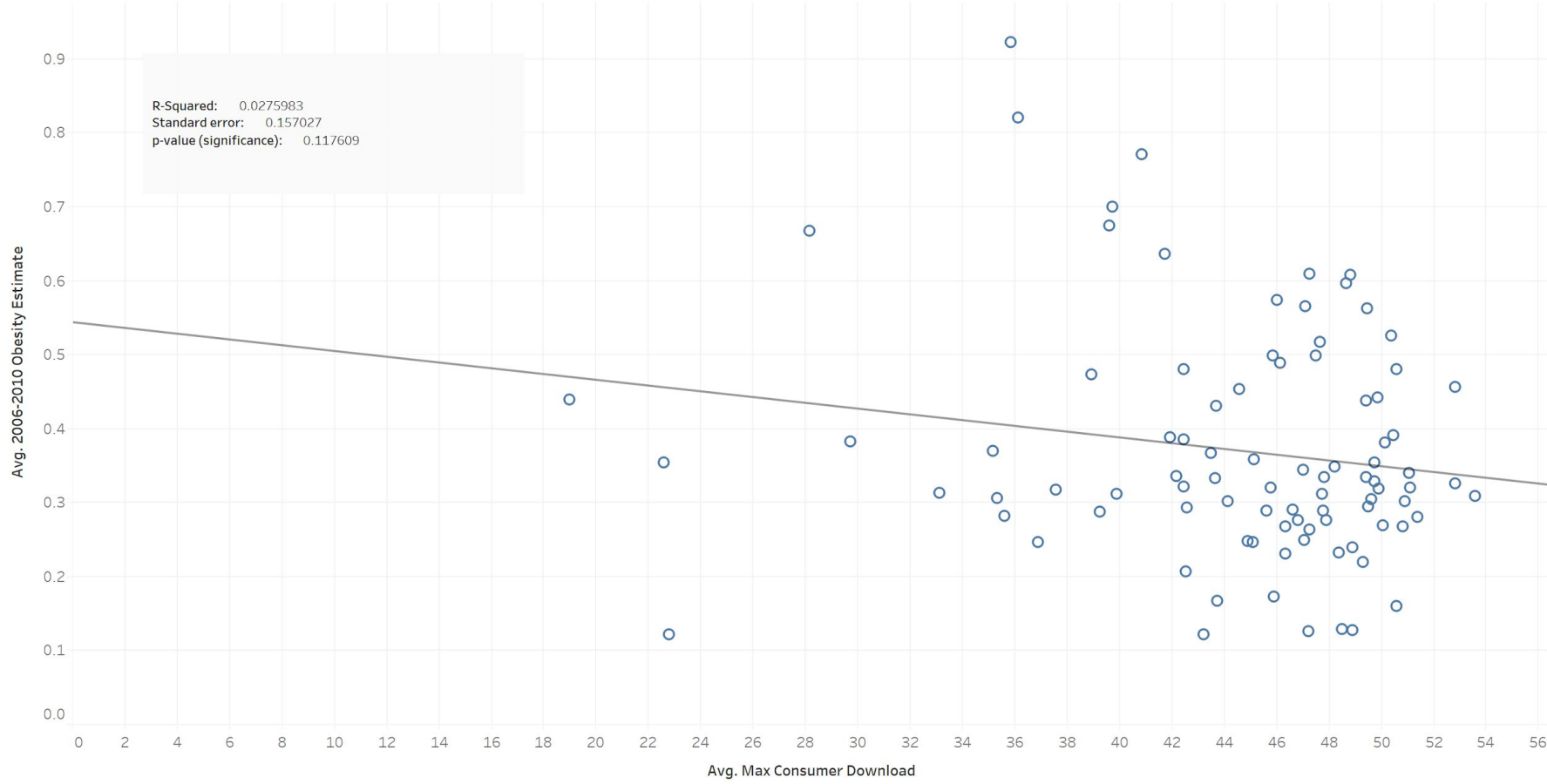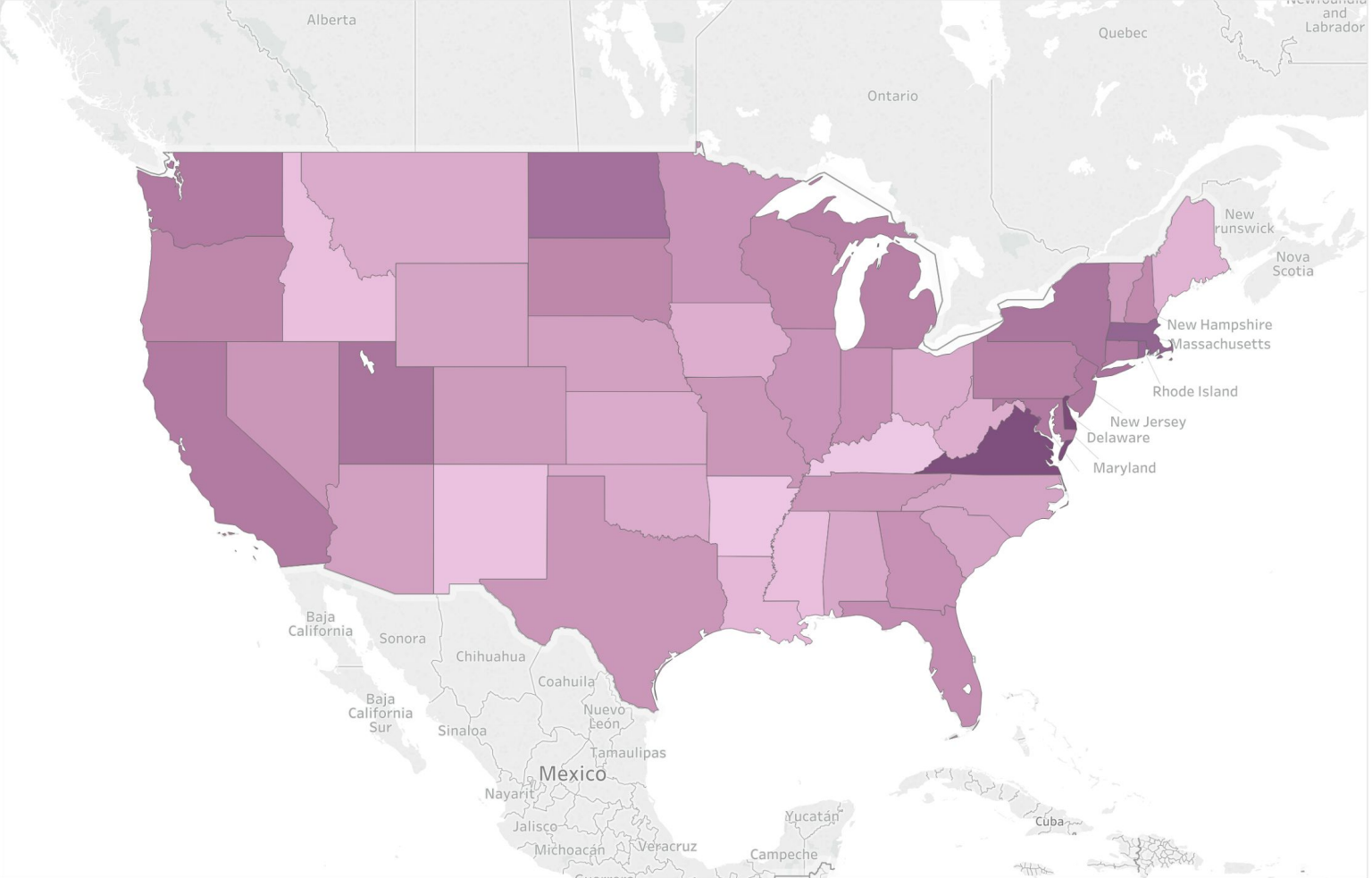Obesity vs Max Consumer Download Speeds (Mbps) for Pittsburgh Neighborhoods

Obesity vs Max Consumer Download Speeds (Mbps) for Pittsburgh Neighborhoods (with Income Grouping)
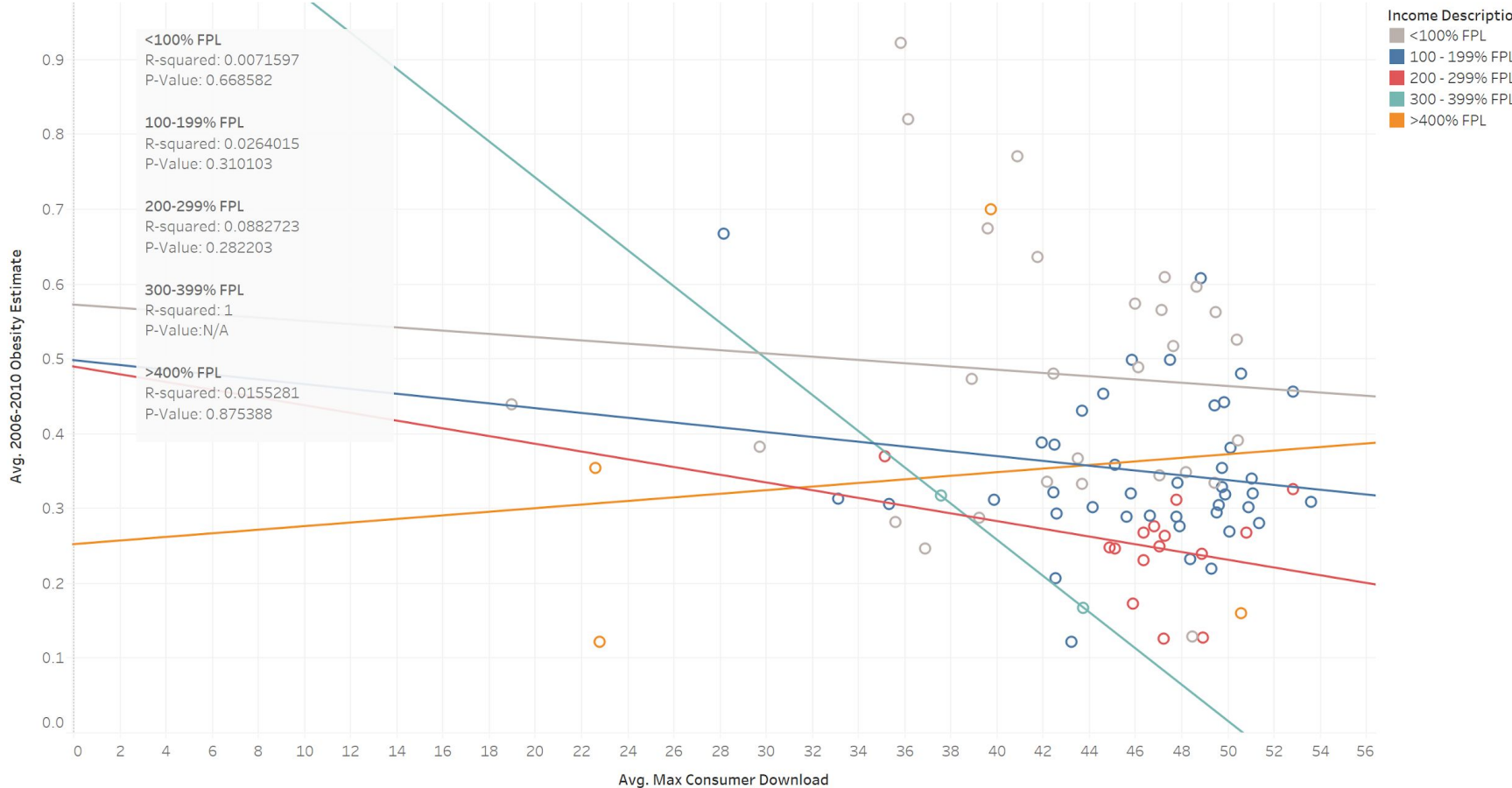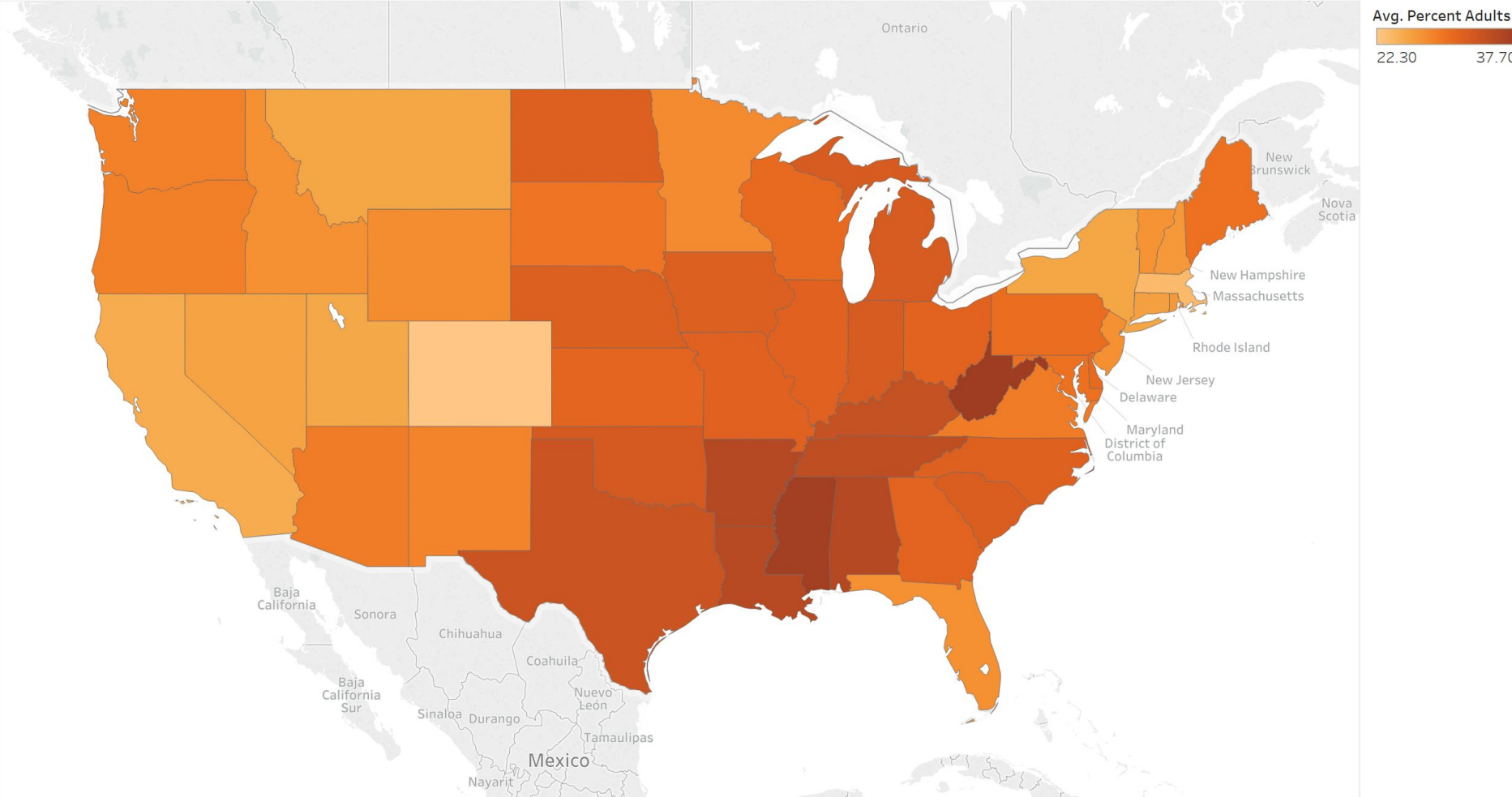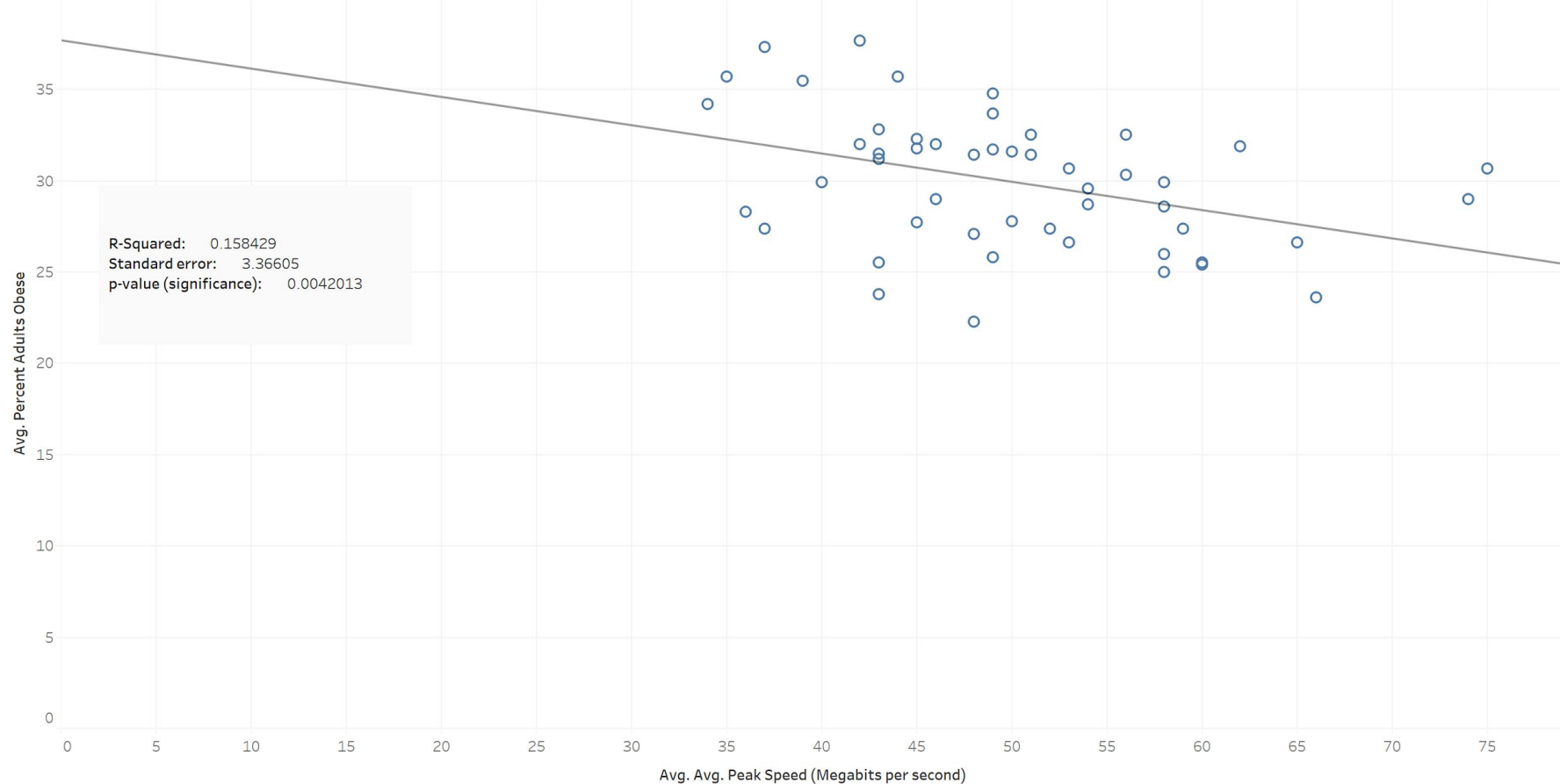
United States

United States Internet Speeds Heat Map

United States Obesity Heat Map

Obesity vs Average Peak Speed (United States)

Obesity vs Average Peak Speed (United States) (with Income Grouping)

Analysis

At the local level, there appears to be a very weak negative correlation of aggregate data. However, given that p = 0.12 > 0.05, this result is not statistically significant. When this same data is divided into distinct income groups (<100% FPL, 100-199% FPL, 200-299% FPL, 300-399% FPL, >400% FPL), there appears to be very weak negative correlations for the <100% FPL, 100-199% FPL, and 200-299% FPL groups and a very weak positive correlation for the >400% FPL group. The results for the 300-399% FPL group can be disregarded as it only contains two data points.

When the aggregate data at the national level is analyzed, there appears to be a statistically significant (p = 0.0042 < .05) correlation between internet speeds and obesity rates. When the data is grouped by income (100-149% FPL, 150-199% FPL, 200-249% FPL), there is a weak negative correlation for the 150-199% FPL income group and weak positive correlations for the 100-149% FPL and 200-249% FPL groups.

Pittsburgh			
Income Group	**r**	**p-value**	**Analysis**
<100% FPL	-0.0846	0.6686	Weak, insignificant
100-199% FPL	-0.1625	0.3101	Weak, insignificant
200-299% FPL	-0.2971	0.2822	Weak, insignificant
300-399% FPL*	—	—	—
>400% FPL	0.1246	0.8754	Weak, insignificant

* The 300-399% FPL group only had 2 data points, so no accurate r and p values could be determined for the group.

United States			
Income Group	**r**	**p-value**	**Analysis**
100-149% FPL	0.4773	0.4163	Moderate, insignificant
150-199% FPL	-0.2871	0.1173	Weak, insignificant
200-249% FPL	0.2341	0.4206	Weak, insignificant

Discussion (Academic Journals)

While the data points towards no correlation between between Internet speeds and obesity rates, other researchers have found significant results regarding the connection between the presence of technology and obesity. For example, A 2009 study by the Central Queensland University published in the Journal of Medical Internet Research determined that participants with a high leisure-time Internet and computer usage were 1.46 times more likely to be overweight than participants with less leisure time Internet usage. Another report from the Milken Institute in 2012 showed that a 10% increase in national spending on technology was correlated with a 1% increase in that nation's obesity rate. So while the results indicate that internet speeds and obesity are not related, internet usage and obesity definitely are. In fact, as outlined by the National Institutes of Health, a potential solution to this problem involves offering extrinsic motivation, such as monetary rewards, in order to encourage more people to exercise.

Conclusion

The final results of the data analysis show that there exists no significant relationship between internet speed and obesity. Thus, we cannot reject the null and the two variables are likely independent.

Challenges

- Finding credible and representative datasets for both the local and national levels
- Determining how to judge a household's income
- Deciding cutoffs for income grouping
- Data visualization using Tableau

Recommendations

1. ISPs should reduce prices to increase high speed Internet access in lower-income neighborhoods.
2. Further research in area to find more definitive conclusions.

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