Project Movat

A guide to understanding the social factors that may contribute to obesity

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Objective

What socioeconomic and economic factors has the highest correlation with obesity rates? The objective is to find if there is correlation between obesity rate and the following social factors:

- **Median household income**
- **% Exercise opportunities**
- **% Physically inactive**
- **% Access to primary care physicians**
- **High school graduation**
- **% Unemployed**

Data Collection

Socrata

United States Census Bureau

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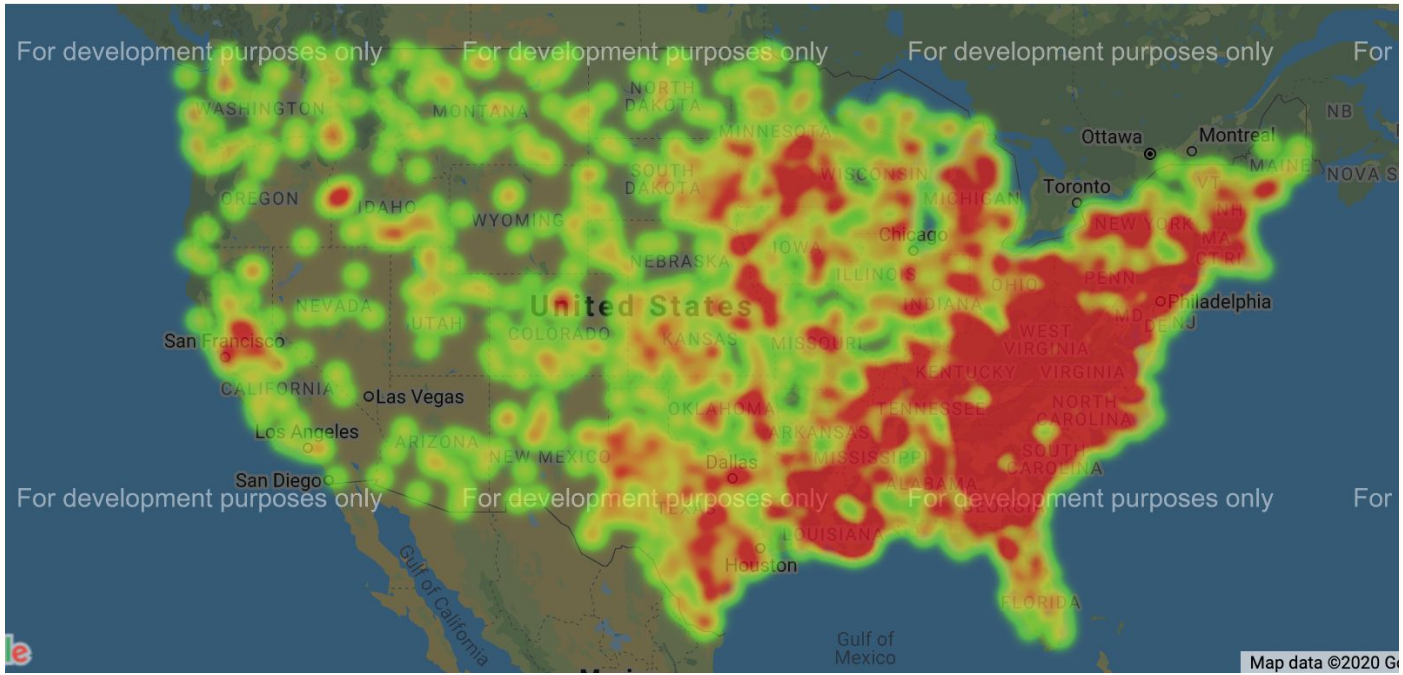
```
path = "./CountyHealthRankings"
all_files = glob.glob(path + "/*.csv")

# Read all csv files in folder and append to create one dataframe

all_states = []
for filename in all_files:
    df = pd.read_csv(filename, index_col=None, header=0)
    all_states.append(df)
frame = pd.concat(all_states, axis=0, ignore_index=True)
frame.head()
states_health_df = frame[[
                          "FIPS",
                          "% Adults with Obesity",
                          "% Physically Inactive",
                          "% With Access to Exercise Opportunities",
                          "Primary Care Physicians Rate",
                          "High School Graduation Rate",
                          "% Unemployed"
                         ]]
states_health_df.head()
```

Obesity Rate Heatmap for the Lower 48 states
Where is obesity concentrated in the US?



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Obesity Rate vs. % Unemployed

California

Texas

Florida

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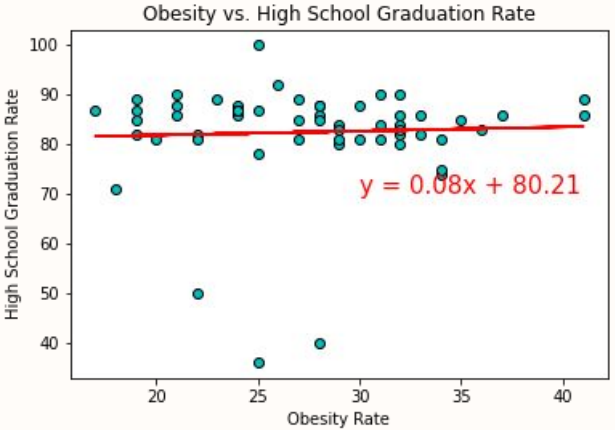
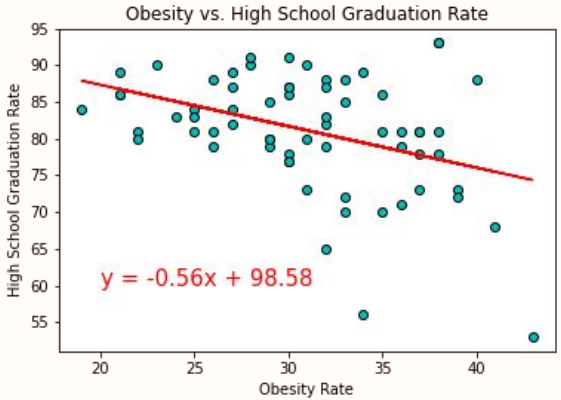
Obesity Rate vs. % High School Graduation



California

Texas



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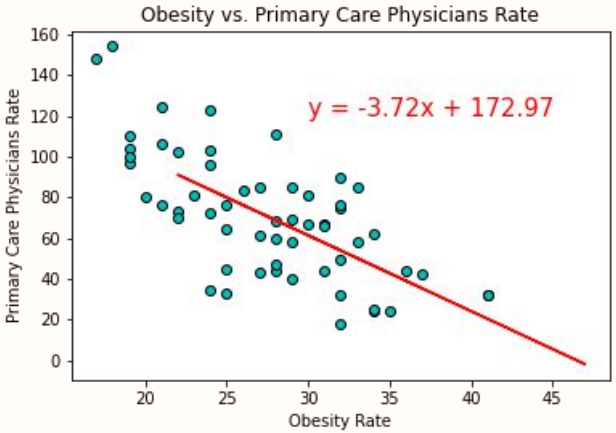
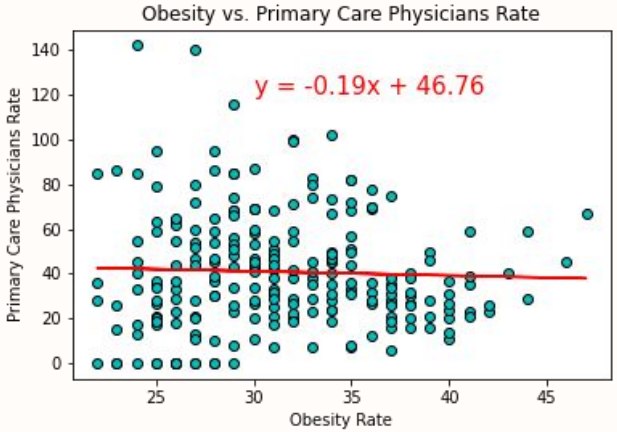
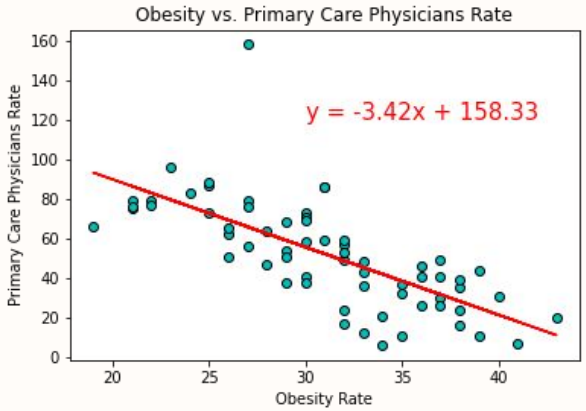
Obesity Rate vs. % Access to Primary Care Physicians



California

Texas





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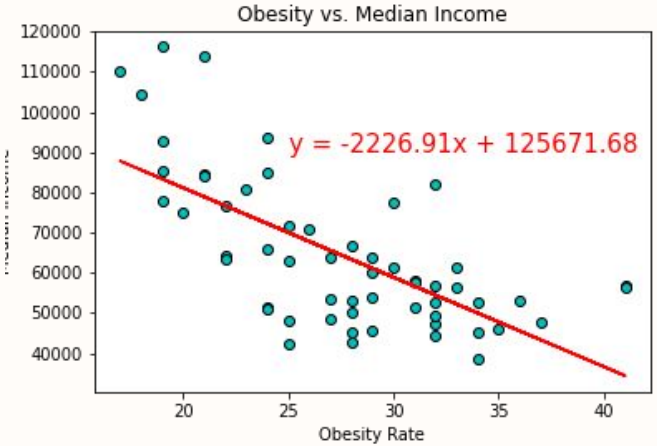
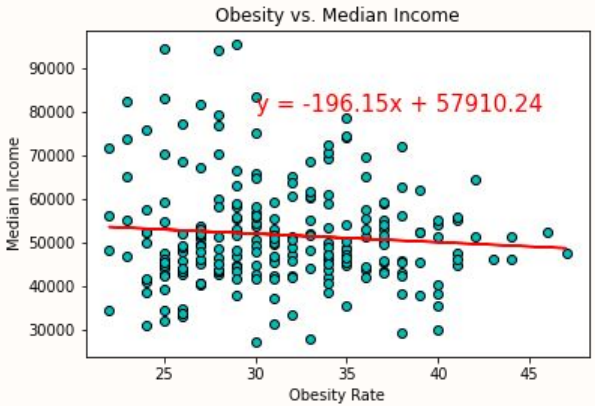
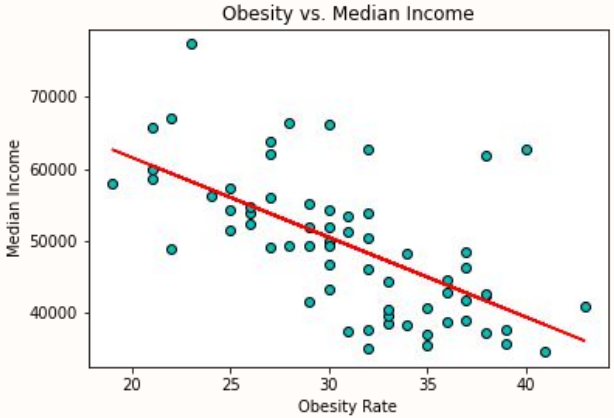
Obesity Rate vs. Median Income



California

Texas





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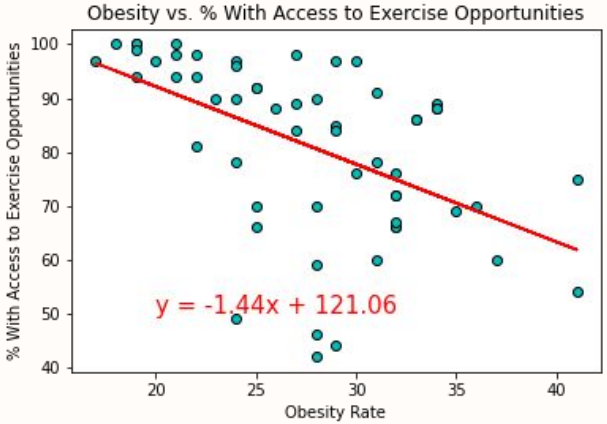
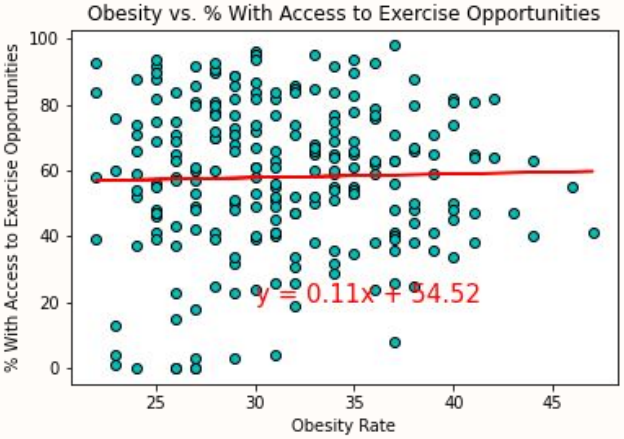
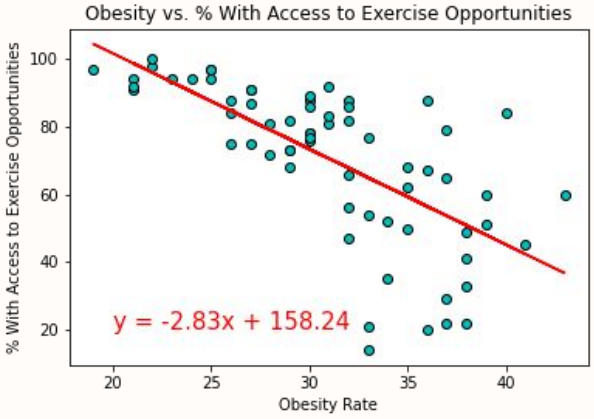
Obesity Rate vs. % Exercise Opportunities



California

Texas





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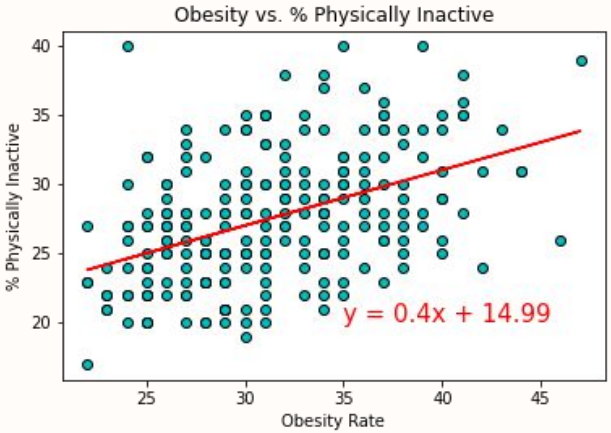
Obesity Rate vs. % Of Physically Inactive

California

Texas



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Omnibus Model testing 6predictors vs. Obesity Rate

OLS Regression Results

Dep. Variable:	% Adults with Obesity	R-squared (uncentered):	0.980
Model:	OLS	Adj. R-squared (uncentered):	0.980
Method:	Least Squares	F-statistic:	2886.
Date:	Fri, 27 Nov 2020	Prob (F-statistic):	2.58e-293
Time:	14:26:43	Log-Likelihood:	-1025.5
No. Observations:	354	AIC:	2063.
Df Residuals:	348	BIC:	2086.
Df Model:	6		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
% With Access to Exercise Opportunities	0.0211	0.012	1.731	0.084	-0.003	0.045
% Physically Inactive	0.6381	0.040	15.968	0.000	0.560	0.717
High School Graduation Rate	0.0873	0.018	4.773	0.000	0.051	0.123
Median Income	2.907e-05	2e-05	1.455	0.147	-1.02e-05	6.84e-05
Primary Care Physicians Rate	-0.0167	0.011	-1.587	0.113	-0.037	0.004
% Unemployed	0.8521	0.149	5.722	0.000	0.559	1.145

Omnibus:	7.883	Durbin-Watson:	1.942
Prob(Omnibus):	0.019	Jarque-Bera (JB):	8.571
Skew:	0.267	Prob(JB):	0.0138
Kurtosis:	3.543	Cond. No.	3.50e+04

Reduced model testing 3 predictors vs. Obesity Rate

OLS Regression Results

Dep. Variable:	% Adults with Obesity	R-squared:	0.399
Model:	OLS	Adj. R-squared:	0.394
Method:	Least Squares	F-statistic:	77.39
Date:	Fri, 27 Nov 2020	Prob (F-statistic):	2.02e-38
Time:	20:33:06	Log-Likelihood:	-1020.0
No. Observations:	354	AIC:	2048.
Df Residuals:	350	BIC:	2063.
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	13.8525	2.193	6.316	0.000	9.539	18.166
% Physically Inactive	0.5491	0.046	11.996	0.000	0.459	0.639
Median Income	-1.219e-05	1.98e-05	-0.616	0.538	-5.11e-05	2.67e-05
% Unemployed	0.6533	0.154	4.252	0.000	0.351	0.956

Omnibus:	9.467	Durbin-Watson:	1.888
Prob(Omnibus):	0.009	Jarque-Bera (JB):	9.480
Skew:	0.392	Prob(JB):	0.00874
Kurtosis:	3.171	Cond. No.	5.24e+05

Applying the best model to all US counties

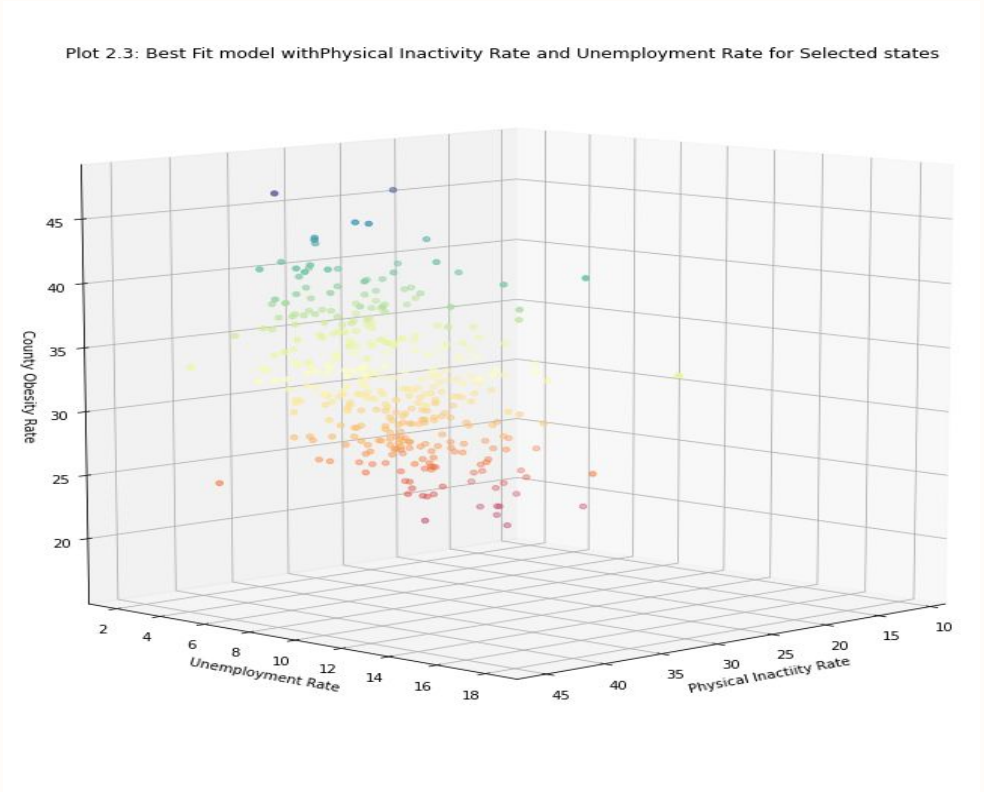
OLS Regression Results

Dep. Variable:	% Adults with Obesity	R-squared:	0.342
Model:	OLS	Adj. R-squared:	0.341
Method:	Least Squares	F-statistic:	503.9
Date:	Sat, 28 Nov 2020	Prob (F-statistic):	1.05e-263
Time:	05:00:45	Log-Likelihood:	-8451.7
No. Observations:	2914	AIC:	1.691e+04
Df Residuals:	2910	BIC:	1.694e+04
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	18.0186	1.143	15.766	0.000	15.778	20.260
% Physically Inactive	0.5141	0.015	34.820	0.000	0.485	0.543
High School Graduation Rate	-0.0113	0.012	-0.958	0.338	-0.034	0.012
% Unemployed	0.4409	0.060	7.342	0.000	0.323	0.559

Omnibus:	35.011	Durbin-Watson:	1.708
Prob(Omnibus):	0.000	Jarque-Bera (JB):	55.623
Skew:	0.089	Prob(JB):	8.35e-13
Kurtosis:	3.653	Cond. No.	1.31e+03

Reduced model testing 2 predictors vs. Obesity Rate



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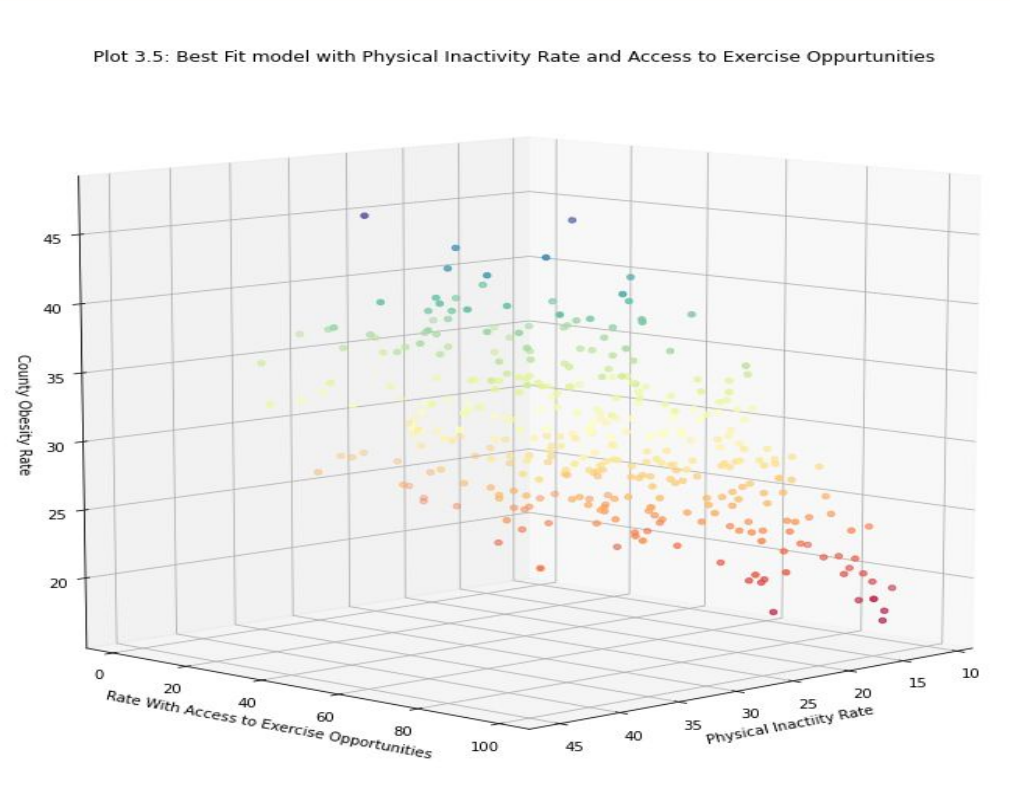
Reduced model testing 2 predictors vs. Obesity Rate



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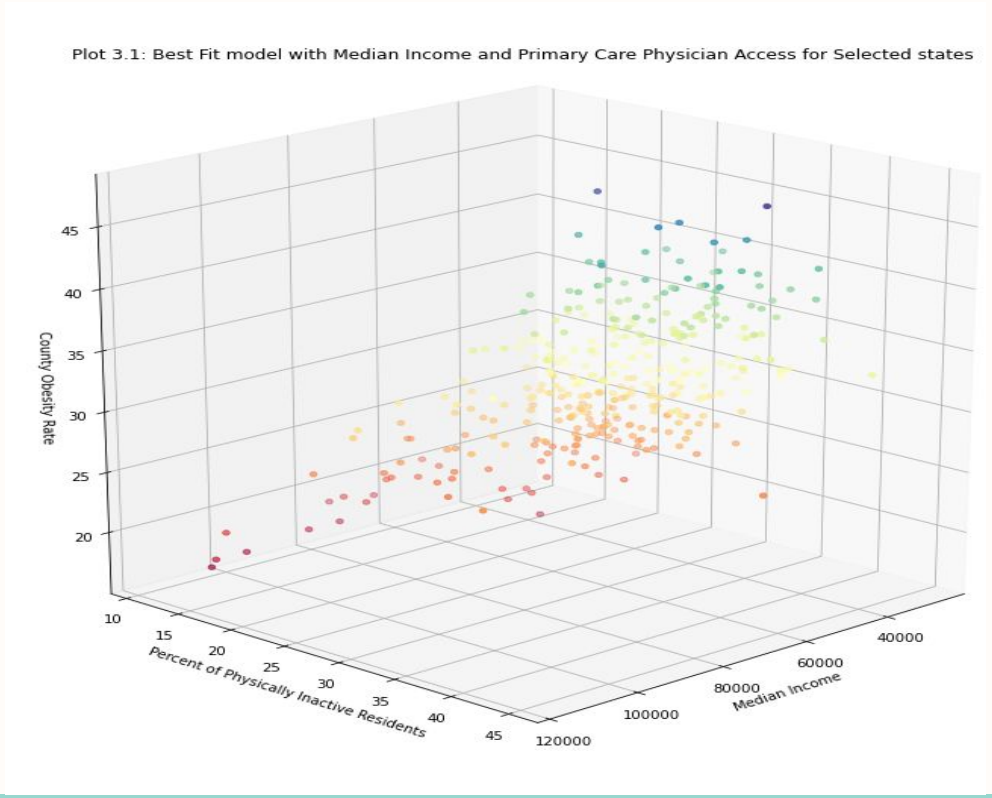
Reduced model testing 2 predictors vs. Obesity Rate



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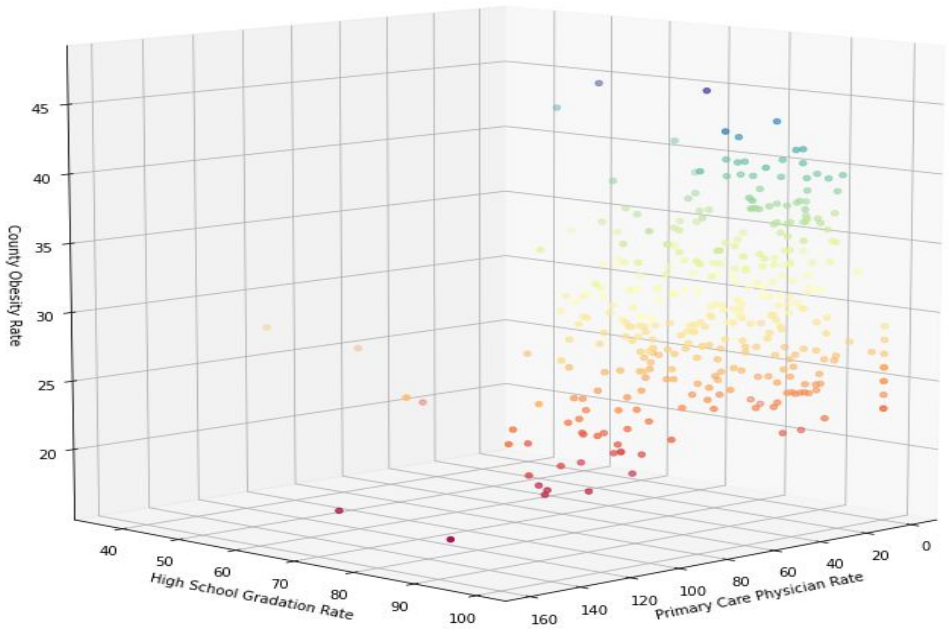
Reduced model testing 2 predictors vs. Obesity Rate

Plot 3.2: Best Fit model with High School Graduation Rate and Primary Care Physician Access for Selected states



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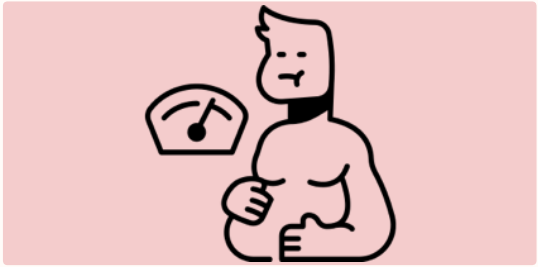
General Findings



33%

Adults were considered to be obese in 2016

15%

Of the top 100 counties with highest obesity rates is in Mississippi, making it the worst state

27%

Adults reported NO leisure-time physical activity

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Limitations

- Median Income data is limited to what we can get from the US Census, therefore it may not be a perfect representation of the correlation between obesity and median income for the year we looked at
- Data is at the county level; and findings may not be applicable to individuals
- Datasets only represent one year
- BMI is not the best indicator of obesity

Conclusions

- Obesity is not necessarily a personal failure. While the best predictors for obesity are wellness indicators like Physical Inactivity; social indicators appear to have significant influence on the outcome as well even when we control for wellness indicators:

- Physical inactivity matters; but substantially less in counties with high median incomes. (Plot 3.1)

- Exercise opportunities and being physically inactive have some the highest correlation, so increasing exercise opportunity can be one solution in the fight against obesity; but only if combined with campaigns to encourage less inactivity. (Plot 3.5)

Take care of your body.

- Eat well-balanced, healthy meals
- Exercise regularly
- Stress less, meditate, and take deep breaths

In other words, do the OPPOSITE of what we've all been doing since the start of the pandemic/ data bootcamp

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FOR OUR EYES ONLY: Explaining MR