# Food-Environment-Effect-On-Obesity

Presented by Jyoti Shukla

# Obesity

Obesity is a complex disease involving an excessive amount of body fat. Obesity isn't just a cosmetic concern. It is a medical problem that increases your risk of other diseases and health problems, such as heart disease, diabetes, high blood pressure and certain cancers. Everybody knows about human risk factors such as diet, physical activity, inactivity, drug use, and genetics.

**Many key factors in our society include education, skills, food marketing, affordability of healthy foods, physical activity, and food environment.**

**The food environment plays a major and frequently dominant role in nutrition choice, eating habits, and eventually energy intake.**

**Through this project, I have analyzed the impact of food environments on adult obesity rates the same is going to present to the County Officials / State Governors some actionable insights.**

# Data Source and understand data

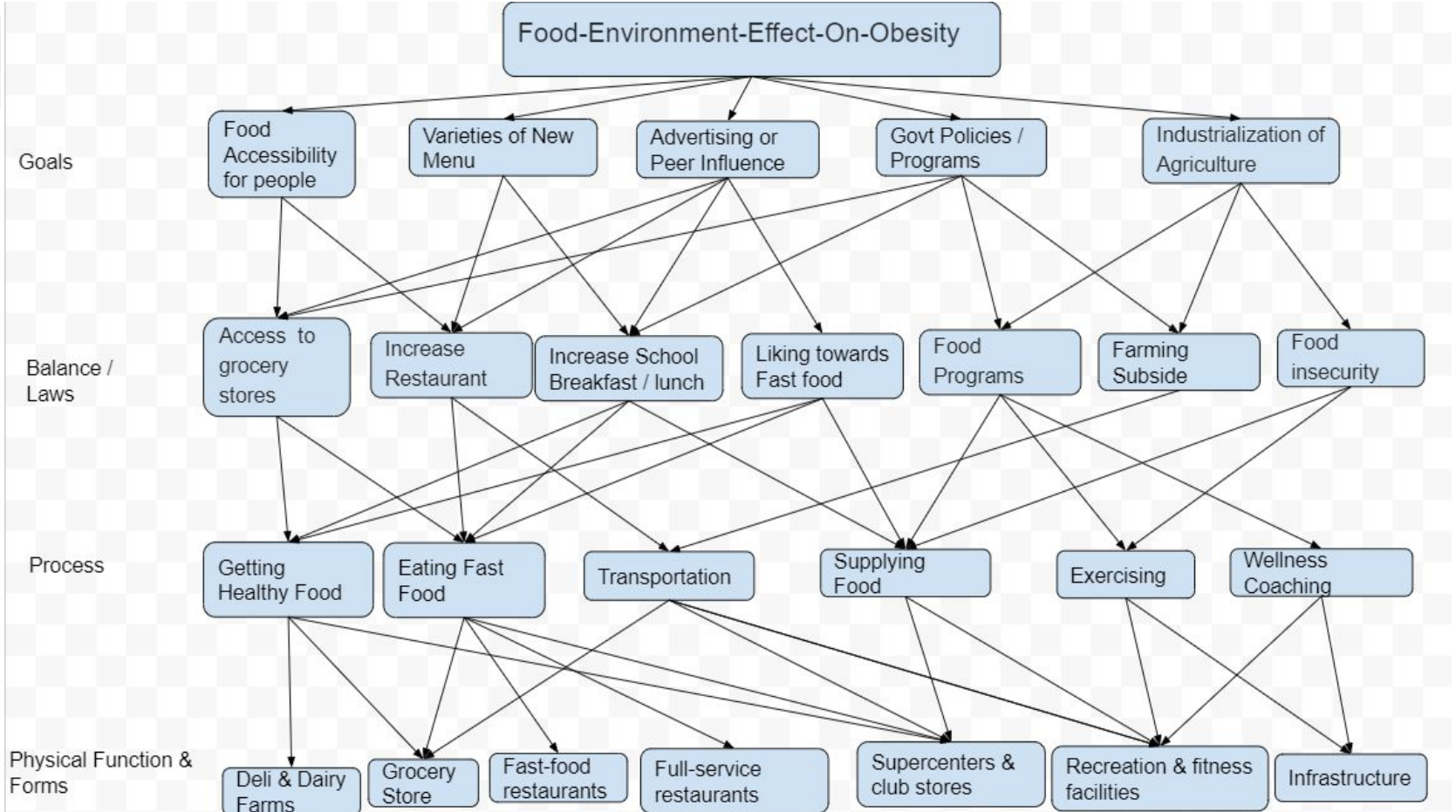
I have used  2014 data from USDA (United States Department of Agriculture, Economic Research Service) Food Atlas [https://www.ers.usda.gov/data-products/food-environment-atlas/data-access-and-documentation-downloads/#February%202014%20Version].

It is a public dataset containing data for 3179 US counties. It has 212 different variable names from different categories like Health, Insecurity, local, restaurants, stores, socio-economic data of each county. It also provides some Supplemental data like population, meal programs in the USDA dataset. The data is in the form of a single excel file with data sorted in multiple sheets as per the category

For this project, I have used the Food Environment Atlas Data: FoodEnvironmentAtlas2014.xls file

For Data Analysis and Visualization I have used some variables from the list, which are described in the Variable and constraints section.

# Work Domain Analysis



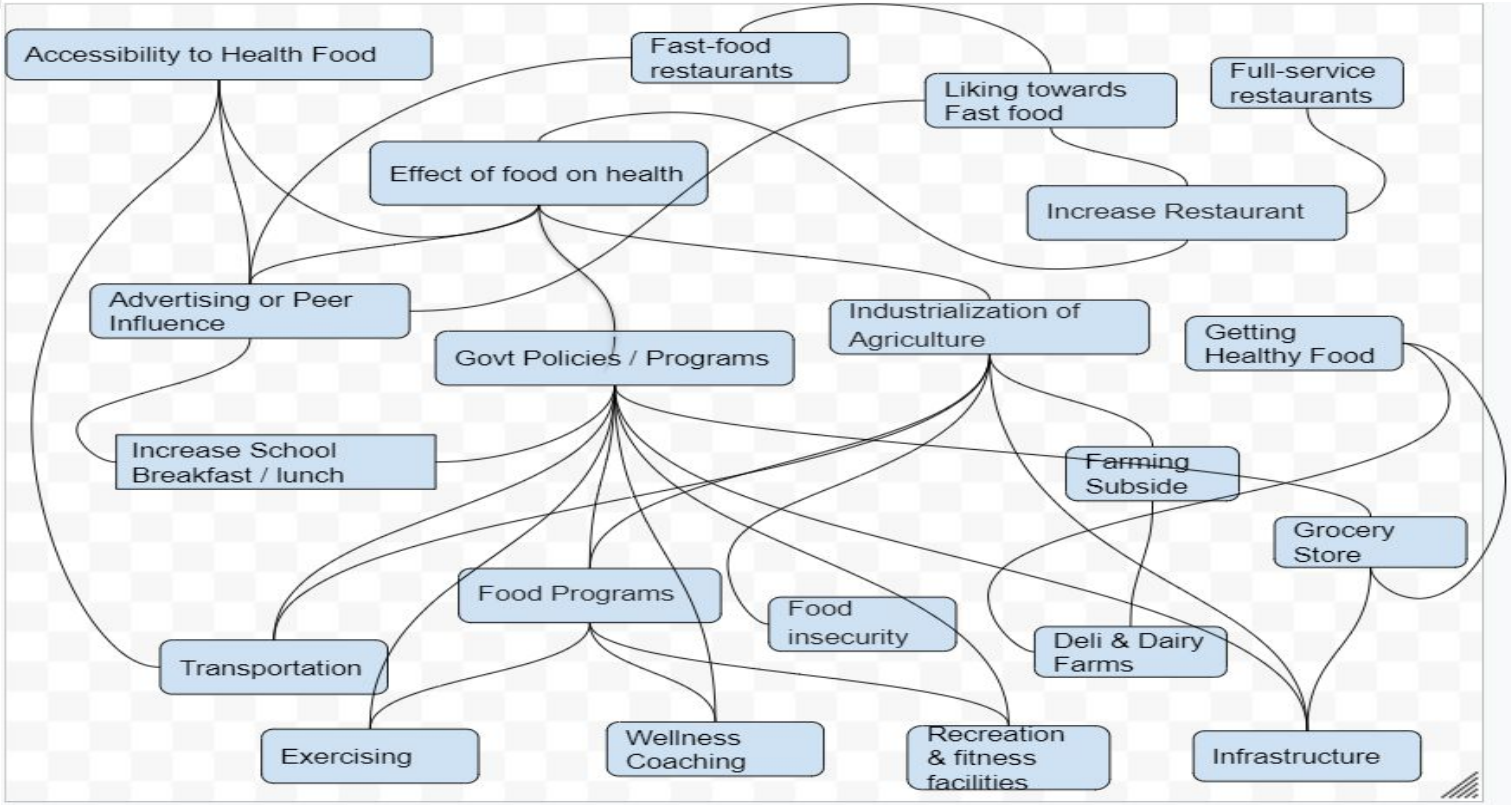
# Part-Whole Decomposition

| | Food-Environment-Effect-On-Obesity | | | | |
|---|---|---|---|---|---|
| Goals | Provide Nutrion Food | Varieties of New Menu | Advertising or Peer Int | Govt Policies / Prog | Industrialization of Agriculture |
| Balance Laws | Access to grocery stores | Increase Restaurant | Increase School Breal | Liking towards Fast | Food Programs<br>Food insecurity<br>Farming Subside |
| Process | Encouraging Food Nutrition | Eating More Fast Food | Transportation | Exercising<br>Wellness Coaching | Supplying |
| Physical Function & Forms | Deli & Dairy Farms | Grocery Store | Fast-food restaurants | Full-service restaura<br>Recreation & fitnes | Infrastructure<br>Supercenters & club stores |

# Variables & Constraints

| Goals | Exhaustive list of Variables | Finalized list of Variables | Types of Con | Constraint | Mean/End Between Variables (if A | Mean/End Realationship between G |
|---|---|---|---|---|---|---|
| Obesity Rate | Unhealthy diet<br>Lack of public transportation<br>Lack of Recreation and fitness center<br>Less access to grocery store | Dependent Variable | Multivariate | Proper healthc | The estimate of the age-adjusted percentage of persons age 20 and older who are obese, where obesity is Body Mass Index (BMI) greater than or equal to 30 kilograms per meter squared. | |
| Food Accessibility for people | Population, low access to store<br>Households, no car & low access to store (%)<br>Children, low access to store | Population, low access to s | Multivariate | Accessibility to | Low access to stores can make it ha<br>People with low income cannot affor<br>their health | Affects the health of low income peopl |
| Varieties of New Food Menu | Full-service restaurants/1,000 pop (% change)<br>Full-service restaurants<br>SNAP redemptions/SNAP-authorized stores<br>SNAP participants (% pop) | Full-service restaurants | Multivariate | Full-service re | The number of full-service restauran<br>per 1,000 residents. | Healthy food availability for the people<br>providing food services by patrons |
| Advertising or Peer Influence | Fast-food restaurants<br>Fast-food restaurants/1,000 pop (% change)<br>Expenditures per capita, fast food | Fast-food restaurants | Multivariate | less Fast-food | The food from fast-food restaurants i | Affects the health of more people |
| Govt Policies / Programs | Low income & low access to store (%)<br>National School Lunch Program participants (% pop)<br>Students eligible for free lunch (%)<br>School Breakfast Program participants (% pop)<br>Summer Food Program participants (change % pop)<br>Poverty rate | Low income & low access t<br>Poverty rate | Multivariate | Provide facilit | Percentage of people in a county wit<br>living more than 1 mile from a superr<br>supercenter, or large grocery store.<br>Percentage of county residents with<br>income below the poverty threshold. | Poverty and low income affects getting |
| Industrialization of Agriculture | Price of sodas/national average<br>Price of low-fat milk/price of sodas | Price of low-fat milk/price of | Multivariate | Low-fat milk st | It is the ratio of prices of healthy proc<br>be useful to check how the affordabil<br>affects obesity. | Price of low fat milk and sodas ratio |
| **Balances / Laws** | **Exhaustive list of Variables** | **Finalized list of Variables** | **Types of Con** | **Constraint** | **Mean/End Between Variables (if A** | **Mean/End Realationship between G** |
| Access to grocery stores | Grocery stores<br>Supercenters & club stores<br>Convenience stores<br>Specialized food stores<br>SNAP-authorized stores<br>WIC-authorized stores | Grocery stores<br>Supercenters & club stores<br>Convenience stores<br>Specialized food stores<br>SNAP-authorized stores | Multivariate | More stores ne | The number of supermarkets, grocer<br>specialized food stores in the<br>county per 1,000 county residents. | Healthy food items availability for the p |
| Increase Restaurant | Full-service restaurants/1,000 pop (% change)<br>Full-service restaurant | Full-service restaurants | Univariate | Full-service re | The number of full-service restauran<br>per 1,000 residents. | Healthy food availability for the people<br>providing food services by patrons |
| Increase School Breakfast / lur | School Breakfast Program participants (% pop)<br>Students eligible for free lunch (%)<br>Child & Adult Care (% pop) | School Breakfast Program | Multivariate | School brakfas | The food program also provides som | The food program in schools affect the |
| Liking towards Fast food | Chip & pretzel sales tax, retail stores<br>Soda sales tax, retail stores | Chip & pretzel sales tax, rel | Multivariate | less availability | The food from fast-food restaurants i | The food from fast-food restaurants is |
| Food Programs | National School Lunch Program participants (% pop)<br>Summer Food Service Program participants (% pop)<br>Price of low-fat milk/price of sodas | Price of low-fat milk/price of | Multivariate | Lunch program | School food Program, Researchers s | these unhealthy school lunches are a |
| Farming Subside | Farms with direct sales<br>Farmers' markets | Farmers' markets | Univariate | More Farmers | The farmers market will have fresh v<br>considered as healthy food | Farmers market affects the healthy die |
| Food insecurity | WIC-authorized stores/1,000 pop<br>Household very low food security<br>Price of low-fat milk/price of sodas | WIC-authorized stores/1,00 | Multivariate | More nutrition | The ratio of the regional average pric<br>to the regional average price of soda<br>national average price ratio | The price of low-fat milk is expensive t |
| **Processes** | **Exhaustive list of Variables** | **Finalized list of Variables** | **Types of Con** | **Constraint** | **Mean/End Between Variables (if A** | **Mean/End Realationship between G** |
| Getting Healthy Food | Farmers' markets/1,000 pop<br>Orchard acres/1,000 pop<br>Berry acres/1,000 pop | Farmers' markets/1,000 po | Multivariate | Farmers' mark | The number of farmers' markets in th<br>1,000 county residents | Farmers' market provides healthy food |
| Eating Fast Food | Chip & pretzel sales tax, vending<br>Soda sales tax, vending | Chip & pretzel sales tax, ve | Univariate | Chip & pretzel | Chip & pretzel sales tax, vending fac | This facility affects more unhealthy foo |
| Transportation | Farms with direct sales (%)<br>Public Transportation | Farms with direct sales (%) | Multivariate | public transpor | Commuting by public transportation i<br>traveling by car | Less public transport affects selling pr |
| Supplying Food | Farms with direct sales (%) | Farms with direct sales (%) | Multivariate | Farms with dir | Farms with direct sales facility and tra | nsportation to the farm |
| Exercising | Recreation & fitness facilities/1,000 pop (% change) | Recreation & fitness facilitie | Multivariate | Coach availab<br>Appointment a<br>Facility availat | Fitness activities will help people in t<br>energy balance, and have a healthy | Affects maintaining healty life style |
| Wellness Coaching | High schoolers physically active (%)<br>ERS natural amenity index | High schoolers physically a | Multivariate | Facility availat | Higher amenity index promotes an a | Impacts more rural lifestyle |
| **Physical Function / Forms** | **Exhaustive list of Variables** | **Finalized list of Variables** | **Types of Con** | **Constraint** | **Mean/End Between Variables (if A** | **Mean/End Realationship between G** |
| Deli & Dairy Farms | No. of Deli and Dairy Stores<br>No. of Grocery stores | No. of Deli and Dairy Store | Univariate | Staff availabilit | Affected by Money, location<br>and transport | This affects the public health |
| Grocery Store | No. of Grocery stores<br>Storage Capacity | No. of Grocery stores | Univariate | Staff availabilit<br>Grocery availa | Affected by Money, location<br>and transport | Is limited by time money and location |
| Fast-food restaurants | No of Fast food restaurants<br>Total Capacity | No of Fast food restaurants | Univariate | Staff availabilit<br>Food avaialble | Affected by Money, location<br>and transport | Is limited by time money and location |
| Full-service restaurants | No. of Food hubs<br>No. of Full Service Restaurants | No. of Food hubs | Univariate | Staff availabilit<br>Food avaialble | Affected by Money, location<br>and transport | Is limited by time money and location |
| Supercenters & club stores | No. of Super centers<br>no. of club stores | No. of Super centers | Univariate | Staff availabilit<br>Items avaialble | Affected by Money, location<br>and transport | Is limited by time money and location |
| Recreation & fitness facilities | No. of Recreation centers<br>No. of fitness facilities | No. of Recreation centers | Multivariate | Staff availabilit<br>Equipment ava | Affected by Money, location,<br>time and transport | Is limited by time money and location |
| Infrastructure | No. of Facilitiess<br>Total Capacity | No. of facilities | Univariate | Facilities avail<br>Staff availabilit | Affected by Money, location<br>and transport | Is limited by time money and location |

# Abstraction Network



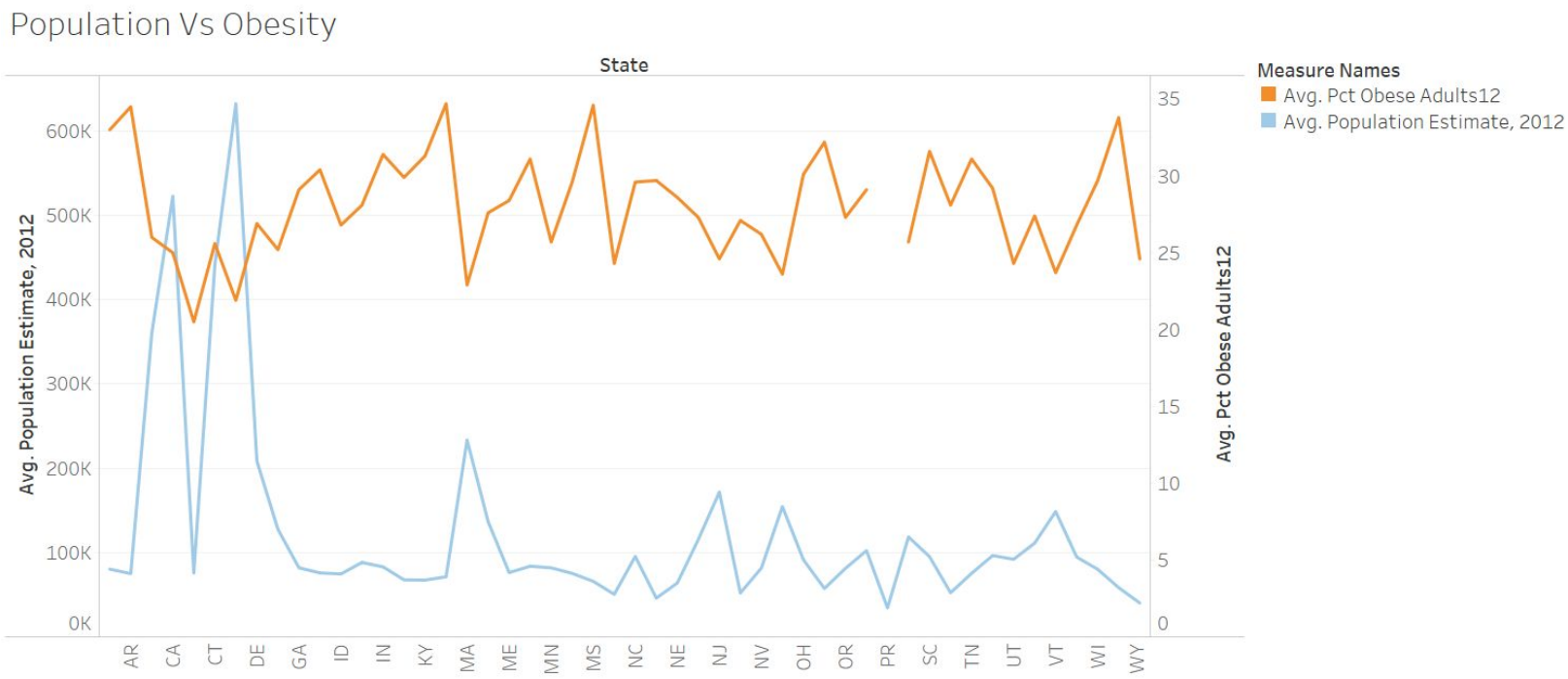
# Data Visualization

I have merged sociodemographic, restaurants, food stores, and obesity data from the Food Environment Atlas Data to show the frames of reference how the obesity over the total  population and the the main reasons are mostly poverty, less healthy food access choice, more fast food consumption and less access to recreation and fitness centers..

From the Visualization it shows the active lifestyle, healthier food environment and choices are significant in controlling obesity and diabetes both..

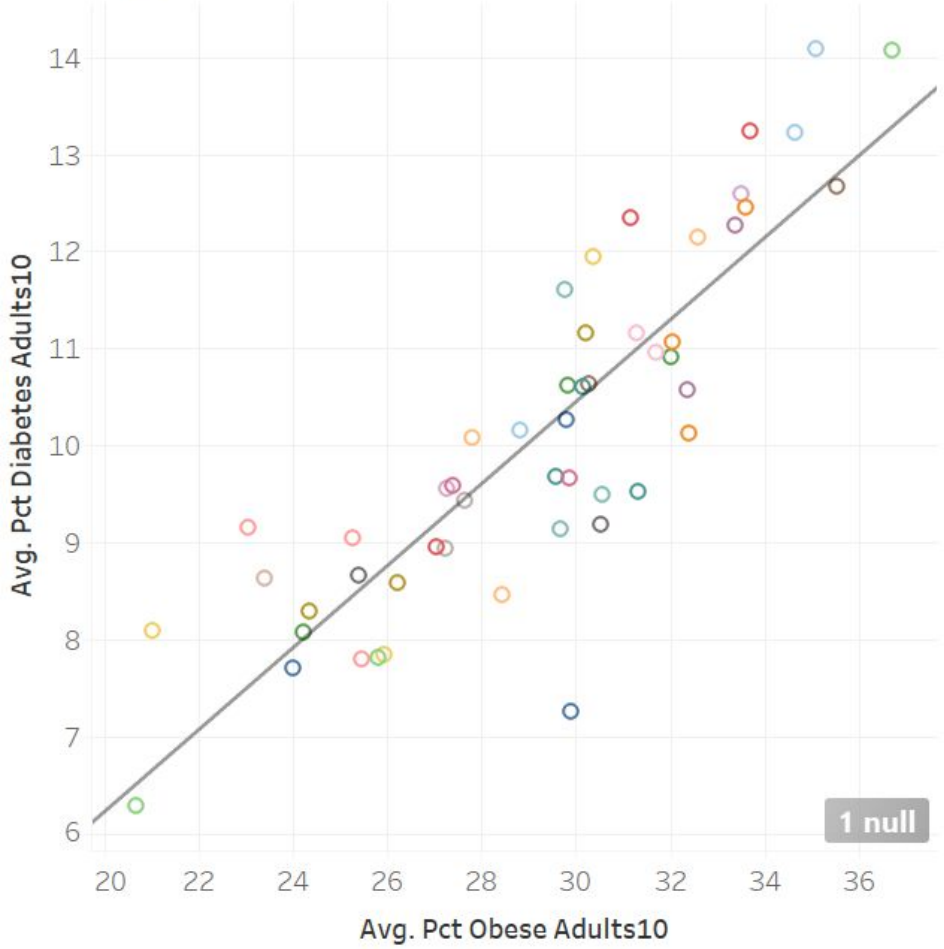
For visualization i have used scatter plot, bar graph and dual axis graph to represent the required data. I have chosen the below frames as they shows how the poverty, and less nutrition food impacts people's' health.

# Frames of reference




The trends of Avg. Population Estimate, 2012 and Avg. Pct Obese Adults12 for State. Color shows details about Avg. Population Estimate, 2012 and Avg. Pct Obese Adults12. The view is filtered on State, which has multiple members selected.

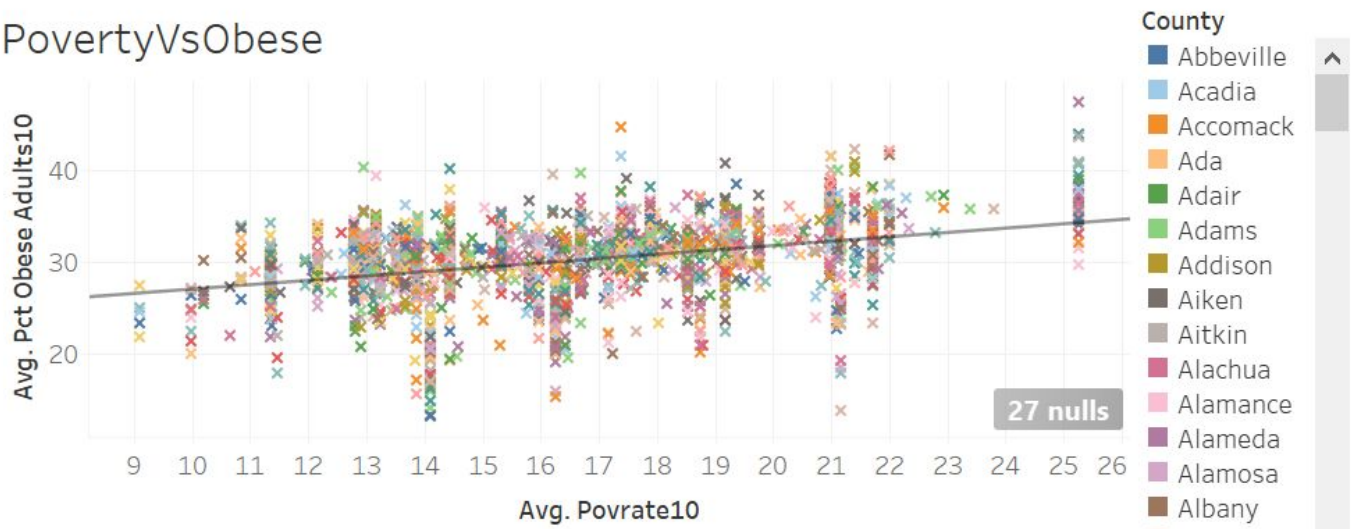
# Obesity Vs Diabetes



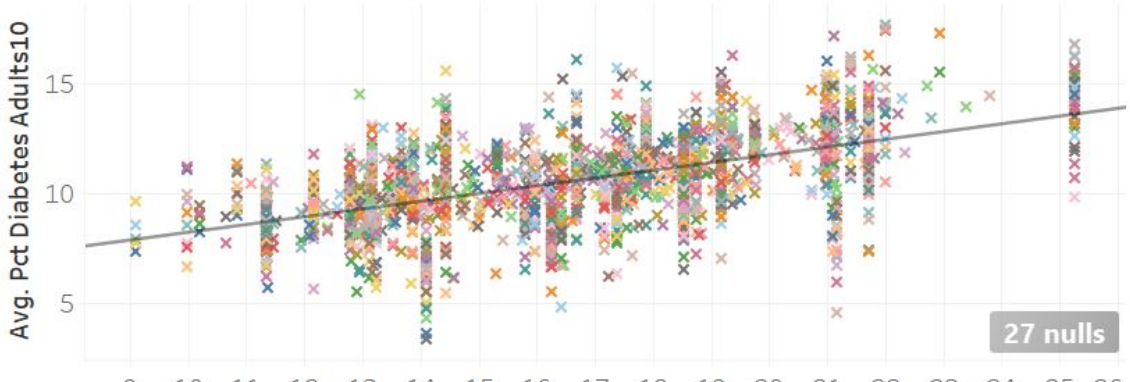

State

- AK
- AL
- AR
- AZ
- CA
- CO
- CT
- DC
- DE
- FL
- GA
- HI
- IA
- ID
- IL
- IN
- KS
- KY
- LA
- MA
- MD
- ME
- MI
- MN
- MO
- MS
- MT

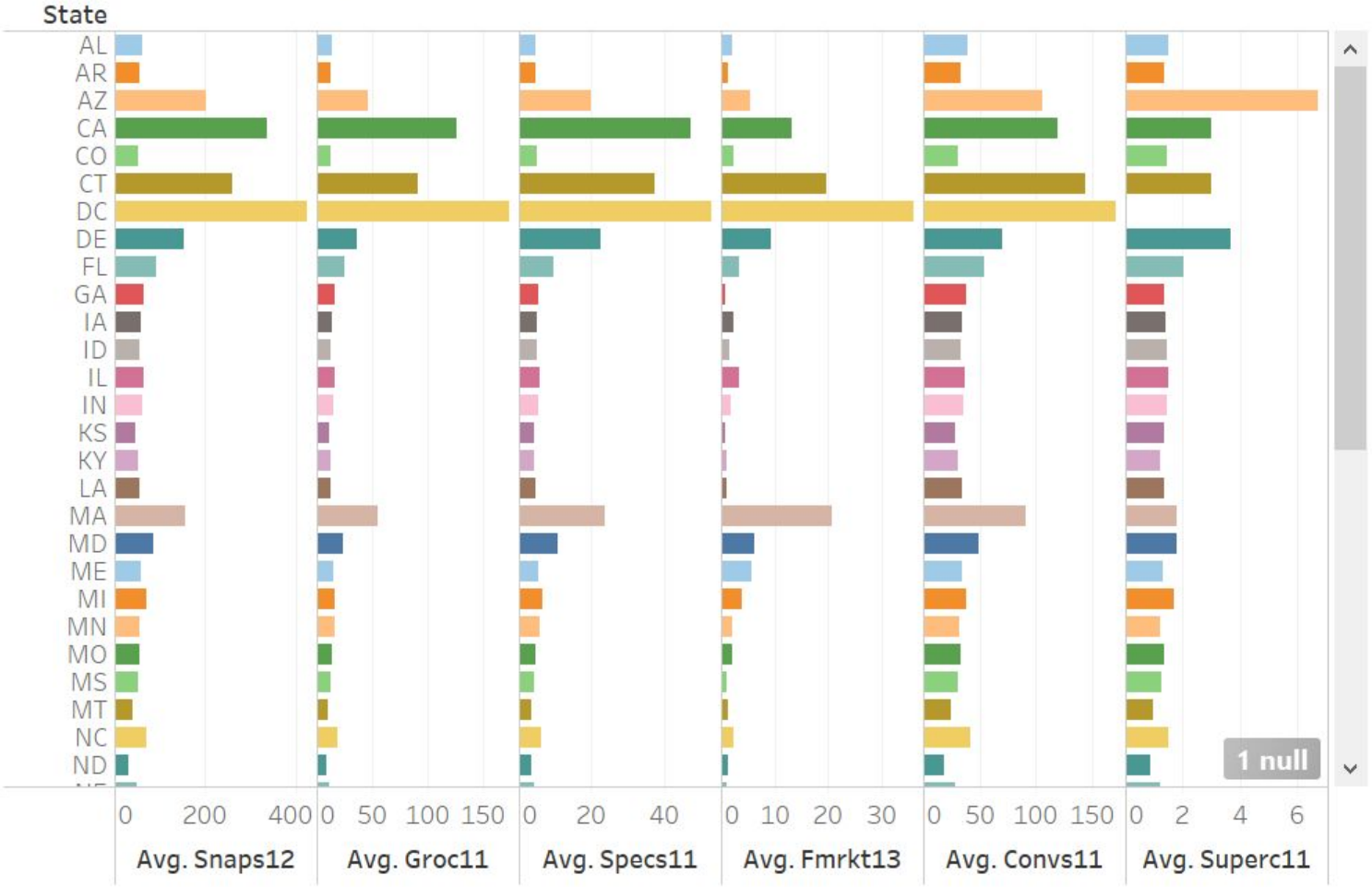
## PovertyVsObese

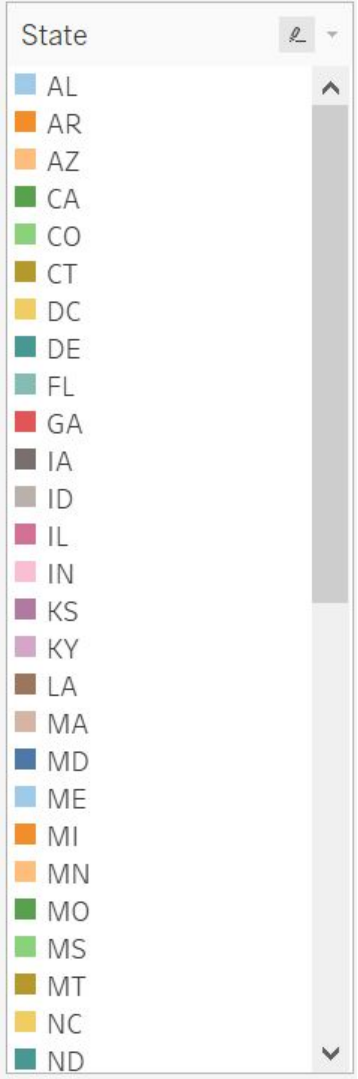



## PovertyVsDiabetes

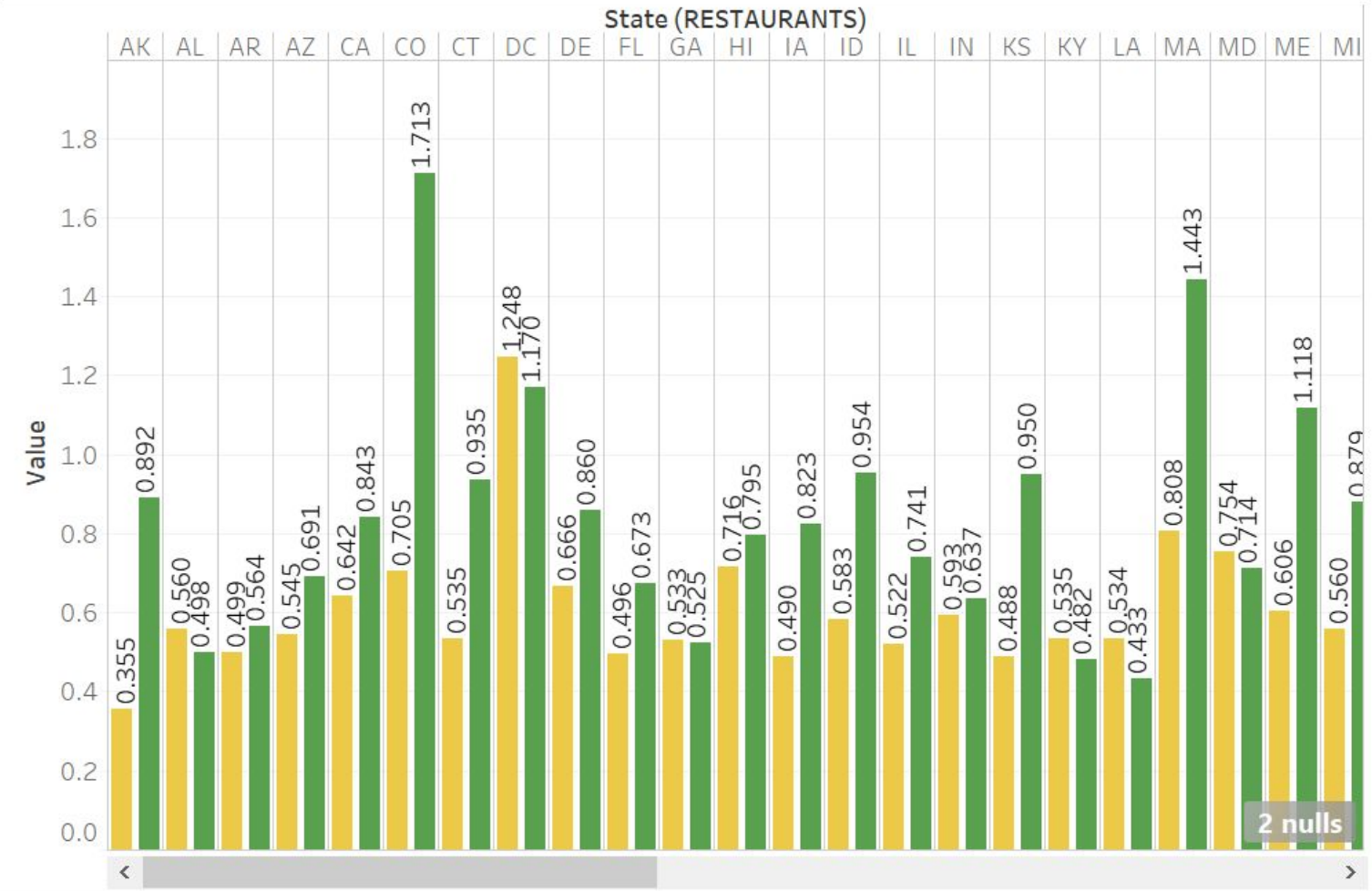


# Stores Availability



# FastfoodVsFullService Restaurant




Measure Names

- Avg. Ffrpth11
- Avg. Fsrpth11

# What factor or factors are contributing to obesity and diabetes in America?

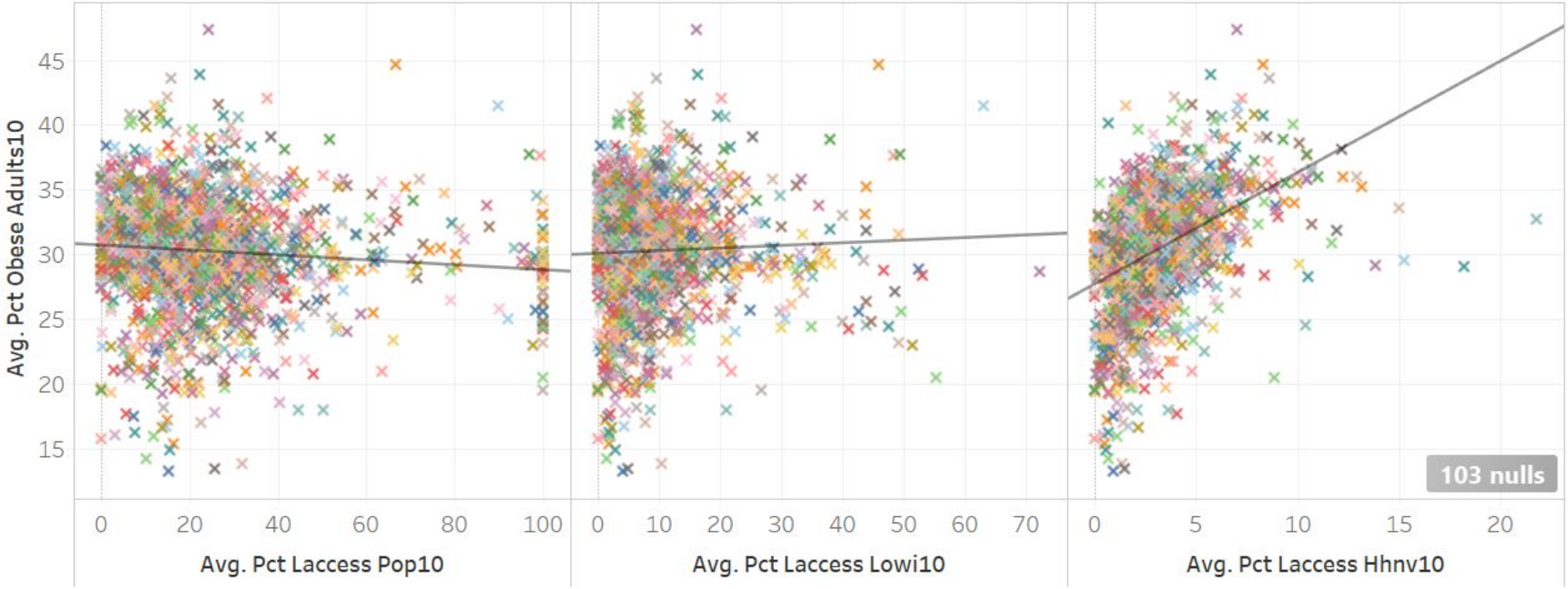
- Recreational facilities promote healthy and active living and can help to reduce obesity
- Full-service restaurants are a healthier alternative to fast food restaurants as they provide well cooked nutritious, low-calorie healthy food.
- The affordability of healthy food items has a great impact on controlling obesity. If the prices are 1% less expensive compared to unhealthy products like soda, obesity can be reduced
- Reducing Poverty also helps to control obesity as the low income people try to but food which is less pricy and these are not healthy
- Specialized food stores like retail bakeries, meat and seafood markets, dairy stores, and produce markets are popular and often visited by people. Obesity can be reduced if the number of specialized stores per 1000 population increase
- If more people travel to work by public transportation, obesity can be controlled
- Finally Education helps to create more awareness about the importance of healthy and active living and can help to reduce obesity.

# Recreational and Fitness facilities helps to reduce obesity

## What factor or factors contained in the dataset DO NOT seem to contributing to one or both of these health issues?

- Low accessibility to stores is a hurdle for having access to healthy food, it does not have any effect on obesity and diabetes. I observed in the visualization low accessibility to store is not really impacting obesity. The same scatter plot graph is shown in the next slide.

# AccessToStore




Caption

Average of Pct Laccess Pop10, average of Pct Laccess Lowi10 and average of Pct Laccess Hhnv10 vs. average of Pct Obese Adults10. Color shows details about County. The data is filtered on State, which has multiple members selected. The view is filtered on County, which has multiple members selected.

# Recommendation to County Officials or State Govt:

- Make healthy food products more affordable with the help of food assistance programs like SNAP(S) (Supplemental Nutrition Assistance Program). Increase of taxes on unhealthy products and subsidies for healthy ones can also help.
- Open more recreational facilities for every 1000 population to promote active living.
- Open more healthy food outlets like full-service restaurants and specialized stores (retail bakeries, meat and seafood markets, dairy stores, and produce markets) for every 1000 population.
- Control the number of supermarkets and club stores per 1000 population. They make food products like soda, instant and processed food, more convenient and readily available. It increases obesity risk.
- Grocery store Vs Convenience store food quality is a characteristic of the food environment that has been found to vary by store type, with convenience stores generally selling fresh produce of lower quality than grocery stores which impacts health.
- My analysis suggests that active lifestyle, healthier food environment and choices are significant in controlling obesity

# Strategies to Prevent Obesity

There is no single or simple solution to the obesity epidemic.

It’s a complex problem and there has to be a multifaceted approach.

Policy makers, state and local organizations, business and community leaders, school, childcare and healthcare professionals, and individuals must work together to create an environment that supports a healthy lifestyle.

There are several ways state and local organizations can create a supportive environment to promote healthy living behaviors that prevent obesity as I described in the Recommendation to County officials and State Govt slide..

# Reference:


1. https://www.ers.usda.gov/data-products/food-environment-atlas/
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4287570/
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2708156/
4. https://www.cdc.gov/obesity/strategies/index.html

Thank you so much!