

# DisFood Food Insecurity Analytics: Improving Chronic Disease Control

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## Summary

How does food insecurity relate to chronic diseases? Can we find counties' similarity and potential food insecurity area with chronic disease factor? Can we set up a new food pantry or supermarket to improve chronic disease control? DisFood is a tool that combines — clustering technique and interactive visualization — to help government and food banks to better allocate resources to those in needs. The tool computes improvement of food insecurity rate by building supermarkets or food pantries.

## Data Source

We analyzed these dataset obtained as shown:

|                                | Number of Rows |
|--------------------------------|----------------|
| Geographic and demographic:    | 72,000         |
| Obesity & diabetes prevalence: | 6,300          |
| Food insecurity rates:         | 3,100          |
| Food pantries locations:       | 352            |
| Supermarket locations:         | 10,000         |

Geographic and demographic, obesity & diabetes prevalence were downloaded from U.S. Census Bureau and CDC respectively. Food insecurity rates and food pantries location were scrapped from FeedingAmerica.org and Foodpantries.org respectively. Supermarket locations were obtained using GoogleMap API.

## Experiments and Results

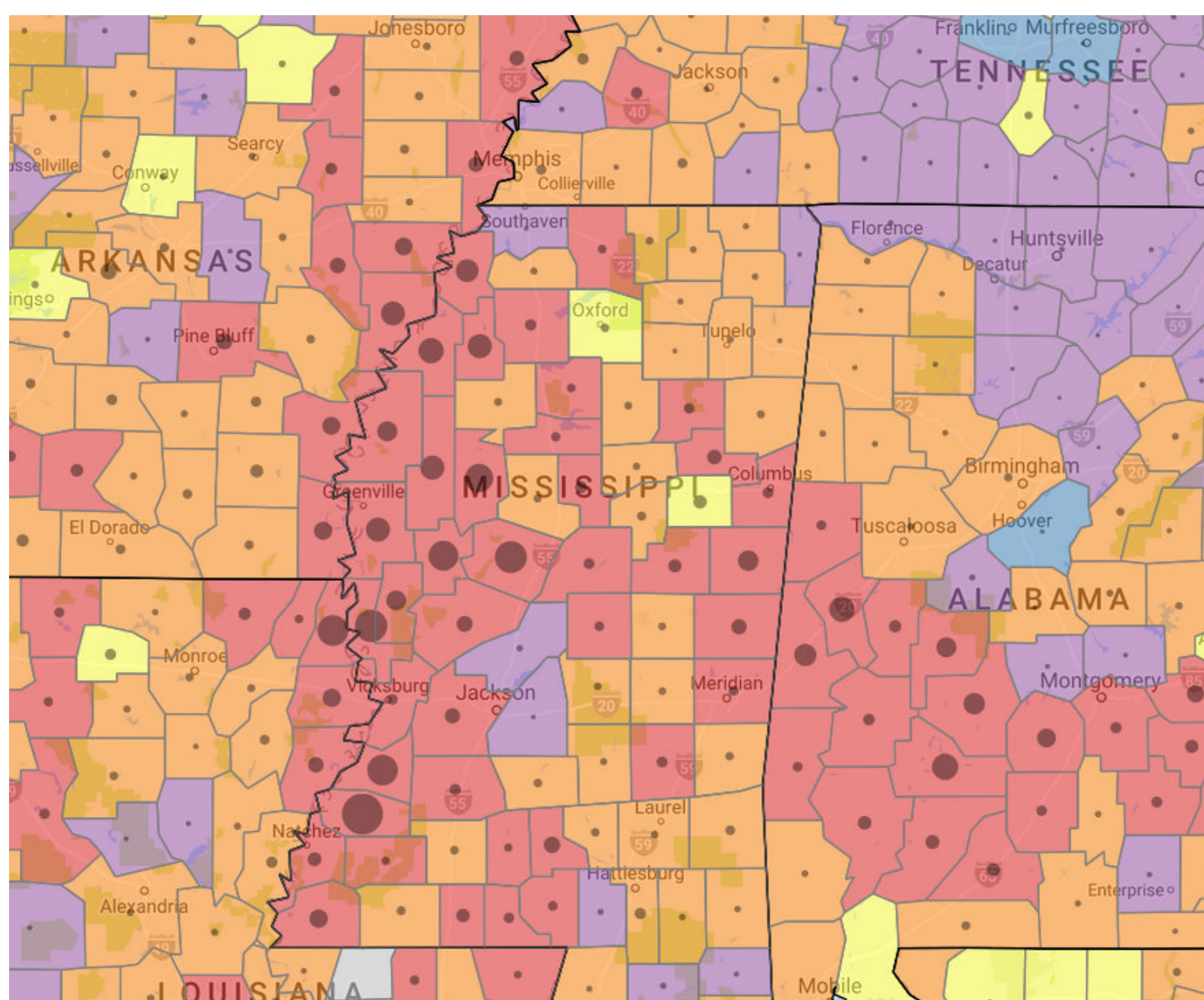
### Evaluation

Number of clusters is computed using [Elbow method](#) to find the size where the change in sum of squared errors become less significant.

We found that the features in the dataset to evaluate the condition of food insecurity are actually non independent. Due to the dependency of the features, euclidean distance provides unreliable similarity result between 2 counties. Taking feature dependency into account, [Mahalanobis distance](#) is used for our algorithm.

### Food Insecurity Implication

From our clustering and visualization, Mississippi appears to be the state with highest number of red clusters. Red clusters tend to have higher food insecurity rates and chronic disease prevalence, indicating severe conditions.

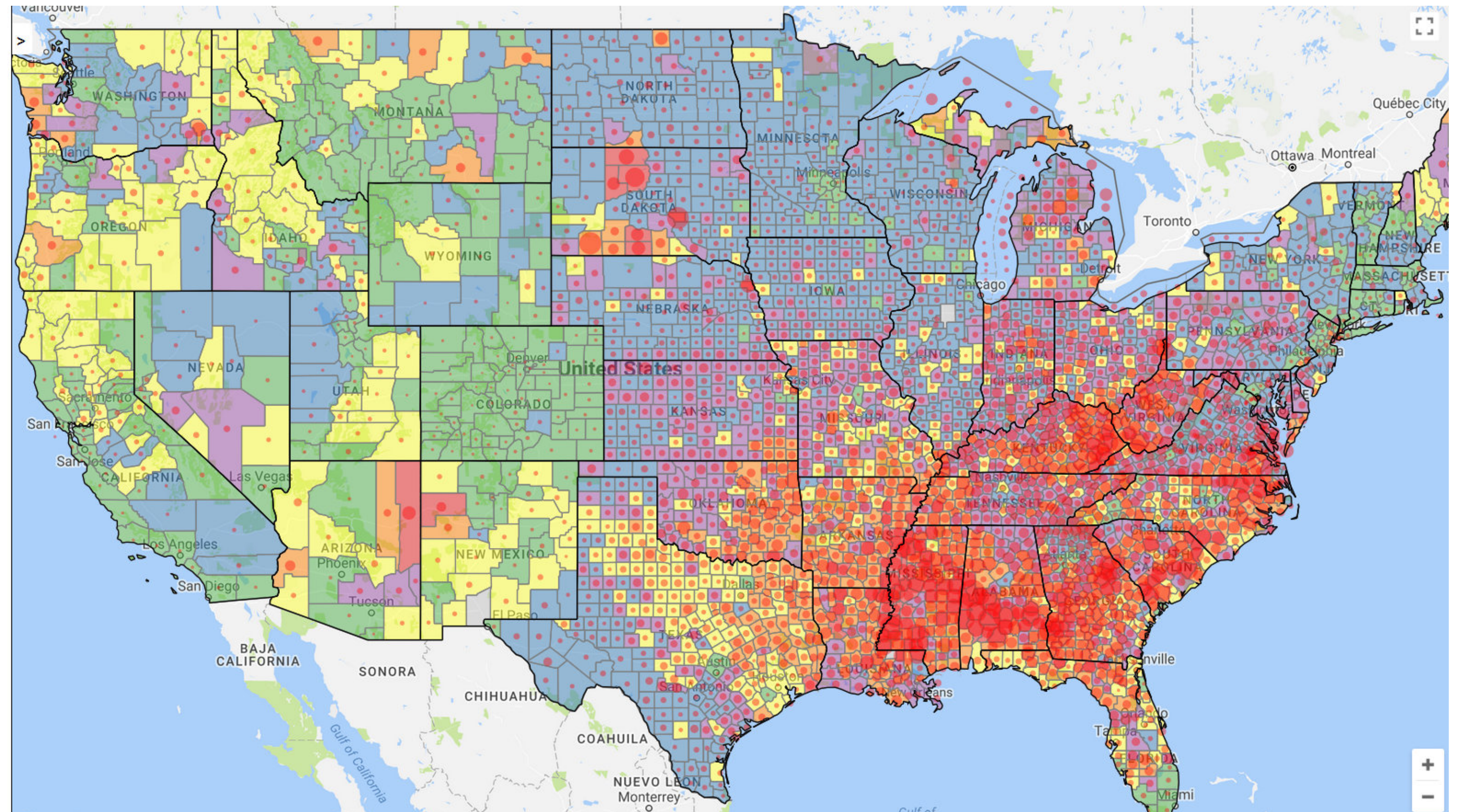
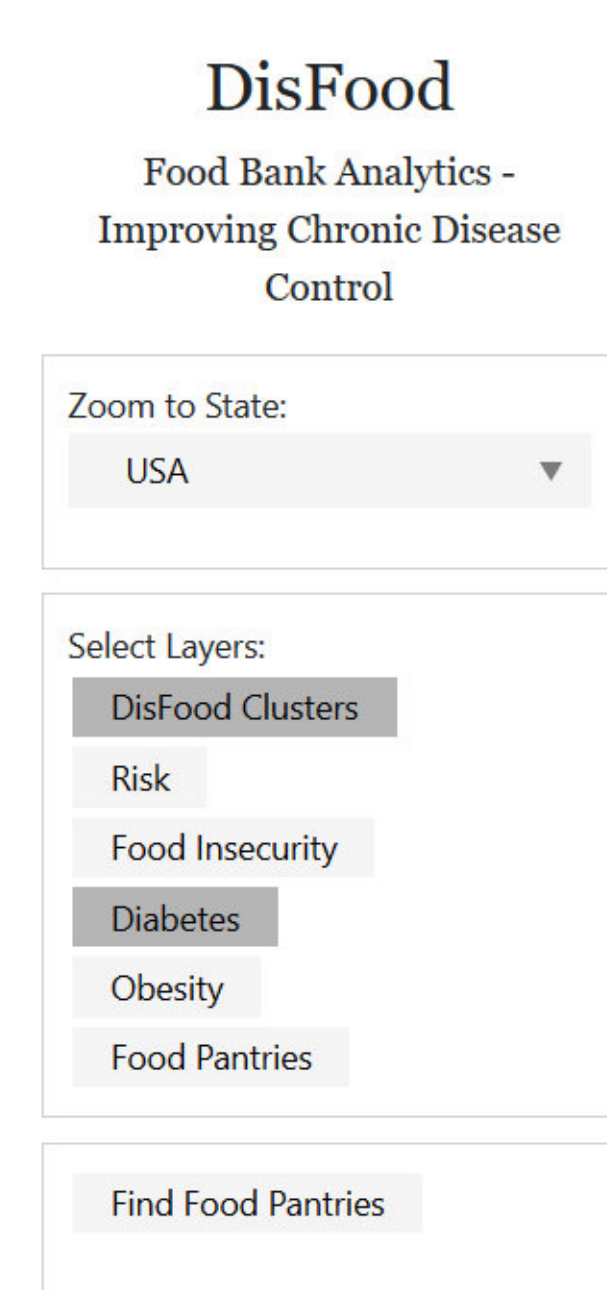


### Motivation

Currently there does not exist analysis and visualization that combine food insecurity and chronic disease prevalence. Multiple studies showed that there is a strong correlation between food security and chronic health conditions. Location of food pantry is crucial to reduce food insecurity and chronic disease prevalence.

### Find Similar Counties with Chronic Disease

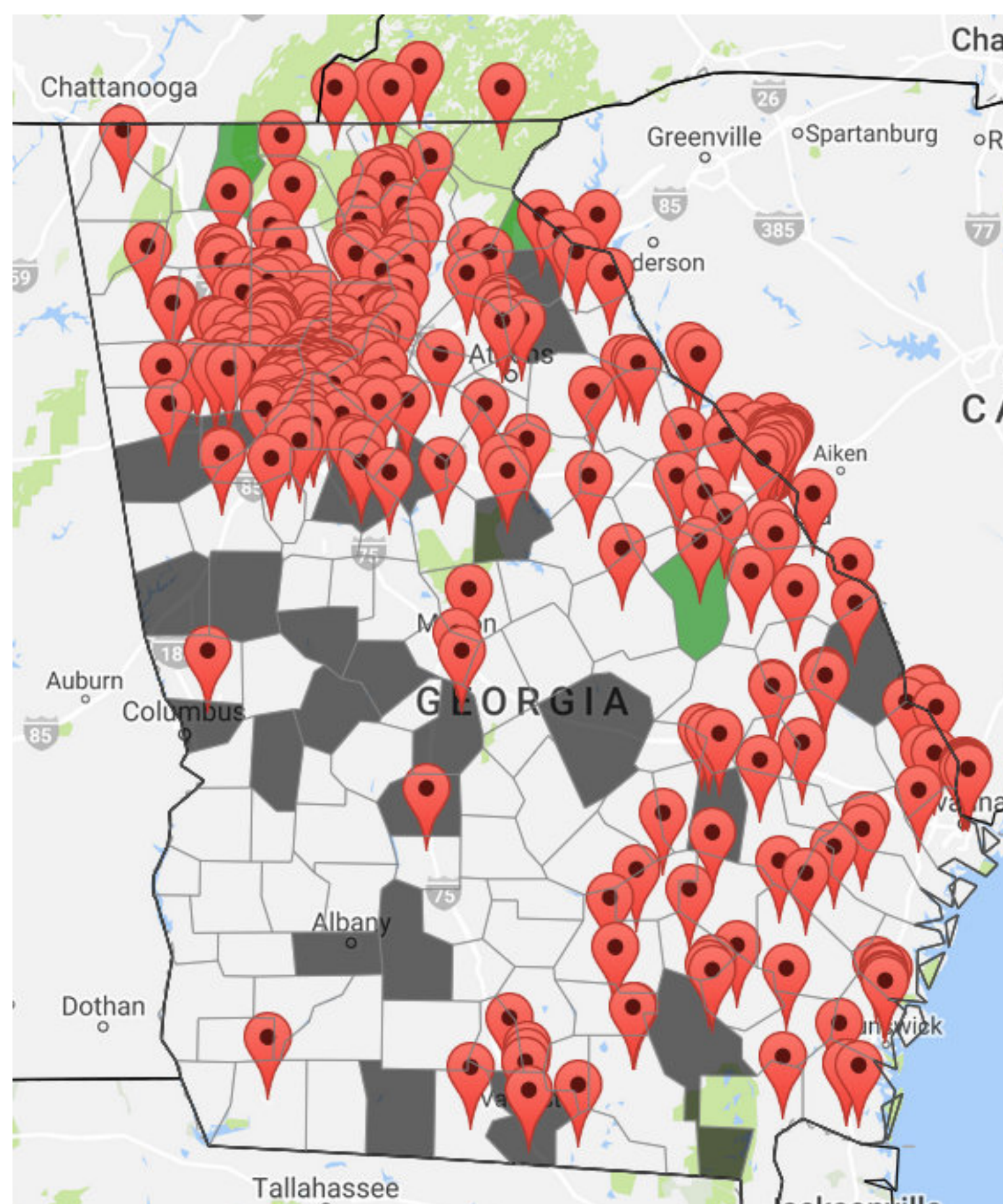
Cluster counties using K-Means into 6 groups based on food insecurity rate, obesity rate, and diabetes rate to better understand condition of food insecurity and chronic disease in U.S.



DisFood user interface displays various information layers on a single US map. The user has selected 2 layers to visualize: 'DisFood Cluster' and 'Diabetes'. The various colors on choropleth map corresponds to the 6 different clusters from our algorithm results, and circle radius for diabetes reflect prevalence levels. Users can [toggle visibility](#) between various layers from the left panel of the interface. This allows users to easily [spot any relationships between various information layers and our cluster results](#).

### Pantry Location vs Higher Food Insecurity

Gray cluster areas are those that have similar living condition such as: food assessment, income, disease rate, poverty rate, etc to their neighbors but tend to have relatively higher food insecurity rate. From the visualization below, gray cluster areas appeared to have fewer food pantries.



### Supermarket Locations

For 1960 census tracts in Georgia, Google Maps API is used to get distance and travel time to the nearby supermarkets. Computed improvements of building a new supermarket or food pantry in a census tract.

The tool is used to [rank and visualize food accessibility](#) by counties and suggests good location to build new supermarkets using these metrics: travel time and affected population. It has more filter options than USDA public data and serves as a novel measure to show the impact of building new supermarket or food pantries.

