

Chronic Diseases and Their Relationship with Unhealthy Behaviors and Preventive Measures

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Abstract

Chronic diseases affect millions of Americans every day. They have no cure, nor do they go away with time. In this project, we analyze measures of chronic diseases, including unhealthy behaviors, health outcomes, and use of preventive services of 500 major cities in the United States. Through comparing different communities based on this data, we find which communities thrive or suffer, and report what factors play a role in their respective outcomes. To visualize this information, we use map plots to show the location of healthy or unhealthy cities, and scatter plots to show correlation between different measures and chronic diseases. We do not know any specific challenges we will face, nor do we know of any correlations between specific unhealthy behaviors or preventative services and chronic diseases. Potential future research could include investigating additional data sets for weather or socioeconomic factors to find more factors that play a role in increased rates of chronic diseases. This analysis will allow public health officials to allocate their limited resources based on the needs of each community, to better improve the well-being of the residents.

1 Introduction

Chronic diseases are measured in months and years instead of days and weeks, and do not disappear with time. They result in constant and repeating health problems for those affected. Table 1 displays the chronic conditions tracked in our data set. The different kinds of chronic diseases are measured by percentage of population affected on the national, city, and census tract level.

Table 1: Conditions and description of measure

Chronic Disease	Data Set Measures
Arthritis	Arthritis among adults aged ≥ 18 Years
High Blood Pressure	High blood pressure among adults aged ≥ 18 Years
Cancer (except skin)	Cancer (excluding skin cancer) among adults aged ≥ 18 Years
Current Asthma	Current asthma among adults aged ≥ 18 Years
Coronary Heart Disease	Coronary heart disease among adults aged ≥ 18 Years
COPD	Chronic obstructive pulmonary disease among adults aged ≥ 18 Years
Physical Health	Physical health not good for ≥ 14 days among adults aged ≥ 18 Years
Diabetes	Diagnosed diabetes among adults aged ≥ 18 Years
High Cholesterol	High cholesterol among adults aged ≥ 18 Years who have been screened in the past 5 Years

Chronic Disease	Data Set Measures
Chronic Kidney Disease	Chronic kidney disease among adults aged ≥ 18 Years
Mental Health	Mental health not good for ≥ 14 days among adults aged ≥ 18 Years
Stroke	Stroke among adults aged ≥ 18 Years
Teeth Loss	All teeth lost among adults aged ≥ 65 Years

Unhealthy behaviors can lead to the development of chronic diseases. Table 2 displays the unhealthy behaviors tracked in our data set, measured by percentage of population affected on the national, city, and census tract level.

Table 2: Unhealthy behaviors and description of measure

Unhealthy Behavior	Data Set Measures
Binge Drinking	Binge drinking among adults aged ≥ 18 Years
Current Smoking	Current smoking among adults aged ≥ 18 Years
Physical Inactivity	No leisure-time physical activity among adults aged ≥ 18 Years
Obesity	Obesity among adults aged ≥ 18 Years
Sleep < 7 hours	Sleeping less than 7 hours among adults aged ≥ 18 Years

Though chronic diseases have no cure, they can be prevented. Table 3 displays the preventive services tracked in our data set, measured by percentage of population affected on the national, city, and census tract level.

Table 3: Preventive service and description of measure

Preventive Service	Data Set Measures
Health Insurance	Current lack of health insurance among adults aged 18-64 Years
Taking BP Medication	Taking medicine for high blood pressure control among adults aged ≥ 18 Years with high blood pressure
Annual Checkup	Visits to doctor for routine checkup within the past Year among adults aged ≥ 18 Years
Cholesterol Screening	Cholesterol screening among adults aged ≥ 18 Years
Colorectal Cancer Screening	Fecal occult blood test, sigmoidoscopy, or colonoscopy among adults aged 50-75 Years
Core preventive services for older men	Older adult men aged ≥ 65 Years who are up to date on a core set of clinical preventive services: Flu shot past Year, PPV shot ever, Colorectal cancer screening
Core preventive services for older women	Older adult women aged ≥ 65 Years who are up to date on a core set of clinical preventive services: Flu shot past Year, PPV shot ever, Colorectal cancer screening, and Mammogram past 2 Years

Preventive Service	Data Set Measures
Dental Visit	Visits to dentist or dental clinic among adults aged ≥ 18 Years
Mammography	Mammography use among women aged 50-74 Years
Pap Smear Test	Papanicolaou smear use among adult women aged 21-65 Years

2 Description of the data.

The data that we have used in this project is the '500 Cities: Local Data for Better Health' data obtained from the CDC's '500 Cities project' [<https://catalog.data.gov/dataset/500-cities-local-data-for-better-health-b32fd>]. This is a publically available data set that includes a model-based small area estimates for 27 measures of chronic disease related to unhealthy behaviors (5), health outcomes (13) and use of preventive services (9) for 500 cities throughout the United States. The primary aim of the data is to make it possible to identify emerging health problems and effective interventions at city level.

2.1 Preparing the Data.

The data was read from the above link into R using the `read.csv` function. This data set for this project did not require data manipulation. However, All the columns of the data set were not necessary for the analysis. Therefore, we subsetted by selecting only the column that were relevant for the analysis. Here are the columns we will use: *UniqueID*, *CityName*, *StateAbbr*, *GeoLocation*, *Year*, *Measure*, *Data_Value*, *PopulationCount*, *GeographicLevel*, *Short_Question_Text*, *Category* and *DataValueTypeID*

3 Data Exploration

3.1 Comparison of large and small cities

This plot visualizes the distribution of percentages of chronic disease in large and small cities, where large cities have populations greater than 100,000.

4 Findings

4.1 Comparison of large and small cities

As we saw from a boxplot, population has little to no effect on overall chronic disease rates. We can also confirm this by using a t-test with the hypothesis $H_0 : \mu_L - \mu_S = 0$ versus the hypothesis $H_a : \mu_L - \mu_S \neq 0$. Here μ_L is a mean percentage of chronic diseases in the large cities (count of peoples is more than 100000) and μ_S is a mean percentage of chronic diseases in the small cities (count of peoples is less or equal to 100000).

Table 4: Welch Two Sample t-test:
v1\$ageadjcitydat.Data_Value by v11 (continued below)

Test statistic	df	P value	Alternative hypothesis
0.4792	13452	0.6318	two.sided

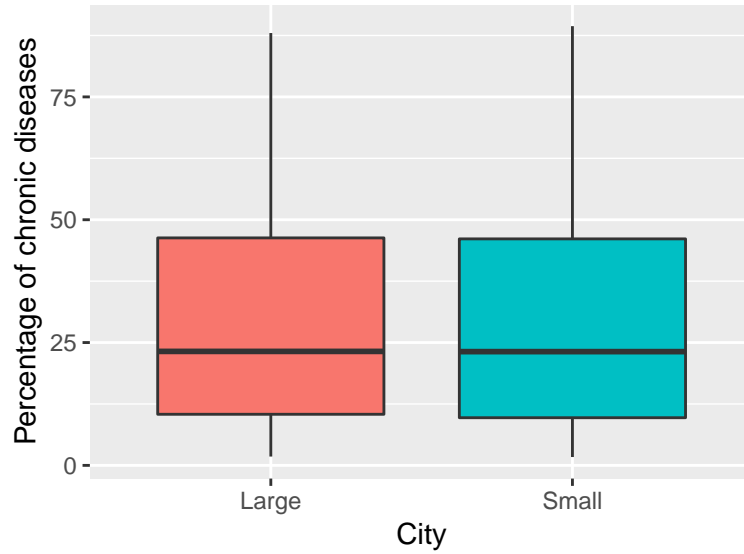


Figure 1: Comparison of chronic disease rates in big and small cities

mean in group Large	mean in group Small
30.59	30.39

Since the p-value is greater than significance level $\alpha = 0.05$ then we no reject a null hypothesis H_0 and we conclude that no significance difference of the mean percentage of chronic diseases in the large and small cities. In the future, we will look at each chronic disease individually to see if any specific disease is correlated with population.