# 500 Cities Local Health Data Set

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### Data Understanding and Analysis

### Task-1 Description of the data source with citation

This is a complete dataset for the 500 Cities project, available from data.gov.

It includes 2013, 2014 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). It also includes estimates for approximately 28,000 census tracts within 500 largest US cities. It includes 21 variables and 810103 observations.

Currently, we are using the dataset with respect to the year 2013 and have separated the original dataset containing years 2013 and 2014 into the 2013 and has 116025 observations and 13 variables that need to be cleaned for better data evaluation and analysis. Due to the reason that we are not doing census tract analysis based on the population count, the variable Low confidence limit, High confidence limit have been removed.

Variables include:

\* Year

\* StateDesc

\* CityName

\* CategoryLevel

\* Measure

\* Data value Type

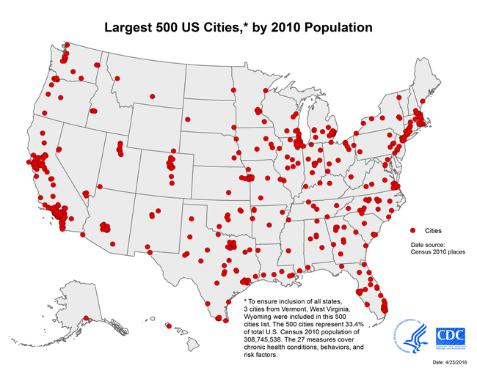
\* Data Value

\* Data Value Footnote

\* Population Count

This dataset is significant to identity emerging health problems and provide information for disease prevention activities.

**Note**: We tend to choose the dataset corresponding to the year 2013 and then try to document the cleaning of data.



**Reference and Citation for Data Source**

500 Cities: Local Data for Better Health. (2016, December 07). Retrieved April 13, 2018, from https://catalog.data.gov/dataset/500-cities-local-data-for-better-health-b32fd

### Task-2 Identifying any intellectual policy constraints (licensing)

This is an open database intended for public use. Open Database License(ODbL). The details of its usage and availability are as follows:

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### Task-3 Description of Metadata and Purpose of Project

1. This is the complete dataset for the 500 Cities project. This dataset includes 2013, 2014 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). Data were provided by the Centers for Disease Control and Prevention (CDC), Division of Population Health, Epidemiology and Surveillance Branch. The project was funded by the Robert Wood Johnson Foundation (RWJF) in conjunction with the CDC Foundation.
2. It represents a first-of-its kind effort to release information on a large scale for cities and for small areas within those cities. It includes estimates for the 500 largest US cities and approximately 28,000 census tracts within these cities. These estimates can be used to identify emerging health problems and to inform development and implementation of effective, targeted public health prevention activities.
3. Because the small area model cannot detect effects due to local interventions, users are cautioned against using these estimates for program or policy evaluations. Data sources used to generate these measures include Behavioral Risk Factor Surveillance System (BRFSS) data (2013, 2014), Census Bureau 2010 census population data, and American Community Survey (ACS) 2009-2013, 2010-2014 estimates. More information about the methodology can be found at www.cdc.gov/500cities.

**Purpose of the Project**

1. “This project reports city and census tract-level data, obtained using small area estimation methods, for 27 chronic disease measures for the 500 largest American cities.
2. The data are published through a public, interactive “500 Cities” website that allows users to view, explore, and download city- and tract-level data.
3. Although limited data are available at the county and metropolitan levels, this project represents a first-of-its kind data analysis to release information on a large scale for cities and for small areas within cities. This system complements existing surveillance data necessary to more fully understand the health issues affecting the residents of that city or census tract.

These high-quality, small-area epidemiologic data can be used both by individual cities and groups of cities as well as other stakeholders to help develop and implement effective and targeted prevention activities; identify emerging health problems; and establish and monitor key health objectives. For example, city planners and elected officials may want to use this data to target neighborhoods with high rates of smoking or other health risk behaviors for effective interventions. “(n.d.500 Cities: Local Data for Better Health.)

**Reference**:

500 Cities: Local Data for Better Health. (2016, December 07). Retrieved April 14, 2018, from https://www.cdc.gov/500cities/about.htm

### Task-4 Issues encountered with data

1. **Data validity and relativeness** - The data being collected for understanding the health of 500 cities in Unites States is limited to entire United States, respective city and census tract levels to understand the Health Outcomes and Prevention categories. Assuming the data with respect to 2013, the parameters are hence analyzed.
2. **Missing Values** - In the column CityName , DataValue , Data\_Value\_Footnote , PopulationCount has data range values having ‘Blanks’ that need to be filled with meaningful and reasonable data values that add meaning and value to the dataset and helps in efficient understanding of data.
3. **Unstandardized data** - The column UniqueID has data values ‘59’, ‘107000’ , ‘0107000-01073000100’ etc. which doesn’t follow a specified pattern or a clarity in naming the ID or providing definition for the ID. Moreover, the value or ID details is not necessary. These need to be fixed or deleted based on the mode of data cleaning and the goal of cleansing the data.
4. **Irrelevant data with respect to Data cleaning and Visualization Goals** - The column UniqueID is not necessary with respect to evaluation of data or the pre-determined research goals. So we chosse to delete the column. Also, the Data\_Value\_Unit which is in ‘%’ can be deleted .The CityFIPS, TractFIPS, ShortQuestionText can be deleted

### Task-5 Description of Rationale for Data Remediation

1. We have made our data research questions and goals clear and do not tend to choose the Census Data for tracting the Census values, instead we have limited data with respect to year 2013 and also eliminated the FIPS value.

2. Additionally, we have filled the missing data values for CityName , DataValue , Data\_Value\_Footnote each with ‘NA’ - *Not Applicable* value and PopulationCount with ‘Unknown’ as those columns with the blank or unknown datavalue are not considered for any sort of data analysis and doesn’t provide much detail or clarity on visualization. Instead, naming them appropriately as NA or Unknown helps in rethinking in data collection and analysis steps.

3.Also we have deleted the irrelevant or unnecessary column and double-checked for data duplicities and their existence and ensure their validity with respect to the data evaluation. This also involved redefining and understanding the end-goals in the data cleaning thereby we have deleted the unstandardized data.

### Task-6 Step-by-step Description of Data Cleaning Process for Replication

* Below is the sequence of steps followed in cleaning the data:

As part of cleaning, I have used R script and that helped in cleaning the data with respect to missing values, data anomalies, unstandardized values and entity matching etc.

1. To get the current working directory: **getwd()**
2. To set the working directory to the desired location: **setwd("C:/Users/sriram/Downloads")**
3. Loading the desired files to the data frame "data": **data<-read.csv("500CitiesLocalDataSetForBetterHealth\_CleanedExcel.csv", header = T , na.strings = c("", "NA"))**
4. To view the loaded data frame : **view(data)**
5. To remove the unwanted columns from the loaded data frame and making a new data frame: **clean\_data<-subset(data, select = -c(6,8,11,12,13,18,19,20))**
6. To view statistics relating the data: **summary(data)**
7. Changing the "NA" values in "PopulationCount" Column to "Unknown" : **clean\_data[["PopulationCount"]][is.na(clean\_data[["PopulationCount"]])] <- "Unknown"**
8. To view the top 6 rows of our working dataframe: **head(clean\_data)**
9. To view the entire dataframe: **View(clean\_data)**
10. To print the required table with set of arguments listed above for clean data: **write.csv(clean\_data, "500CitiesLocalDatasetForBetterHealth\_CleanedExcelv2.csv")**

### R Plot - Documentation

This document also explains the steps in creating an R Plot for data visualization for the Research Questions raised in the previous assignments for 500 Local Cities Health Dataset. The R Plot is created based on the R script generated previously as part of Data Preparation.

*#Removed unwanted state rowname with the value "USA"*

mergedHealthOutcome\_Prevention <- mergedHealthOutcome\_Prevention[-8,]

*#Create 3 temporary data frames for creating an R Plot*

a <- data.frame(mergedHealthOutcome\_Prevention$Region)

b <- data.frame(mergedHealthOutcome\_Prevention$Population\_Health\_Outcomes)

c <- data.frame(mergedHealthOutcome\_Prevention$Population\_Prevention\_Category)

*#Merge all the data frames into one*

df <- data.frame(a,b,c)

*#Filter the data frame values based on Region*

df <- melt(df, id.vars = "mergedHealthOutcome\_Prevention.Region")

*#Create an R plot using ggplot library*

ggplot(df, aes(x=reorder(mergedHealthOutcome\_Prevention.Region, value),

y=value/1000000, fill=variable)) +

geom\_bar(stat = "identity") +

scale\_fill\_manual(values = c("#303B41", "#00B2B9"),

labels= c("Health Outcome", "Prevention Category")) +

xlab("Regions") +

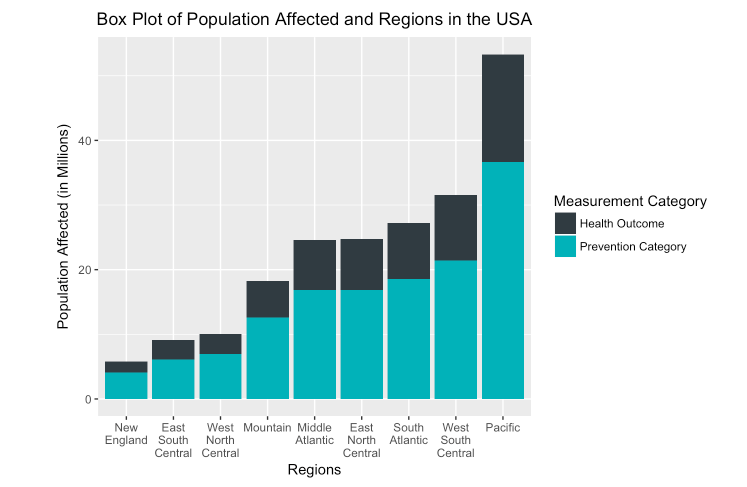
ylab("Population Affected (in Millions)") +

ggtitle("Box Plot of Population Affected and Regions in the USA") +

theme(plot.title = element\_text(hjust = 0.5)) +

scale\_x\_discrete(labels = **function**(x) str\_wrap(x, width=5)) +

labs(fill="Measurement Category")



The above plot intends to provide a visualization on the different measure of Categories by which the 500 Cities Local Health Dataset is based upon. The categories, Health Outcomes and Preventive Measures, are combined to be depicted on a single bar graph divided based on Regions in the USA The visualization depicts that there has been a linear relation with the number of Preventive Measures with respect to Health outcomes in the 5 Regions in the USA.

*#Create a CSV of the cleaned data and R Script created in the previous assignment*

state\_and\_region <- read.csv("Updated\_US\_States\_Regions\_Health.csv")

*#Create a new data frame creating a relation between Measures and States*

measureStateRelation <- aggregate(list(state\_and\_region$ActualPopulation,

state\_and\_region$PopulationCount),

by=list(Measures = state\_and\_region$MeasureId, State = state\_and\_region$StateDesc), FUN=sum)

*#Rename column name to a meaningful name*

colnames(measureStateRelation)[3] <- "Affected\_Population"

colnames(measureStateRelation)[4] <- "Total\_Population"

measureStateRelation$Percent\_Affected\_Population <-

(measureStateRelation$Affected\_Population /

measureStateRelation$Total\_Population \* 100)

*#Create a data frame for High BP Health Outcome*

measureBPHigh <- subset(measureStateRelation, Measures == 'BPHIGH')

*#Removed unwanted "USA" column*

measureBPHigh <- measureBPHigh[-45,]

measureBPHigh <- measureBPHigh[,-1]

*#Convert column and rownames to lower case for plotting on US Map*

colnames(measureBPHigh)[1] <- "state"

levels(measureBPHigh$state) <- tolower(levels(measureBPHigh$state))

*#Install required libraries*

**library**(fiftystater)

**library**(mapproj)

## Loading required package: maps

data("fifty\_states")

*#Create a plot to show State wise Distribution of High BP in the USA*

p <- ggplot(measureBPHigh, aes(map\_id = state)) +

geom\_map(aes(fill=Percent\_Affected\_Population),

map = fifty\_states) +

expand\_limits(x = fifty\_states$long, y = fifty\_states$lat) +

coord\_map() + scale\_x\_continuous(breaks=NULL) +

scale\_y\_continuous(breaks=NULL) +

labs(x="", y="") +

theme(panel.background = element\_blank())

*#Provide a title to the R Plot*

p + scale\_fill\_gradient(low="#86b2f9", high = "#002266",

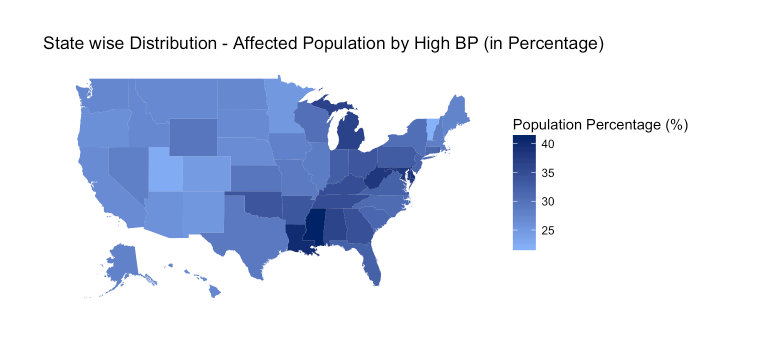
space = "Lab",

guide = "colourbar") +

ggtitle("State wise Distribution - Affected Population by High BP (in Percentage)") +

theme(plot.title = element\_text(hjust = 0.1)) +

labs(fill="Population Percentage (%)")



The above plot shows a visualization of the High BP measure (Health Outcome) in all the states in the USA. It can be seen that a state like California has population affected by High BP

*#Rename column to meaningful name in the main data frame*

colnames(measureStateRelation)[2] <- "state"

*#Create a data frame for BP Prevention Measure*

measureBPMed <- subset(measureStateRelation, Measures == 'BPMED')

measureBPMed <- measureBPMed[,-1]

measureBPMed <- measureBPMed[-45,]

*#Change the state names to lower case for mapping on US map*

levels(measureBPMed$state) <- tolower(levels(measureBPMed$state))

*#Create a R Plot for State Wise Distribution for BP Prevention*

vizMeasureBPMed <- ggplot(measureBPMed, aes(map\_id = state)) +

geom\_map(aes(fill=Percent\_Affected\_Population),

map = fifty\_states) +

expand\_limits(x = fifty\_states$long, y = fifty\_states$lat) +

coord\_map() + scale\_x\_continuous(breaks=NULL) +

scale\_y\_continuous(breaks=NULL) + labs(x="", y="") +

theme(panel.background = element\_blank())

*#Provide a Title and colour to the R Plot*

vizMeasureBPMed + scale\_fill\_gradient(low="#9dfbb0", high = "#006622",

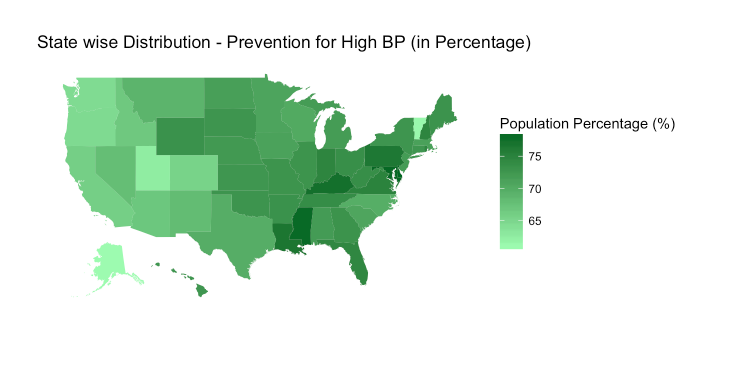
space = "Lab",

guide = "colourbar") +

ggtitle("State wise Distribution - Prevention for High BP (in Percentage)") +

theme(plot.title = element\_text(hjust = 0.1)) +

labs(fill="Population Percentage (%)")



The above plot shows a visualization of a Preventive measure of Medium BP in all the states in the USA. This provides an insight, in comparison with the Health Outcomes of High BP in the previous plot, on how the Preventive measure was carried out.

*#Create a data frame for High Cholesterol Health Outcome in states of USA*

measureHighCholesterol <- subset(measureStateRelation, Measures == 'HIGHCHOL')

measureHighCholesterol <- measureHighCholesterol[,-1]

measureHighCholesterol <- measureHighCholesterol[-45,]

*#Change rownames to lower case for proper mapping*

levels(measureHighCholesterol$state) <- tolower(levels(measureHighCholesterol$state))

*#Create a R Plot for State wise distribution of High Cholesterol Health Outcome in the USA*

vizMeasureHighCholesterol <- ggplot(measureHighCholesterol, aes(map\_id = state)) +

geom\_map(aes(fill=Percent\_Affected\_Population),

map = fifty\_states) +

expand\_limits(x = fifty\_states$long, y = fifty\_states$lat) +

coord\_map() + scale\_x\_continuous(breaks=NULL) +

scale\_y\_continuous(breaks=NULL) + labs(x="", y="") +

theme(panel.background = element\_blank())

*#Provide a title and colour to the R Plot*

vizMeasureHighCholesterol + scale\_fill\_gradient(low="#f1a7b0", high = "#af0418",

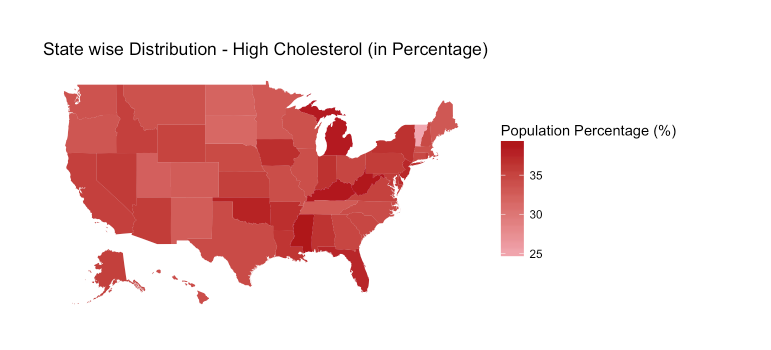
space = "Lab",

guide = "colourbar") +

ggtitle("State wise Distribution - High Cholesterol (in Percentage)") +

theme(plot.title = element\_text(hjust = 0.1)) +

labs(fill="Population Percentage (%)")



The above plot shows a visualization of the High Cholesterol measure (Health Outcome) in all the states in the USA. It can be seen that a state like California has population affected by High Cholesterol.

*#Create a data frame for Cholesterol Prevention Measure in USA*

measureCholesterolScreen <- subset(measureStateRelation, Measures == 'CHOLSCREEN')

measureCholesterolScreen <- measureCholesterolScreen[,-1]

measureCholesterolScreen <- measureCholesterolScreen[-45,]

*#Change rownames to lower case for proper mapping*

levels(measureCholesterolScreen$state) <- tolower(levels(measureCholesterolScreen$state))

*#Create R Plot for State wise distribution of Cholesterol Prevention measure*

vizHighCholesterolPrevention <- ggplot(measureCholesterolScreen, aes(map\_id = state)) +

geom\_map(aes(fill=Percent\_Affected\_Population),

map = fifty\_states) +

expand\_limits(x = fifty\_states$long, y = fifty\_states$lat) +

coord\_map() + scale\_x\_continuous(breaks=NULL) +

scale\_y\_continuous(breaks=NULL) + labs(x="", y="") +

theme(panel.background = element\_blank())

*#Provide a title and colour to the R Plot*

vizHighCholesterolPrevention + scale\_fill\_gradient(low="#e6bcf0", high = "#990bbb",

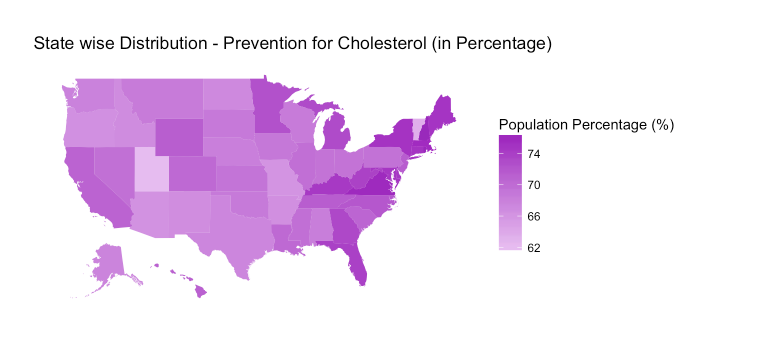
space = "Lab",

guide = "colourbar") +

ggtitle("State wise Distribution - Prevention for Cholesterol (in Percentage)") +

theme(plot.title = element\_text(hjust = 0.1)) +

labs(fill="Population Percentage (%)")



The above plot shows a visualization of the Cholesterol Screening (Preventive Measure) in all the states in the USA.

The dataset has only one quantitative value by which different states or regions of the USA could be compared. Hence the opportunity to use data and create different kinds of visualization was limited.

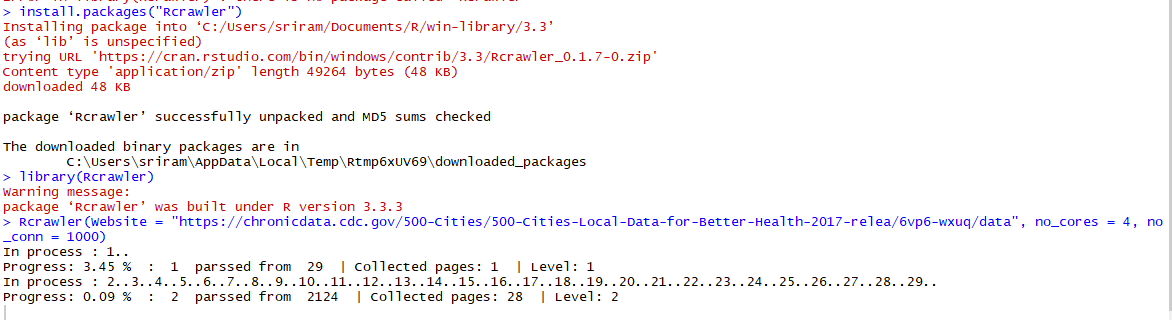
However, the current visualization created through R Plots provides an insight on how the Health Outcomes and Preventive Measures are distributed across various Regions in the USA and provides a concentration of each Measure in all the states of USA

**R Crawler – Web Crawling for Data Mining**

R Crawler is an R package for web crawling websites and extracting structured data which can be used for a wide range of useful applications, like web mining, text mining, web content mining, and web structure mining. So, what is the difference between Rcrawler and rvest : rvest extracts data from one specific page by navigating through selectors. However, Rcrawler automatically traverses and parse all web pages of a website and extract all data you need from them at once with a single command. For example, collect all published posts on a blog, or extract all products on a shopping website, or gathering comments, reviews for your opinion mining studies. More than that, Rcrawler can help you studies web site structure by building a network representation of a website internal and external hyperlinks (nodes & edges).

1. **Collecting Web Pages from website**

With the documentation and research suggestion from Dr.Salim.K , I have performed web crawling to test and retrieve web pages related to the Health DataSet. More information to perform the R Crawling to any website is available [here](https://github.com/salimk/Rcrawler).



The package Rcrawler is installed on RStudio environment and the web address to crawl the information i.e. dataset source or address can be provided with the number of HTTP requests to be sent and the number of cores can also be set.

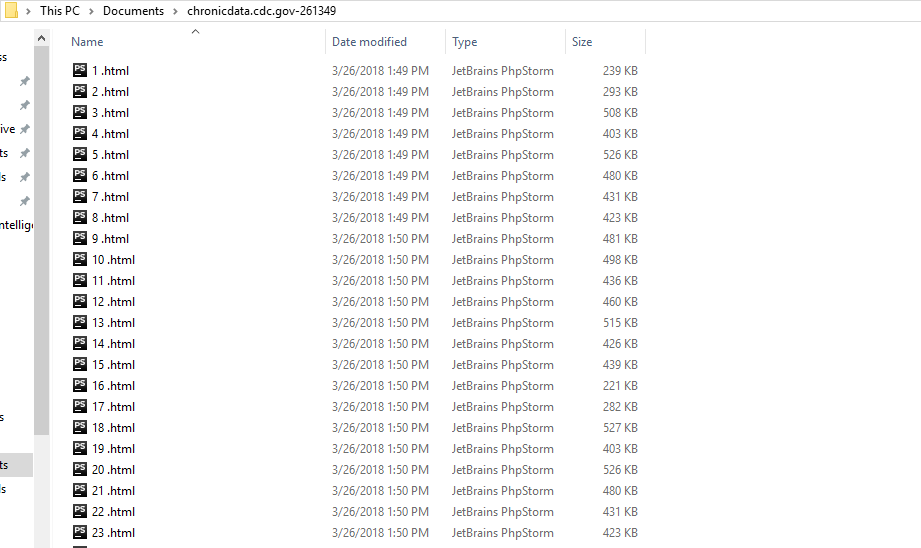
This command allows downloading all HTML files of a website from the server to your computer. It can be useful if you want to analyze or apply something on the whole web page (HTML file).

* no\_cores specify how many processes will execute the task
* no\_conn specify how many HTTP requests will be sent simultaneously (in parallel).

At the end of crawling process this function will return :

A variable named "INDEX" in the global environment: It's a data frame representing the general URL index, which includes all crawled/scraped web pages with their details (content type, HTTP state, the number of out-links and in-links, encoding type, and level). [n.d. Salim, K (April, 2018)]

Upon collection of web pages, the documents can be stored in the system as shown below:



1. **Loading collected HTML files to memory R environment**

After running Rcrawler command, Collected HTML web pages are supposed to be stored on your hard drive, In fact putting downloaded files directly into variables will consume the RAM, So, the crawler creates a folder for each crawling sessions with a name similar this pattern "website-DateTime" . To load collected files into a variable for processing or analysis, you will need to run these two functions: ListProjects and LoadHTMLFiles.

**ListProjects()**

Run this command to list all your crawling project folders. Then you just need to pick-up (copy) the project name you want. Then run the following command which will load all HTML into a vector.

**MyData <- ­­­­­LoadHTMLFiles("chronicdata.cdc.gov-261349", type = "vector")**

You can specify "list" as a type of returned variable. Also, this function has a parameter called (max) useful to limit the number of imported files.

The next steps can be followed from the documentation and research provided [here](https://github.com/salimk/Rcrawler)

**Data Mining**

1. ZeroR method Classification

=== Run information ===

Scheme: weka.classifiers.rules.ZeroR

Relation: 500CitiesLocalHealthData-weka.filters.unsupervised.attribute.Remove-R9

Instances: 116024

Attributes: 16

Year

StateDesc

CityName

GeographicLevel

Category

Measure

Data\_Value\_Type

Data\_Value\_Footnote

PopulationCount

CategoryID

MeasureId

ActualPopulation

Region

HealthOutcomes

Prevention

Test mode: split 75.0% train, remainder test

=== Classifier model (full training set) ===

ZeroR predicts class value: Pacific

Time taken to build model: 0.18 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0.77 seconds

=== Summary ===

Correctly Classified Instances 6838 23.5744 %

Incorrectly Classified Instances 22168 76.4256 %

Kappa statistic 0

Mean absolute error 0.1715

Root mean squared error 0.2928

Relative absolute error 100 %

Root relative squared error 100 %

Total Number of Instances 29006

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class

0.000 0.000 ? 0.000 ? ? 0.500 0.000 USA

0.000 0.000 ? 0.000 ? ? 0.500 0.044 East South Central

1.000 1.000 0.236 1.000 0.382 ? 0.500 0.236 Pacific

0.000 0.000 ? 0.000 ? ? 0.500 0.097 Mountain

0.000 0.000 ? 0.000 ? ? 0.500 0.146 West South Central

0.000 0.000 ? 0.000 ? ? 0.500 0.033 New England

0.000 0.000 ? 0.000 ? ? 0.500 0.131 South Atlantic

0.000 0.000 ? 0.000 ? ? 0.500 0.137 East North Central

0.000 0.000 ? 0.000 ? ? 0.500 0.058 West North Central

0.000 0.000 ? 0.000 ? ? 0.500 0.119 Middle Atlantic

Weighted Avg. 0.236 0.236 ? 0.236 ? ? 0.500 0.143

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

0 0 3 0 0 0 0 0 0 0 | a = USA

0 0 1268 0 0 0 0 0 0 0 | b = East South Central

0 0 6838 0 0 0 0 0 0 0 | c = Pacific

0 0 2811 0 0 0 0 0 0 0 | d = Mountain

0 0 4230 0 0 0 0 0 0 0 | e = West South Central

0 0 963 0 0 0 0 0 0 0 | f = New England

0 0 3795 0 0 0 0 0 0 0 | g = South Atlantic

0 0 3976 0 0 0 0 0 0 0 | h = East North Central

0 0 1684 0 0 0 0 0 0 0 | i = West North Central

0 0 3438 0 0 0 0 0 0 0 | j = Middle Atlantic

**Health Outcomes**

=== Run information ===

Scheme: weka.classifiers.rules.ZeroR

Relation: 500CitiesLocalHealthData-weka.filters.unsupervised.attribute.Remove-R9

Instances: 116024

Attributes: 16

Year

StateDesc

CityName

GeographicLevel

Category

Measure

Data\_Value\_Type

Data\_Value\_Footnote

PopulationCount

CategoryID

MeasureId

ActualPopulation

Region

HealthOutcomes

Prevention

Test mode: split 75.0% train, remainder test

=== Classifier model (full training set) ===

ZeroR predicts class value: 568.9505275201722

Time taken to build model: 0.14 seconds

=== Evaluation on test split ===

Time taken to test model on test split: 0.9 seconds

=== Summary ===

Correlation coefficient 0

Mean absolute error 632.912

Root mean squared error 751.8357

Relative absolute error 100 %

Root relative squared error 100 %

Total Number of Instances 29006

**Decision Table Rule based Classification**

=== Run information ===

Scheme: weka.classifiers.rules.DecisionTable -X 1 -S "weka.attributeSelection.BestFirst -D 1 -N 5"

Relation: 500CitiesLocalHealthData-weka.filters.unsupervised.attribute.Remove-R9

Instances: 116024

Attributes: 16

Year

StateDesc

CityName

GeographicLevel

Category

Measure

Data\_Value\_Type

Data\_Value\_Footnote

PopulationCount

CategoryID

MeasureId

ActualPopulation

Region

HealthOutcomes

Prevention

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

Decision Table:

Number of training instances: 116024

Number of Rules : 47

Non matches covered by Majority class.

Best first.

Start set: no attributes

Search direction: forward

Stale search after 5 node expansions

Total number of subsets evaluated: 82

Merit of best subset found: 100

Evaluation (for feature selection): CV (leave one out)

Feature set: 1,14

Time taken to build model: 45.34 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances 115976 99.9586 %

Incorrectly Classified Instances 48 0.0414 %

Kappa statistic 0.9995

Mean absolute error 0.0009

Root mean squared error 0.0096

Relative absolute error 0.5047 %

Root relative squared error 3.2678 %

Total Number of Instances 116024

=== Detailed Accuracy By Class ===

TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class

1.000 0.000 0.889 1.000 0.941 0.943 1.000 0.889 USA

0.999 0.000 0.999 0.999 0.999 0.999 1.000 0.999 East South Central

1.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000 Pacific

0.999 0.000 0.999 0.999 0.999 0.999 1.000 0.999 Mountain

1.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000 West South Central

0.998 0.000 0.998 0.998 0.998 0.998 1.000 0.999 New England

0.999 0.000 1.000 0.999 1.000 0.999 1.000 1.000 South Atlantic

1.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000 East North Central

0.999 0.000 0.999 0.999 0.999 0.999 1.000 0.999 West North Central

1.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000 Middle Atlantic

Weighted Avg. 1.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

8 0 0 0 0 0 0 0 0 0 | a = USA

1 5108 0 0 0 0 0 0 3 0 | b = East South Central

0 1 27331 1 1 0 2 0 0 0 | c = Pacific

0 0 3 11240 1 0 0 1 2 1 | d = Mountain

0 2 0 1 16851 1 0 1 0 0 | e = West South Central

0 0 0 2 1 3762 2 0 0 1 | f = New England

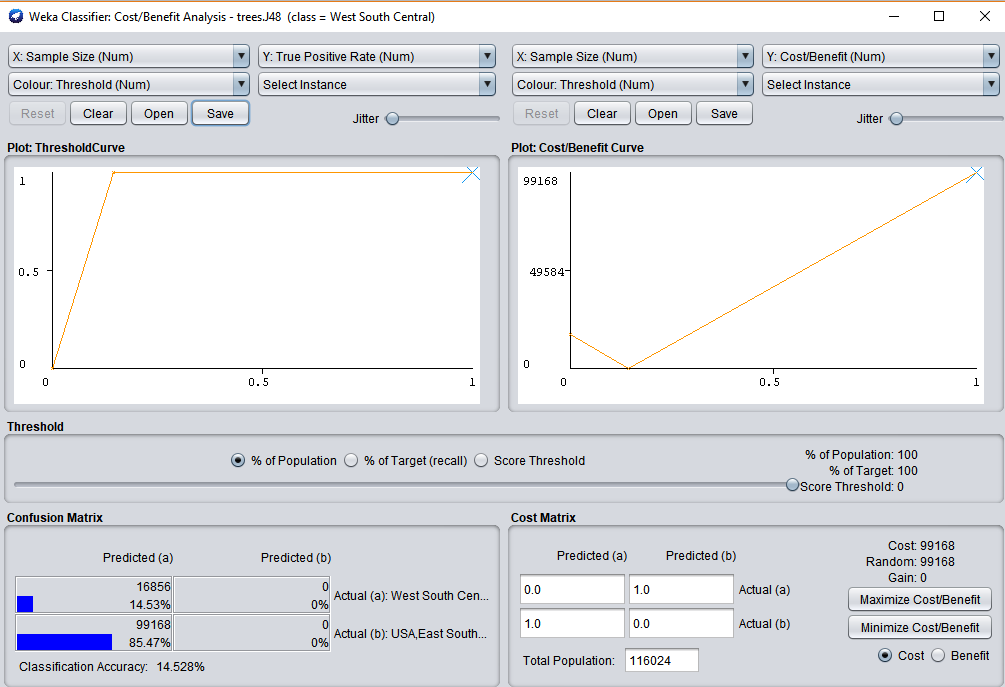
0 0 1 0 0 4 15396 0 2 1 | g = South Atlantic

0 0 0 1 0 0 1 15793 1 0 | h = East North Central

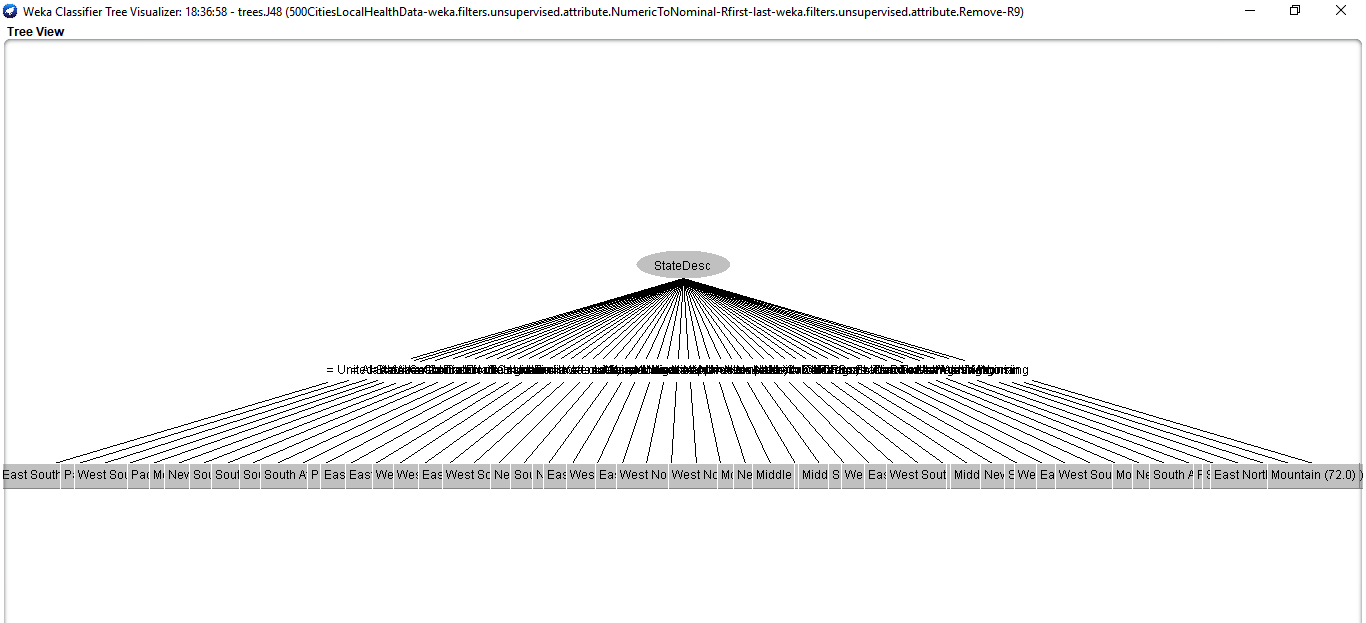
0 1 0 0 0 0 2 2 6539 0 | i = West North Central

0 0 1 1 0 2 0 0 0 13948 | j = Middle Atlantic

//////////////////////////////////////////////////////////////////////////////////////////



**J48 Prune Decision Tree**



**K-Means Clustering**

=== Run information ===

Scheme: weka.clusterers.SimpleKMeans -init 0 -max-candidates 100 -periodic-pruning 10000 -min-density 2.0 -t1 -1.25 -t2 -1.0 -N 10 -A "weka.core.EuclideanDistance -R first-last" -I 500 -num-slots 1 -S 10

Relation: 500CitiesLocalHealthData-weka.filters.unsupervised.attribute.Remove-R9-weka.filters.unsupervised.attribute.NumericToNominal-Rfirst-last

Instances: 116024

Attributes: 16

Year

StateDesc

CityName

GeographicLevel

Category

Measure

Data\_Value\_Type

Data\_Value\_Footnote

PopulationCount

CategoryID

MeasureId

ActualPopulation

Region

HealthOutcomes

Prevention

Test mode: evaluate on training data

=== Clustering model (full training set) ===

kMeans

======

Number of iterations: 5

Within cluster sum of squared errors: 711229.0

Initial starting points (random):

**Cluster 0**: 58658,2013,Michigan,Detroit,'Census Tract',Prevention,'Cholesterol screening among adults aged equal and larger than 18 Years','Crude prevalence',NA,6295,PREVENT,CHOLSCREEN,4859.74,'East North Central',0,4859.74

**Cluster 1:** 34677,2013,Florida,'Fort Lauderdale','Census Tract',Prevention,'Cholesterol screening among adults aged equal and larger than 18 Years','Crude prevalence',NA,2224,PREVENT,CHOLSCREEN,1779.2,'South Atlantic',0,1779.2

**Cluster 2:** 86332,2013,Oklahoma,'Broken Arrow','Census Tract',Prevention,'Cholesterol screening among adults aged equal and larger than 18 Years','Crude prevalence',NA,1350,PREVENT,CHOLSCREEN,1058.4,'West South Central',0,1058.4

**Cluster 3:** 90809,2013,Pennsylvania,Philadelphia,'Census Tract',Prevention,'Cholesterol screening among adults aged equal and larger than 18 Years','Crude prevalence',NA,3996,PREVENT,CHOLSCREEN,2901.096,'Middle Atlantic',0,2901.096

**Cluster 4:** 93347,2013,'South Carolina','North Charleston','Census Tract','Health Outcomes','High cholesterol among adults aged equal and larger than 18 Years who have been screened in the past 5 Years','Crude prevalence',NA,2649,HLTHOUT,HIGHCHOL,1003.971,'South Atlantic',1003.971,0

**Cluster 5:** 59078,2013,Michigan,Detroit,'Census Tract','Health Outcomes','High cholesterol among adults aged equal and larger than 18 Years who have been screened in the past 5 Years','Crude prevalence',NA,1899,HLTHOUT,HIGHCHOL,725.418,'East North Central',725.418,0

**Cluster 6:** 68474,2013,'New Mexico',Albuquerque,'Census Tract','Health Outcomes','High blood pressure among adults aged equal and larger than 18 Years','Crude prevalence',NA,3170,HLTHOUT,BPHIGH,763.97,Mountain,763.97,0

**Cluster 7**: 100051,2013,Texas,'El Paso','Census Tract','Health Outcomes','High blood pressure among adults aged equal and larger than 18 Years','Crude prevalence',NA,4542,HLTHOUT,BPHIGH,1380.768,'West South Central',1380.768,0

**Cluster 8:** 40486,2013,Georgia,'Johns Creek','Census Tract',Prevention,'Taking medicine for high blood pressure control among adults aged equal and larger than 18 Years with high blood pressure','Crude prevalence',NA,287,PREVENT,BPMED,200.039,'South Atlantic',0,200.039

**Cluster 9**: 99170,2013,Texas,Dallas,'Census Tract',Prevention,'Taking medicine for high blood pressure control among adults aged equal and larger than 18 Years with high blood pressure','Crude prevalence',NA,7167,PREVENT,BPMED,4880.727,'West South Central',0,4880.727

Missing values globally replaced with mean/mode

Final cluster centroids:

Cluster#

Attribute Full Data 0 1 2 3 4 5 6 7 8 9

(116024.0) (17410.0) (5470.0) (4238.0) (5998.0) (24431.0) (5319.0) (23446.0) (4817.0) (20681.0) (4214.0)

==========================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================================

1 5 4867 3219 29989 7 2084 1 6009 3 6028

Year 2013 2013 2013 2013 2013 2013 2013 2013 2013 2013 2013

StateDesc California California Florida Texas New York California Illinois California Texas California Texas

CityName New York Los Angeles Baltimore Houston New York New York Chicago New York Houston Los Angeles Houston

GeographicLevel Census Tract Census Tract Census Tract Census Tract Census Tract Census Tract Census Tract Census Tract Census Tract Census Tract Census Tract

Category Health Outcomes Prevention Prevention Prevention Prevention Health Outcomes Health Outcomes Health Outcomes Health Outcomes Prevention Prevention

Measure

High blood pressure among adults aged equal and larger than 18 Years Cholesterol screening among adults aged equal and larger than 18 Years Cholesterol screening among adults aged equal and larger than 18 Years Cholesterol screening among adults aged equal and larger than 18 Years Cholesterol screening among adults aged equal and larger than 18 Years

High cholesterol among adults aged equal and larger than 18 Years who have been screened in the past 5 Years

High cholesterol among adults aged equal and larger than 18 Years who have been screened in the past 5 Years

High blood pressure among adults aged equal and larger than 18 Years High blood pressure among adults aged equal and larger than 18 Years

Taking medicine for high blood pressure control among adults aged equal and larger than 18 Years with high blood pressure

Taking medicine for high blood pressure control among adults aged equal and larger than 18 Years with high blood pressure

**Data\_Value\_Type** Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence Crude prevalence

**Data\_Value\_Footnote** NA NA NA NA NA NA NA NA NA NA NA

**PopulationCount**  1394 2529 1 1394 1754 1394 1 1394 1394 1394 1394

**CategoryID**  HLTHOUT PREVENT PREVENT PREVENT PREVENT HLTHOUT HLTHOUT HLTHOUT HLTHOUT PREVENT PREVENT

**MeasureId** BPHIGH CHOLSCREEN CHOLSCREEN CHOLSCREEN CHOLSCREEN HIGHCHOL HIGHCHOL BPHIGH BPHIGH BPMED BPMED

**ActualPopulation**  0 0 0 0 0 0 0 0 0 0 0

**Region**  Pacific Pacific South Atlantic West South Central Middle Atlantic Pacific East North Central Pacific West South Central Pacific West South Central

HealthOutcomes 0 0 0 0 0 0 0 0 0 0 0

Prevention 0 0 0 0 0 0 0 0 0 0 0

Time taken to build model (full training data) : 9.88 seconds

=== Model and evaluation on training set ===

Clustered Instances

0 17410 ( 15%)

1 5470 ( 5%)

2 4238 ( 4%)

3 5998 ( 5%)

4 24431 ( 21%)

5 5319 ( 5%)

6 23446 ( 20%)

7 4817 ( 4%)

8 20681 ( 18%)

9 4214 ( 4%)

**Data Mining Analysis Conclusion and Recommendations**

Based on my analysis, I believe that there are still many states which are not completely covered with Preventive measures for the health risk faced by the population. The Population affected by the High Blood Pressure is covered with measures than the states facing High Cholesterol.

For Population affected by High Cholesterol, more preventive measures need to be taken covering more states and more cities. I would recommend the Data decision makers/ government officers/ Chief Medical officers should create strategy Plan to solve the problem of High Cholesterol in various states. The information also needs to be updated and researched based on other heath aspects and vision that could benefit more population in the United States.