Assignment 2

Niko Amber Assignments!

Assignment 1

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Problem 1

Install the datasets package on the console below using `install.packages("datasets")`. Now load the library.

Answer: I've loaded the library!

Load the USArrests dataset and rename it `dat`. Note that this dataset comes with R, in the package datasets, so there's no need to load data from your computer. Why is it useful to rename the dataset?

```
dat <- USArrests
```

Answer: It is beneficial to rename the data set, so we can replicate analyses without disturbing the original data set. Additionally, it is nice to rename your data set to know exactly it is called

Problem 2

First I am making states lowercarse, to be used as variables later.

```
dat$state <- tolower(rownames(USArrests))
```

This dataset has the state names as row names, so we just want to make them into a new variable. We also make them all lower case, because that will help us draw a map later - the map function requires the states to be lower case.

List the variables contained in the dataset `USArrests`.

The variables contained in the dataset 'USArrests' are Murder, Assault, and Rape. Additionally, the data set shows us what percentage of people live in urban areas.

```
USArrests
```

```
##               Murder Assault UrbanPop Rape          state
## Alabama         13.2     236       58 21.2        alabama
## Alaska          10.0     263       48 44.5         alaska
## Arizona          8.1     294       80 31.0        arizona
## Arkansas         8.8     190       50 19.5       arkansas
## California       9.0     276       91 40.6     california
```

```
## Colorado          7.9     204       78 38.7       colorado
## Connecticut       3.3     110       77 11.1    connecticut
## Delaware          5.9     238       72 15.8       delaware
## Florida          15.4     335       80 31.9        florida
## Georgia          17.4     211       60 25.8        georgia
## Hawaii            5.3      46       83 20.2         hawaii
## Idaho             2.6     120       54 14.2          idaho
## Illinois         10.4     249       83 24.0       illinois
## Indiana           7.2     113       65 21.0        indiana
## Iowa              2.2      56       57 11.3           iowa
## Kansas            6.0     115       66 18.0         kansas
## Kentucky          9.7     109       52 16.3       kentucky
## Louisiana        15.4     249       66 22.2      louisiana
## Maine             2.1      83       51  7.8          maine
## Maryland         11.3     300       67 27.8       maryland
## Massachusetts     4.4     149       85 16.3  massachusetts
## Michigan         12.1     255       74 35.1       michigan
## Minnesota         2.7      72       66 14.9      minnesota
## Mississippi      16.1     259       44 17.1    mississippi
## Missouri          9.0     178       70 28.2       missouri
## Montana           6.0     109       53 16.4        montana
## Nebraska          4.3     102       62 16.5       nebraska
## Nevada           12.2     252       81 46.0         nevada
## New Hampshire     2.1      57       56  9.5  new hampshire
## New Jersey        7.4     159       89 18.8     new jersey
## New Mexico       11.4     285       70 32.1     new mexico
## New York         11.1     254       86 26.1       new york
## North Carolina   13.0     337       45 16.1 north carolina
## North Dakota      0.8      45       44  7.3   north dakota
## Ohio              7.3     120       75 21.4           ohio
## Oklahoma          6.6     151       68 20.0       oklahoma
## Oregon            4.9     159       67 29.3         oregon
## Pennsylvania      6.3     106       72 14.9   pennsylvania
## Rhode Island      3.4     174       87  8.3   rhode island
## South Carolina   14.4     279       48 22.5 south carolina
## South Dakota      3.8      86       45 12.8   south dakota
## Tennessee        13.2     188       59 26.9      tennessee
## Texas            12.7     201       80 25.5          texas
## Utah              3.2     120       80 22.9           utah
## Vermont           2.2      48       32 11.2        vermont
## Virginia          8.5     156       63 20.7       virginia
## Washington        4.0     145       73 26.2     washington
## West Virginia     5.7      81       39  9.3  west virginia
## Wisconsin         2.6      53       66 10.8      wisconsin
## Wyoming           6.8     161       60 15.6        wyoming
```

Problem 3

What type of variable (from the DVB chapter) is `Murder`?

Answer: Murder is a categorical variable, it is one of many catagories that crime falls into. It is not ordinal, there is no ordering of crime.

What R Type of variable is it?

Answer: 'Murder' is a character variable, it contains information that isn't numeric.

Problem 4

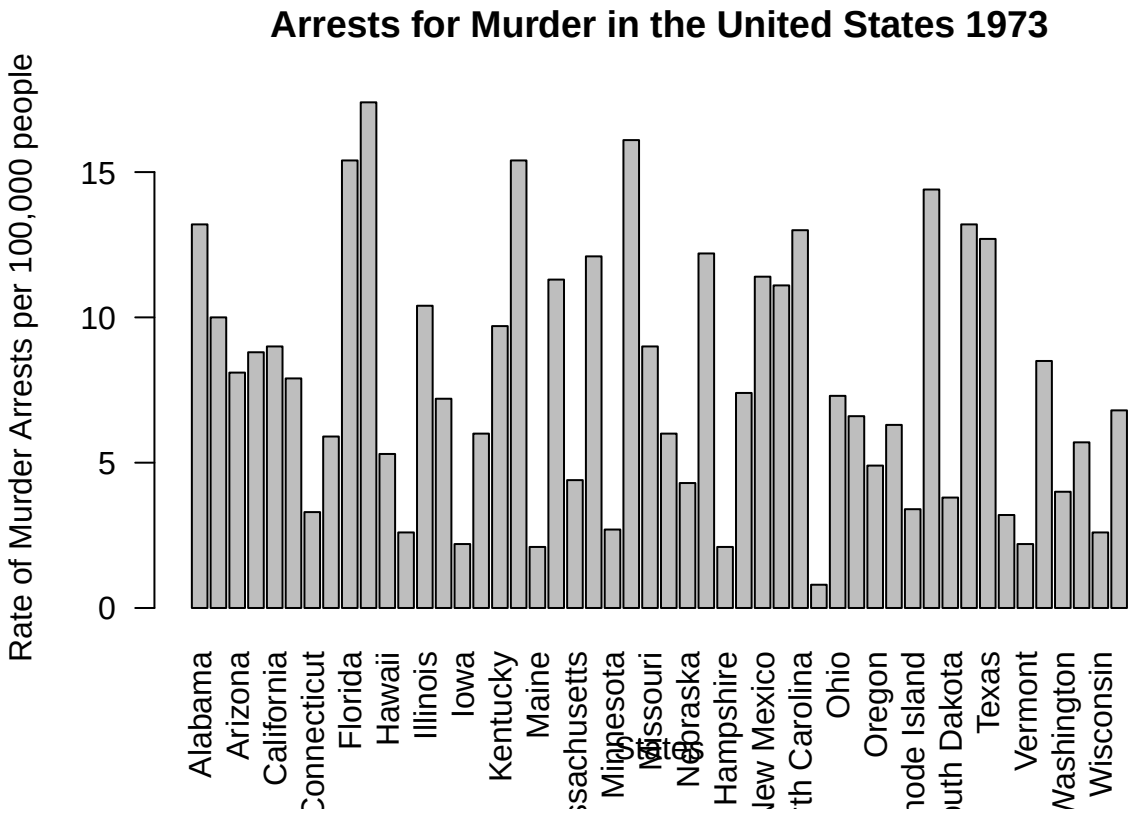
What information is contained in this dataset, in general? What do the numbers mean?

Answer: The Data set USArrests contains data about the rate of arrests for murder, rape and assault per 100,000 residents in each US state in 1973. The data set also includes the percent of the population living in urban cities in each state. The collums represent each type or crime (and urban population percentage) The numbers in each row are the rate of arrests per state (per 100,000).

Problem 5

Draw a (histogram) bar graph of `Murder` with proper labels and title. I used a bar graph instead of a histogram because I feel that is a better way to represent this data.

```
barplot(USArrests$Murder , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Murder Arrest
        main = "Arrests for Murder in the United States 1973")
```



Problem 6

Please summarize `Murder` quantitatively. What are its mean and median? What is the difference between mean and median? What is a quartile, and why do you think R gives you the 1st Qu. and 3rd Qu.?

I used the summary function to gather this information

```
summary(USArrests$Murder)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.800   4.075   7.250   7.788  11.250  17.400
```

The mean for murder is 7.788 meaning this is the average rate of people (per 100,000) murdered in each US state in 1973. The median for murder is 7.250 meaning in the United States in 1973 half of the states had a rate per 100,000 more that 7.250 and half had fewer. Median is the middle of numbers in a data set, while mean is the average of all numbers in said set. If the data is evenly distributed the median will equal the mean.

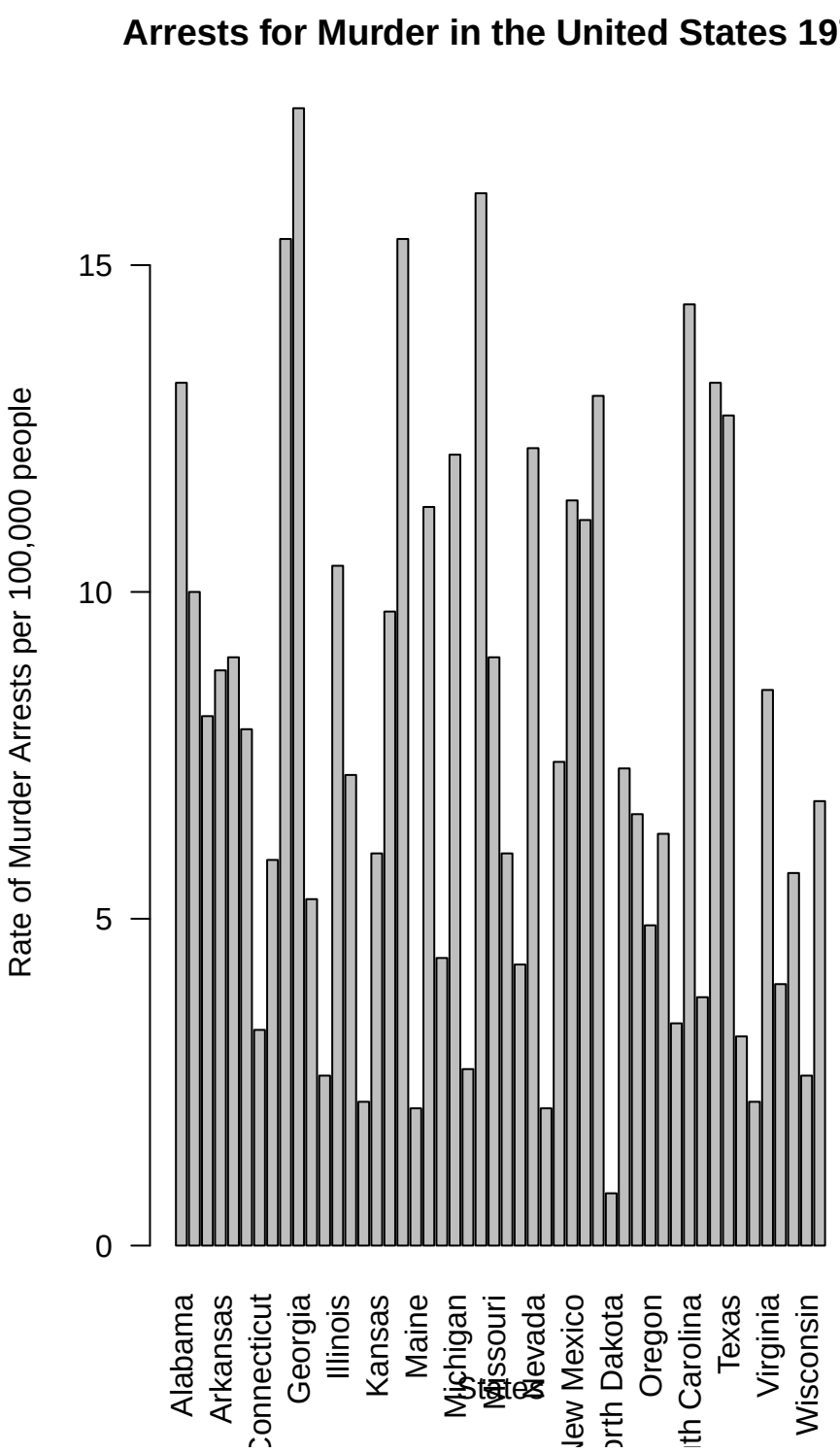
A quartile is when the data is divided into four equal parts: the 1st, 2nd, 3rd, and 4th quartile. R gives the 1st and 3rd quartile because it represents the middle of the data. 1st quartile is lowest 25% and 3rd quartile is highest 25%.

Problem 7

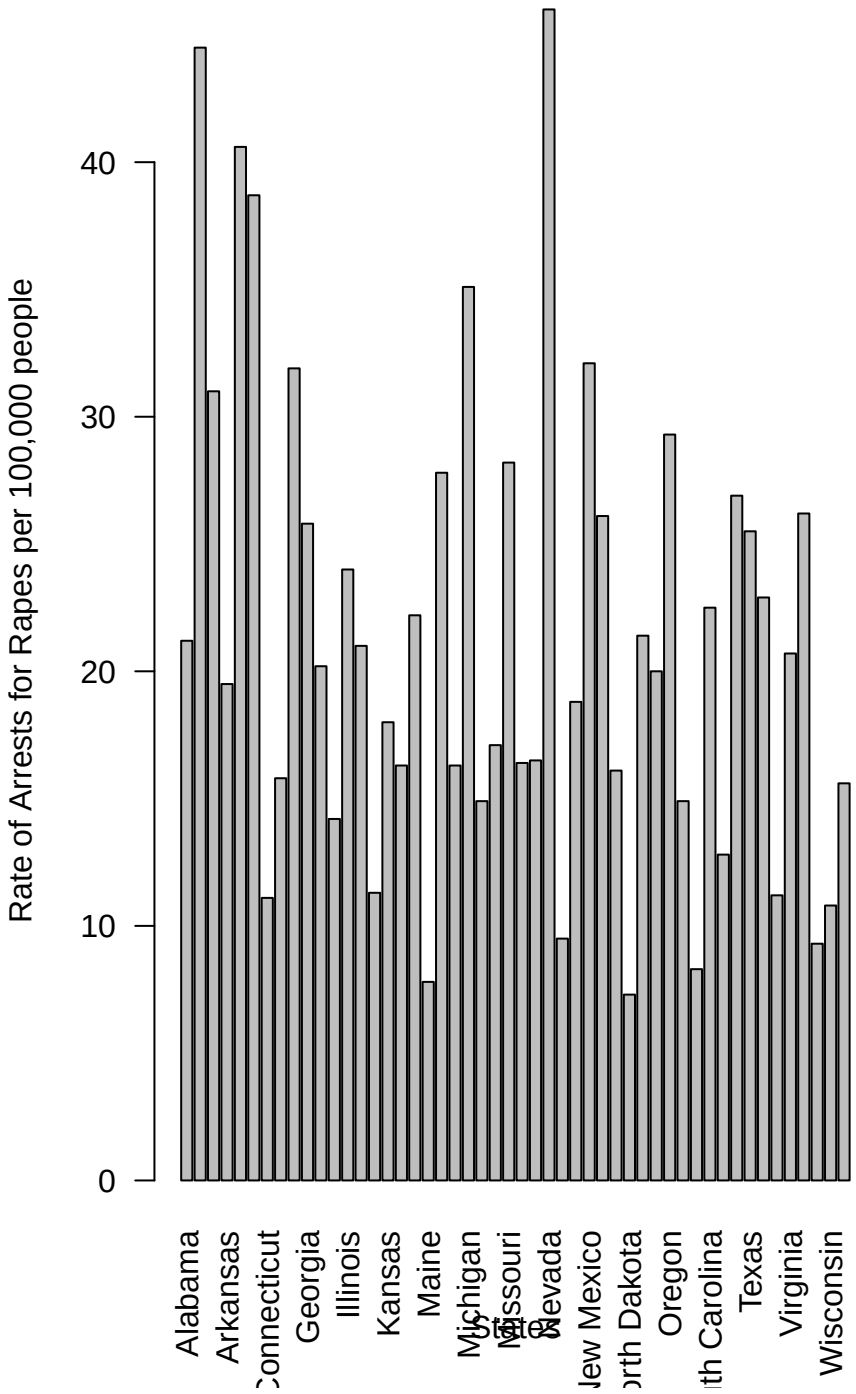
Repeat the same steps you followed for `Murder`, for the variables `Assault` and `Rape`. Now plot all three histograms together. You can do this by using the command `par(mfrow=c(3,1))` and then plotting each of the three.

Note: I used bar graphs

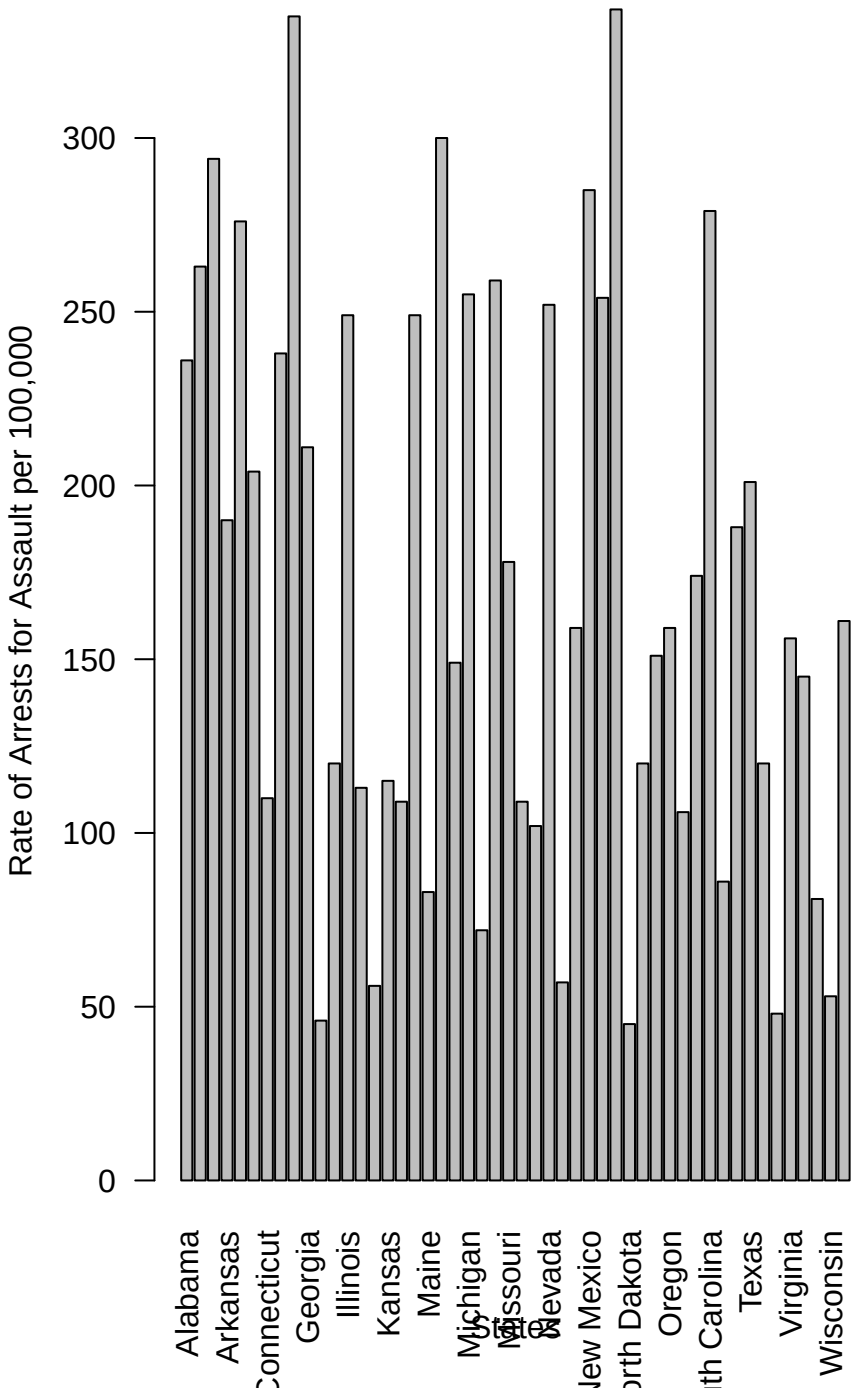
```
barplot(USArrests$Murder , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Murder Arrest
        main = "Arrests for Murder in the United States 1973")
```




```r
#Bar plot for rape arrests
barplot(USArrests$Rape , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Arrests for Rape
        main = "Rate of Arrests for Rape in the United States in 1973")
```




```r
#Bar plot for assault arrests
barplot(USArrests$Assault , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Arrests for A
        main = "Rate of Arrests for Assaults in the United States")
```

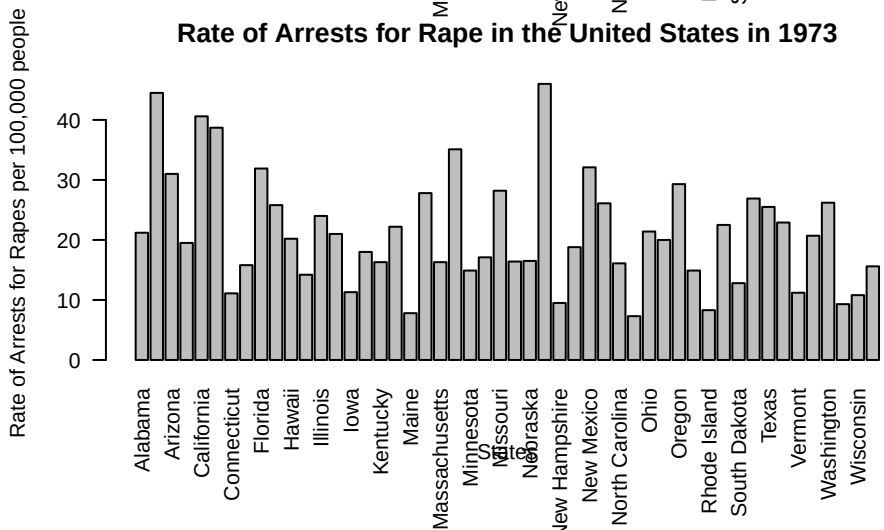


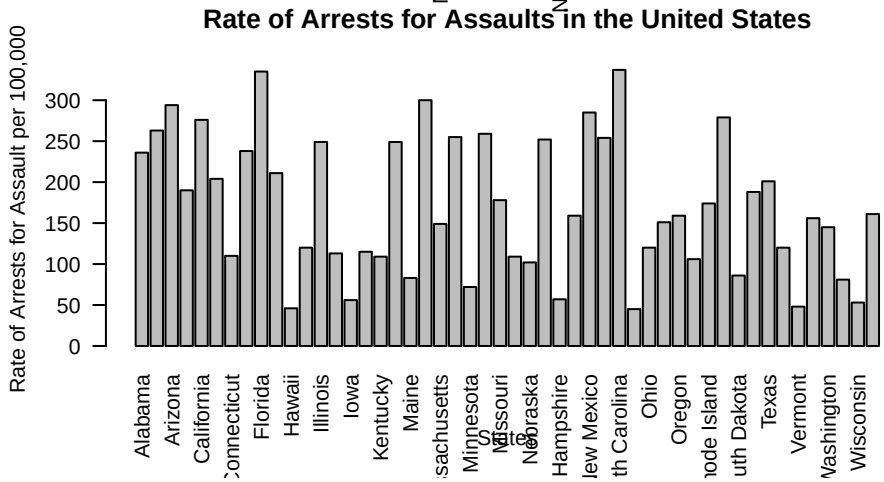

```
#plotting the graphs together

par(mfrow=c(3,1))
barplot(USArrests$Murder , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Murder Arrests
        main = "Arrests for Murder in the United States 1973")
```

```r
#Bar plot for rape arrests
barplot(USArrests$Rape , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Arrests for Rape
        main = "Rate of Arrests for Rape in the United States in 1973")

#Bar plot for assault arrests
barplot(USArrests$Assault , names.arg = state.name,las=2, xlab = "States", ylab = "Rate of Arrests for A
        main = "Rate of Arrests for Assaults in the United States")
```






```
par
```

```
## function (..., no.readonly = FALSE)
## {
##     .Pars.readonly <- c("cin", "cra", "csi", "cxy", "din", "page")
```

```
##     single <- FALSE
##     args <- list(...)
##     if (!length(args))
##         args <- as.list(if (no.readonly)
##             .Pars[-match(.Pars.readonly, .Pars)]
##         else .Pars)
##     else {
##         if (all(unlist(lapply(args, is.character))))
##             args <- as.list(unlist(args))
##         if (length(args) == 1) {
##             if (is.list(args[[1L]]) || is.null(args[[1L]]))
##                 args <- args[[1L]]
##             else if (is.null(names(args)))
##                 single <- TRUE
##         }
##     }
##     value <- .External2(C_par, args)
##     if (single)
##         value <- value[[1L]]
##     if (!is.null(names(args)))
##         invisible(value)
##     else value
## }
## <bytecode: 0x7f7ee0939da8>
## <environment: namespace:graphics>
```

What does the command par do, in your own words (you can look this up by asking R `?par`)?

Answer: This command allows R to set paramaters, this way multiple data sets can be graphed together.

What can you learn from bar graphs the histograms together?

Answer: When we plot these bar graphs together we can compare each state's arrest rates for different crimes. For example, when looking at the bar graphs it is easy to see that North Carolina's arrest rate for assault is much higher than the arrest rate for rape. This can lead researchers to ask questions: why were there more arrests for assaults? Were there possible sexually based assault that should have been charged as rape?

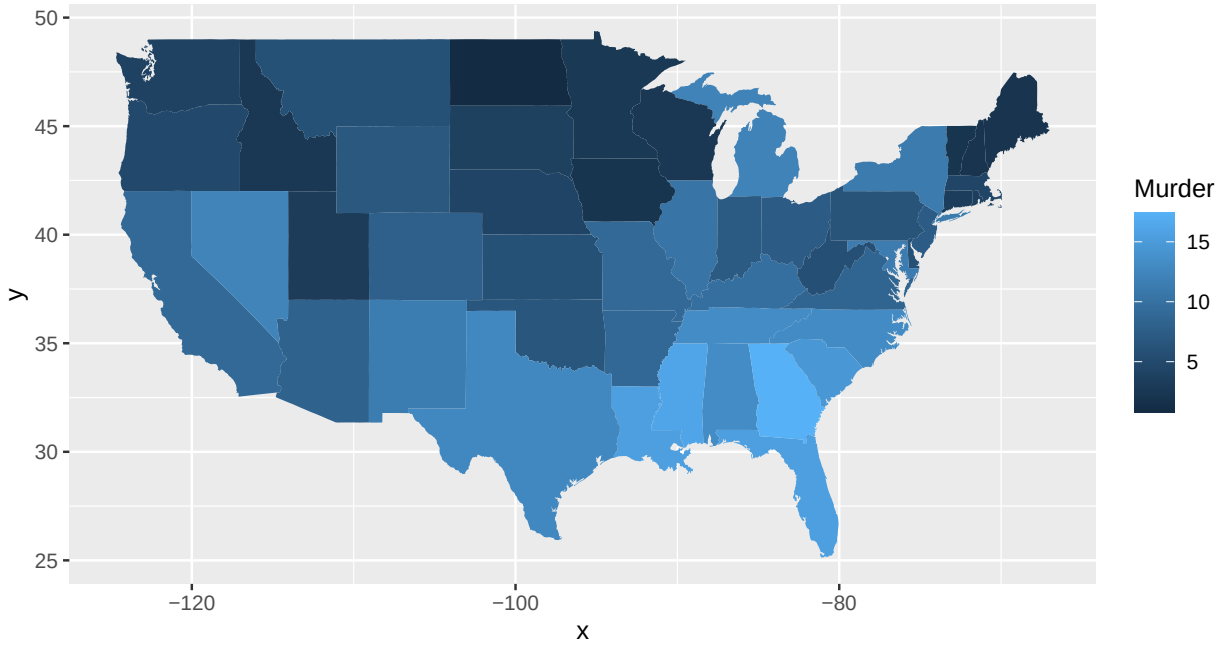
Problem 8

In the console below (not in text), type `install.packages("maps")` and press Enter, and then type `install.packages("ggplot2")` and press Enter. This will install the packages so you can load the libraries.

Run this code:

```
library('maps')
library('ggplot2')

#this code creates a map
ggplot(dat, aes(map_id=state, fill=Murder)) +
  geom_map(map=map_data("state")) +
  expand_limits(x=map_data("state")$long, y=map_data("state")$lat)
```



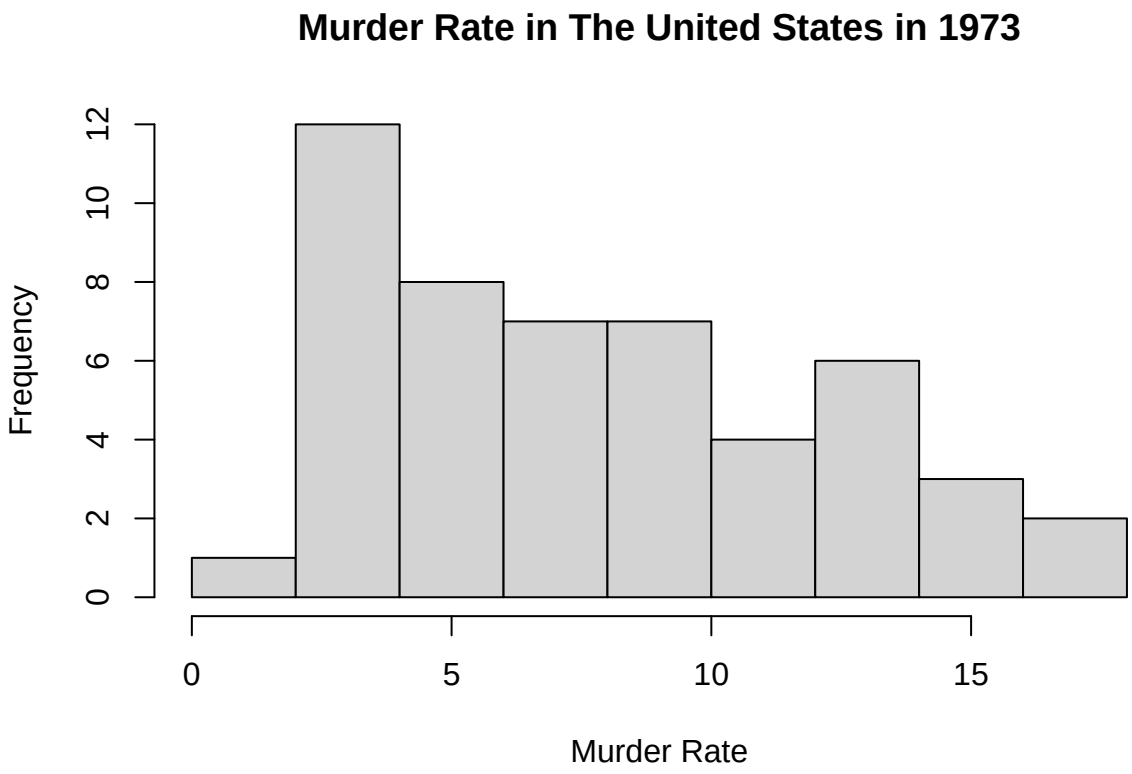
What does this code do? Explain what each line is doing.

Answer: This code creates a colored map that uses our data set to show murder rates. The lighter the blue, the higher the murder rate.

The first line of code creates a map that is divided by states. TYhe first line also applies the data set to the map, so the color of the state will be lighter if murder rates are higher. The second line of code designs the map by breaking it up by state. The last line of code expands the limits of the map

Here is my histogram

```
hist(dat$Murder, main = "Murder Rate in The United States in 1973", xlab = "Murder Rate", ylab = "Frequ
```



Assignment 2

Assignment 2

Problem 1

```
knitr::opts_chunk$set(echo = TRUE)
```

```
setwd("/Users/nikoamber/Library/Mobile Documents/com~apple~CloudDocs/Penn/Freshman Fall/Criminology/Ass

dat <- read.csv(file = 'dat.nsduh.small.1.csv')

names(dat)
```

```
## [1] "mjage"     "cigage"    "iralcage"  "age2"      "sexatract" "speakengl"
## [7] "irsex"
```

```
nrow(dat)
```

```
## [1] 171
```

```
ncol(dat)
```

```
## [1] 7
```

There are seven columns and 171 rows

Problem 2

Describe the variables in the dataset.

The variables in the data are:

MJAGE which is how old the participants are the first time they used marijuana/hashish. It is a quantitative continuous variable.

CIGAGE which is how old the participants were when they first started smoking cigarettes everyday. It is a quantitative continuous variable.

IRALCAGE which is how old the participants were when they first tried alcohol. it is a quantitative continuous variable.

AGE2S which is the age of the respondents of the survey, categorized into groups. It is a categorical nominal variable.

IRSEX which is which sex participants identify as. It is a categorical, nominal variable. Participants can only identify as male or female. which is coded as 1 or 2.

SEXATRACT which is who participants of the study are attracted to. It is a categorical, nominal variable. Participants identified their sexual preference on a catagory scale of 1-6, but there is no ranking.

SPEAKENGL which is how well do participants speak English. It is a categorical, ordinal variable. Participants rate on a scale of 1-4 where 1 is speaking English well and 4 is not at all.

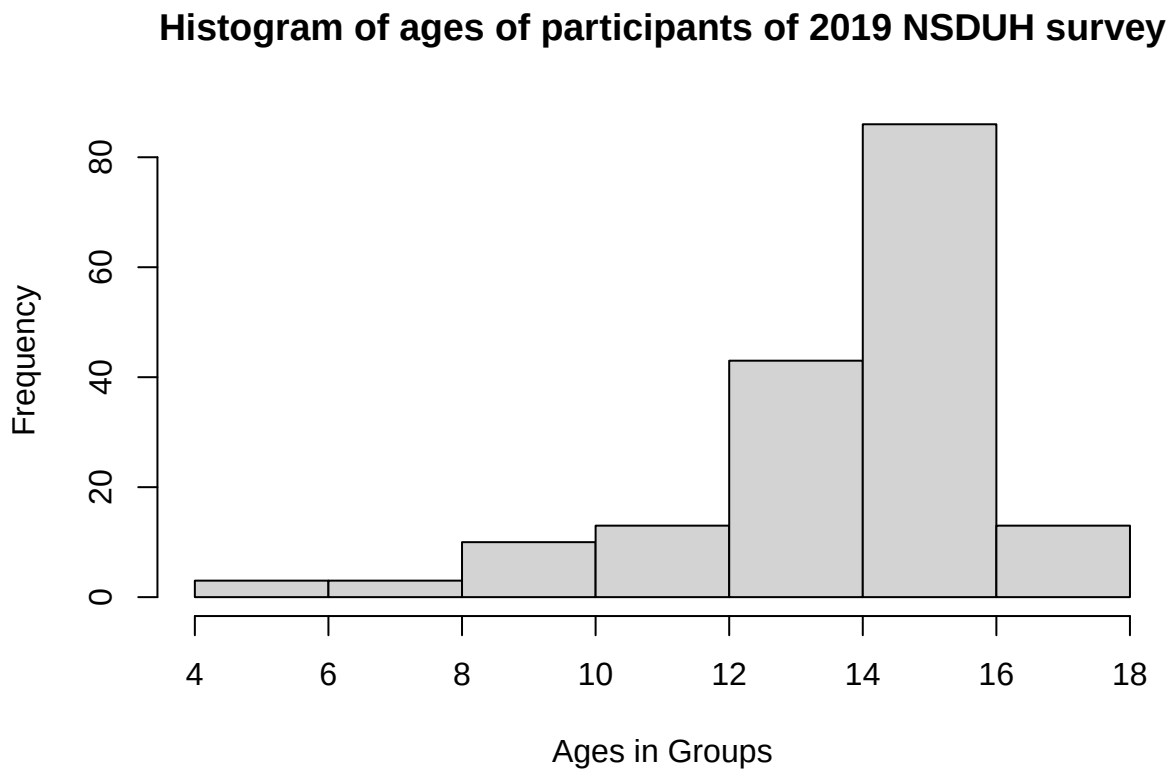
What is this dataset about? Who collected the data, what kind of sample is it, and what was the purpose of generating the data?

This data set is a sample form a 2019 survey taken by the National Survey of Drug Use and Health. This data is only a sample of the survey and has the first 1000 values, and does not include missing values. The data is a random sampling of the US population, and it can be used to tell us more about the US population and their relationship with drugs.

Problem 3: Age and gender

What is the age distribution of the sample like? Make sure you read the codebook to know what the variable values mean.

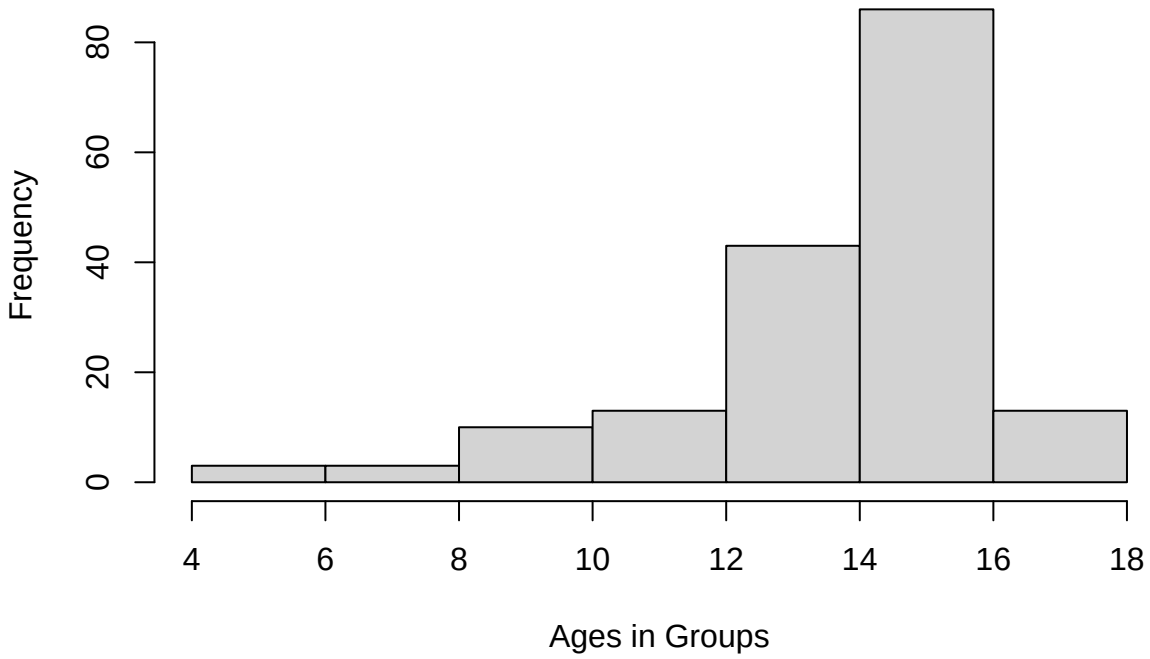
```
hist(dat$age2, main= "Histogram of ages of participants of 2019 NSDUH survey", xlab= "Ages in Groups",
```



Problem 3: Age and gender

What is the age distribution of the sample like? Make sure you read the codebook to know what the variable values mean.

```
hist(dat$age2, main= "Histogram of ages of participants of 2019 NSDUH survey", xlab= "Ages in Groups",
```



The age distribution is from ages 12-65+. As mentioned in the code book, it is grouped in sections. but not every group holds the same number of years. Because of this it is difficult to see the age distribution properly. While it appears that most participants are in group 15, group 15 has ages 35-49 (14 years) while groups 1-9 only have one year.

Do you think this age distribution representative of the US population? Why or why not?

Because of the way the ages are grouped together, this histogram is left skewed. However, there are no respondents below the age of 12, which makes sense given the content of this survey. There are also very few older participants. Therefore this data is probably a good representation of the US population for the purposes of this study, but obviously is not representative of the entire US population.

Is the sample balanced in terms of gender? If not, are there more females or males?

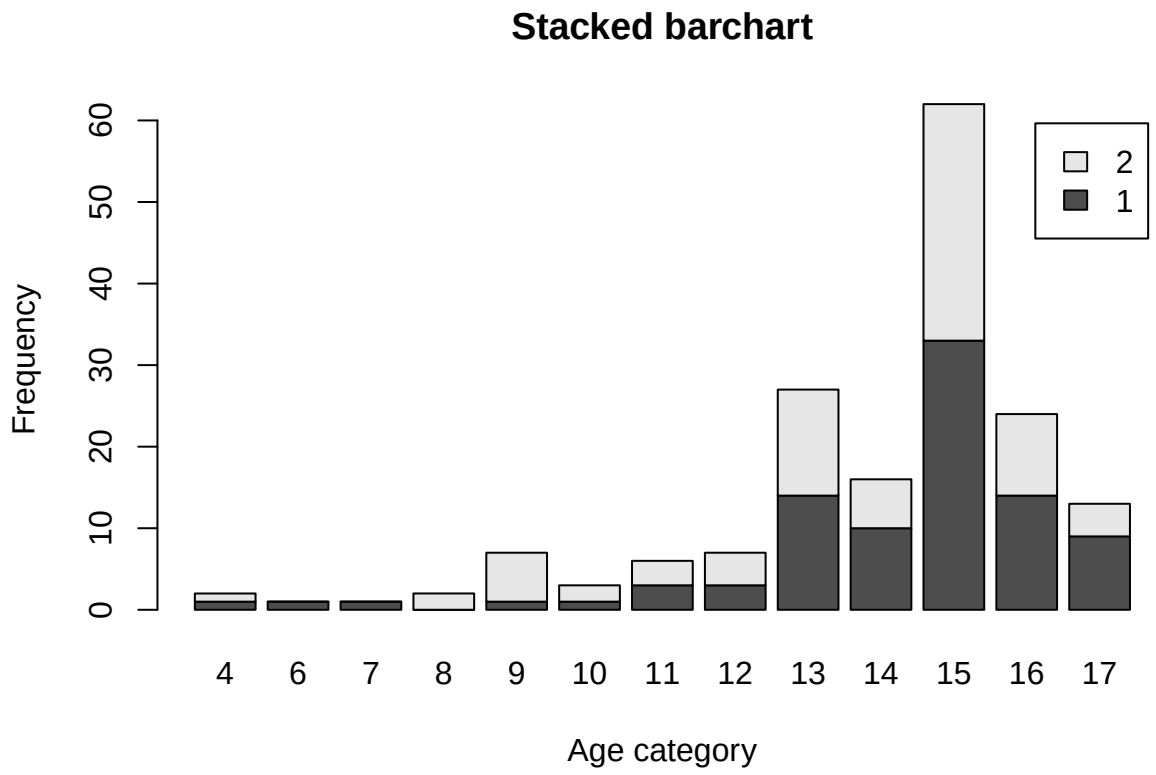
```
table(dat$irsex)
```

```
##
##  1  2
## 91 80
```

There are more males than females in this sample. It is not representative of the US population, because in the population there are slightly more women then men. This scale is also on a bianary, when there are many people in the United States who may not identify with one of these two genders. According to the code book, the entire data set has more females then males, but in these 1000 data points, there are more males then females.

Use this code to draw a stacked bar plot to view the relationship between sex and age. What can you conclude from this plot?

```
tab.agesex <- table(dat$irsex, dat$age2)
barplot(tab.agesex,
        main = "Stacked barchart",
        xlab = "Age category", ylab = "Frequency",
        legend.text = rownames(tab.agesex),
        beside = FALSE) # Stacked bars (default)
```

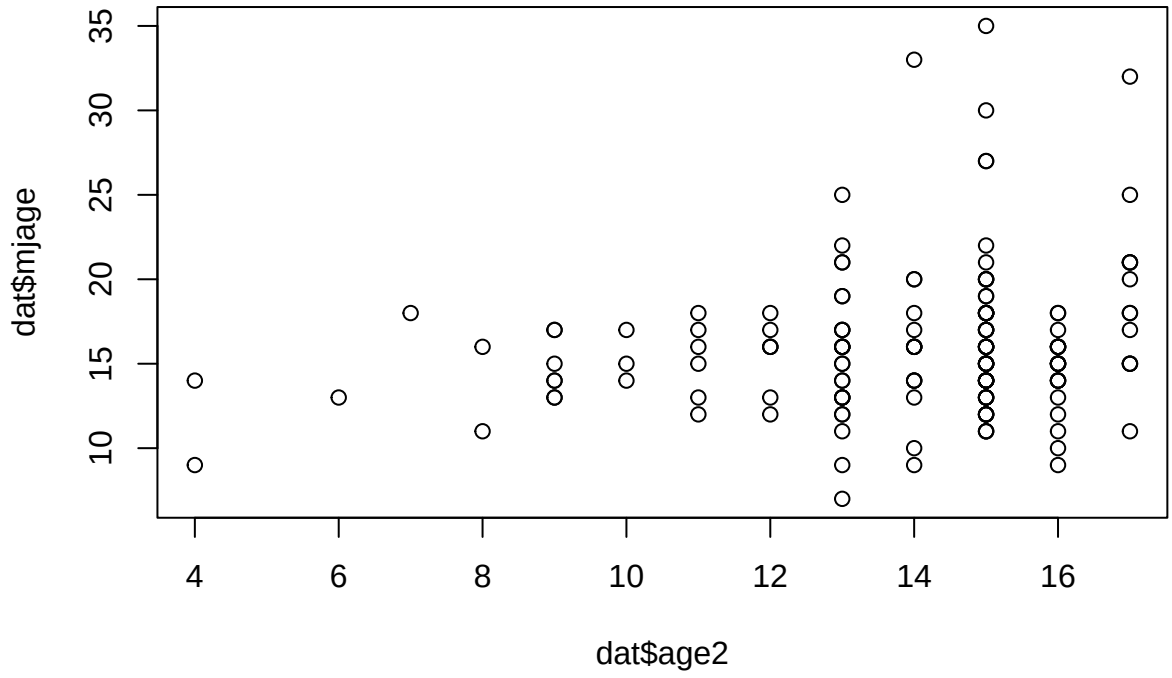


In the age category 15, that represents respondents between 35 and 49 and 26-29, there is about an even distribution between men and women. However, the younger groups tend to have more female participants then male (group 8 does not have any male respondents) and the groups above 15 seerm to have a larger percentage of men.

Problem 4: Substance use

For which of the three substances included in the dataset (marijuana, alcohol, and cigarettes) do individuals tend to use the substance earlier?

```
par(mfrow=c (1,1))
plot(dat$age2, dat$mjage)
```



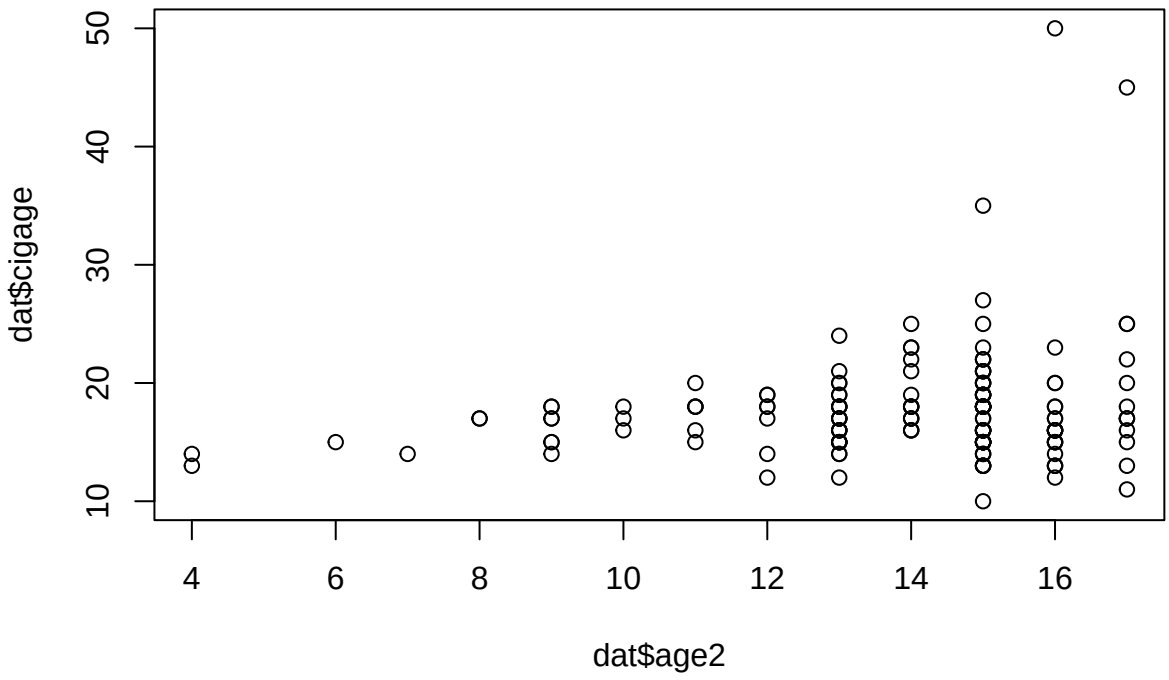

```
cor(dat$age2, dat$mjage)
```

```
## [1] 0.1811713
```

```
cor(dat$age2, dat$cigage)
```

```
## [1] 0.1697763
```

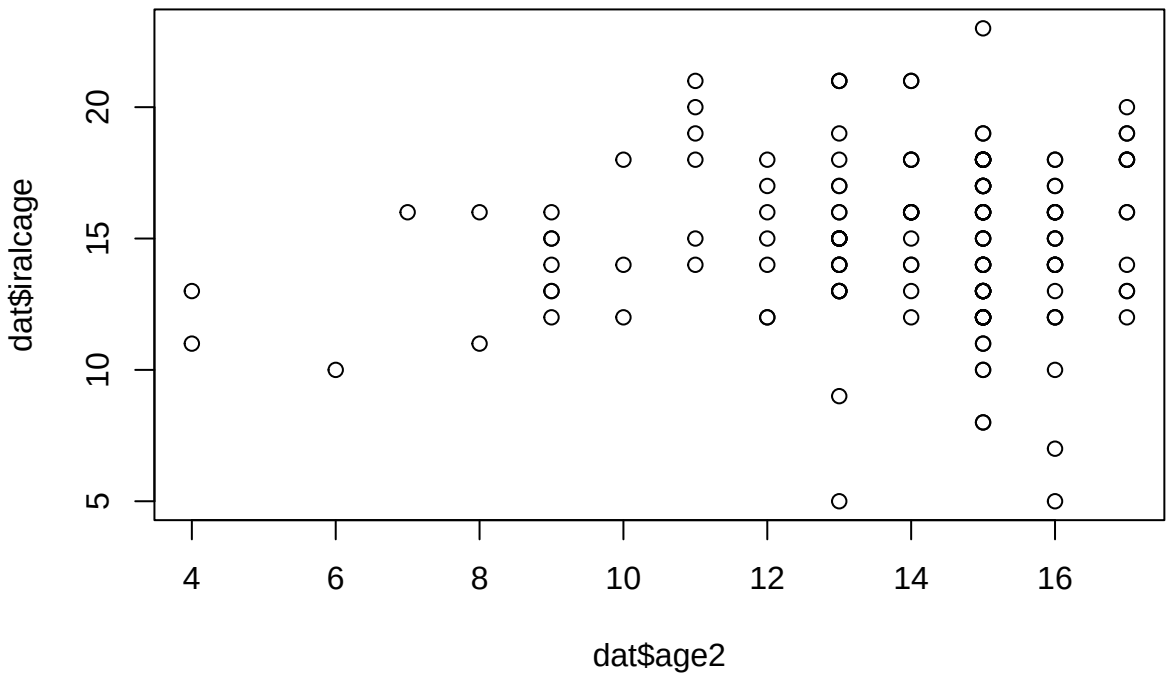
```
plot(dat$age2, dat$cigage)
```




```
cor(dat$age2, dat$iralcage)
```

```
## [1] 0.07253557
```

```
plot(dat$age2, dat$iralcage)
```

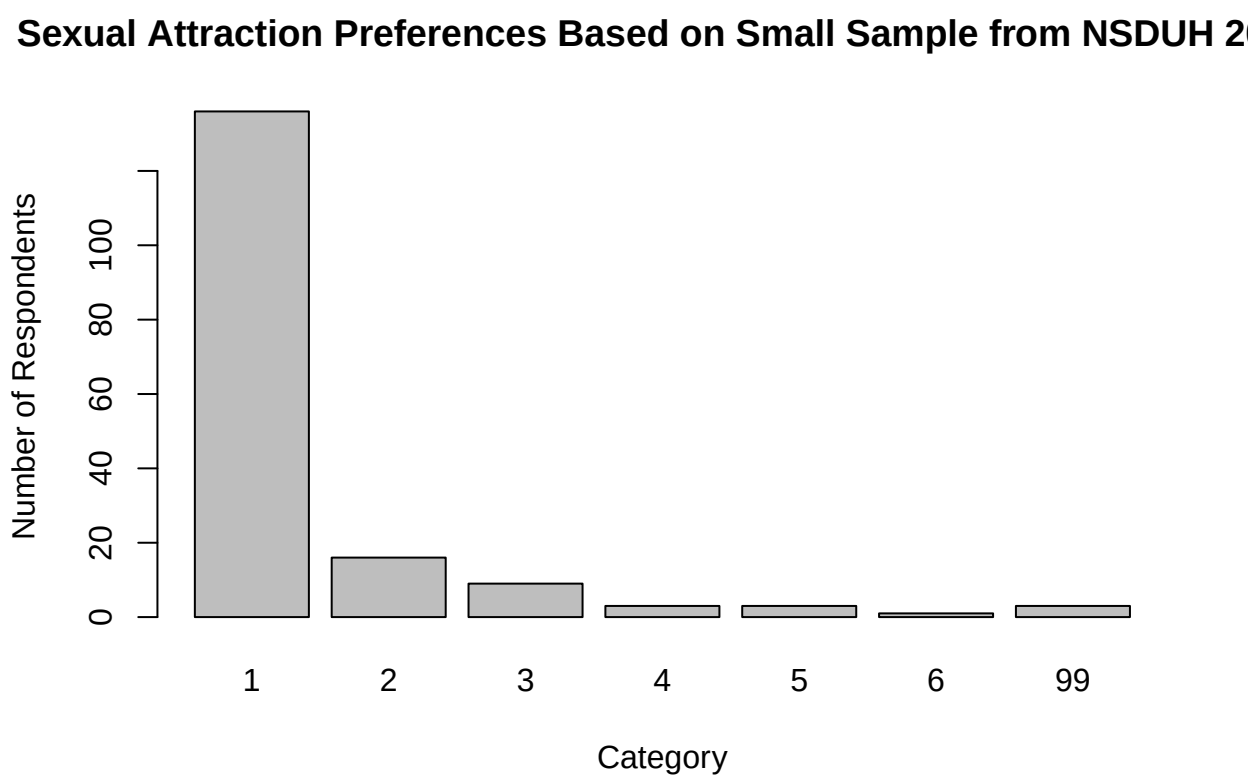


People in the survey tended to use alcohol earlier than other substances. This can be seen by the scatter plots. Additionally, alcohol has the lowest correlation coefficient.

Problem 5: Sexual attraction

What does the distribution of sexual attraction look like? Is this what you expected?

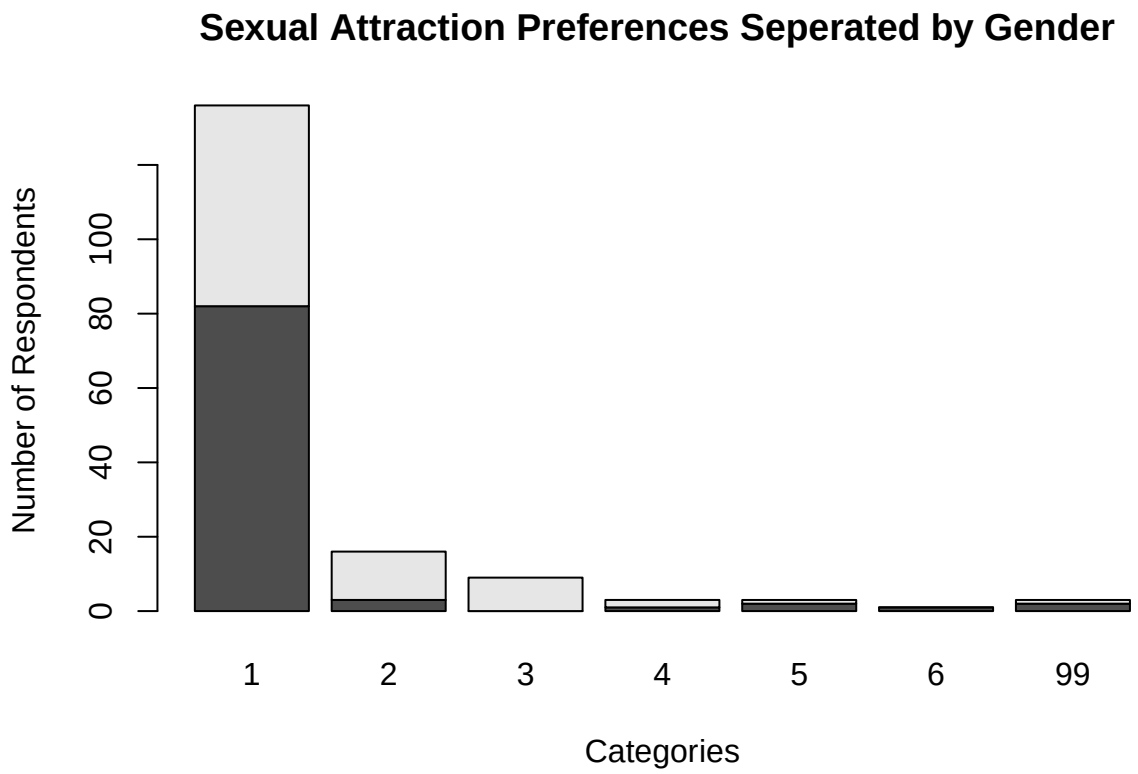
```
counts <- table(dat$sexatract)
barplot(counts, main= "Sexual Attraction Preferences Based on Small Sample from NSDUH 2019", xlab= "Cat
```



According to this bargraph, most people answered 1, which indicates preference for the opposite sex.This does not surprise me, as most people in the United States are heterosexual, however I would expect more people to answer 3 or 5.

What is the distribution of sexual attraction by gender?

```
counts <- table(dat$irsex, dat$sexatract)
barplot(counts, main= "Sexual Attraction Preferences Seperated by Gender ", xlab="Categories", ylab= "Nu
```

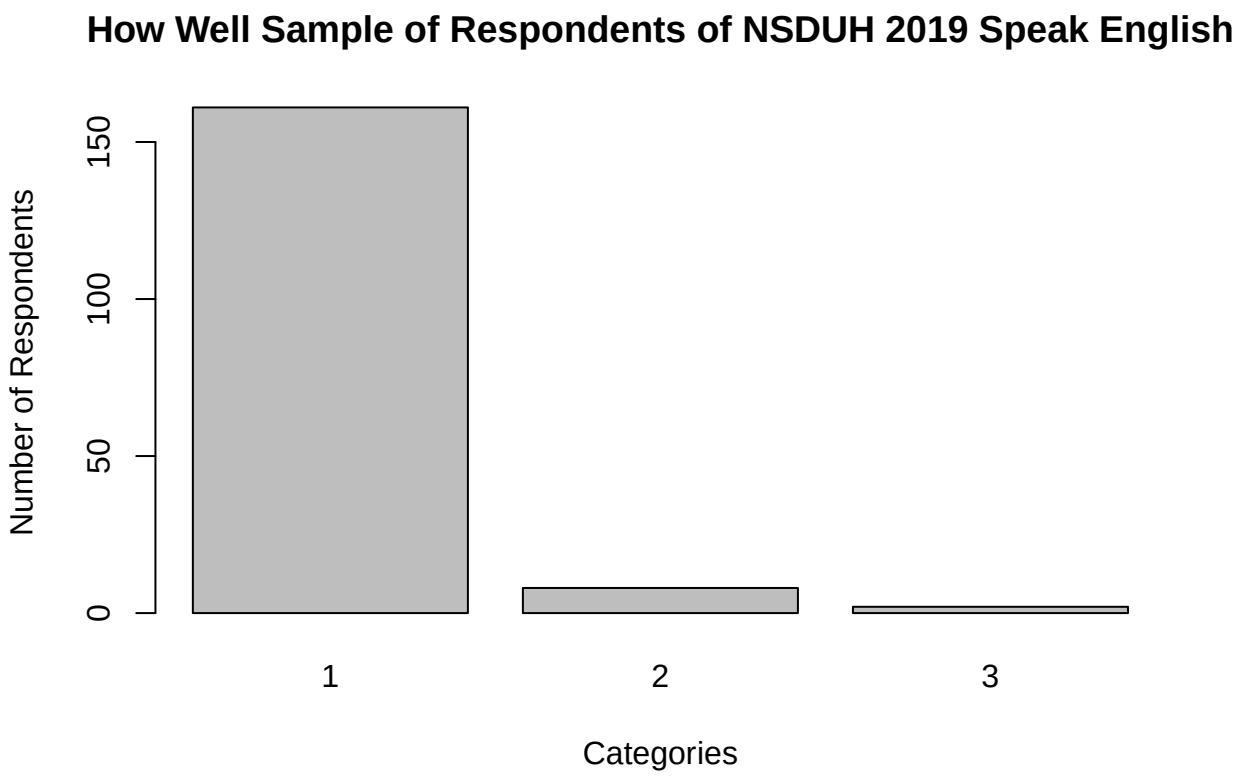


Group 1, which is heterosexual, is mainly composed of males. While group 3, which is bisexual is completely female. Group 6, which is homosexual, is also completely male.

Problem 6: English speaking

What does the distribution of English speaking look like in the sample? Is this what you might expect for a random sample of the US population?

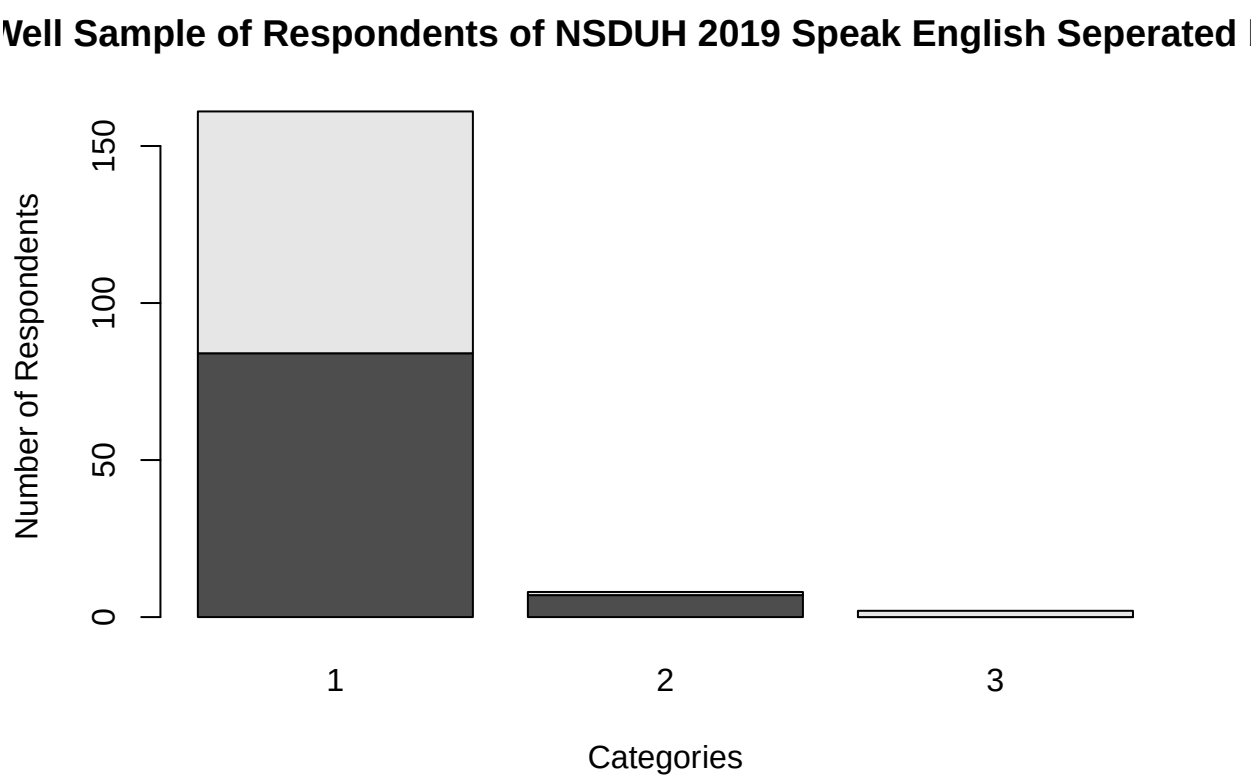
```
counts <- table(dat$speakengl)
barplot(counts, main= "How Well Sample of Respondents of NSDUH 2019 Speak English", xlab="Categories", y
```



Most participants speak English very well, very few speak well and almost none speak not well or none at all. If this survey was only given out in English, this distribution makes sense. But in the US population, while the majority of people speak English, many do not speak it "very well."

#Are there more English speaker female or males?

```
counts <- table(dat$irsex, dat$speakengl)
barplot(counts, main= "How Well Sample of Respondents of NSDUH 2019 Speak English Seperated by Gender",
```



There are a similar number of males and females who speak English “very well” There are many more females who speak English “Well,” so overall there are more females then males who speak English.