Assignments

Assignment 1

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Problem 1

Install the datasets package on the console below and load the data

```
dat<-USArrests
```

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?

Answer: It is useful to rename the data set for convenience and easy accessibility.

```
USArrests
```

```
##                Murder Assault UrbanPop Rape
## Alabama          13.2     236       58 21.2
## Alaska           10.0     263       48 44.5
## Arizona           8.1     294       80 31.0
## Arkansas          8.8     190       50 19.5
## California        9.0     276       91 40.6
## Colorado          7.9     204       78 38.7
## Connecticut       3.3     110       77 11.1
## Delaware          5.9     238       72 15.8
## Florida          15.4     335       80 31.9
## Georgia          17.4     211       60 25.8
## Hawaii            5.3      46       83 20.2
## Idaho             2.6     120       54 14.2
## Illinois         10.4     249       83 24.0
## Indiana           7.2     113       65 21.0
## Iowa              2.2      56       57 11.3
## Kansas            6.0     115       66 18.0
## Kentucky          9.7     109       52 16.3
## Louisiana        15.4     249       66 22.2
## Maine             2.1      83       51  7.8
## Maryland         11.3     300       67 27.8
## Massachusetts     4.4     149       85 16.3
## Michigan         12.1     255       74 35.1
## Minnesota         2.7      72       66 14.9
## Mississippi      16.1     259       44 17.1
## Missouri          9.0     178       70 28.2
## Montana           6.0     109       53 16.4
## Nebraska          4.3     102       62 16.5
## Nevada           12.2     252       81 46.0
## New Hampshire     2.1      57       56  9.5
## New Jersey        7.4     159       89 18.8
## New Mexico       11.4     285       70 32.1
## New York         11.1     254       86 26.1
## North Carolina   13.0     337       45 16.1
## North Dakota      0.8      45       44  7.3
## Ohio              7.3     120       75 21.4
## Oklahoma          6.6     151       68 20.0
## Oregon            4.9     159       67 29.3
## Pennsylvania      6.3     106       72 14.9
## Rhode Island      3.4     174       87  8.3
## South Carolina   14.4     279       48 22.5
## South Dakota      3.8      86       45 12.8
## Tennessee        13.2     188       59 26.9
## Texas            12.7     201       80 25.5
## Utah              3.2     120       80 22.9
## Vermont           2.2      48       32 11.2
## Virginia          8.5     156       63 20.7
## Washington        4.0     145       73 26.2
## West Virginia     5.7      81       39  9.3
## Wisconsin         2.6      53       66 10.8
## Wyoming           6.8     161       60 15.6
```

```
dat<-USArrests
```

Problem 2

List the variables contained in the dataset:

The four variables within the dataset are Murder, Assault, Urbanpop and Rape

Problem 3

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

Answer: categorical

What R Type of variable is it?

Answer: character

Problem 4

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

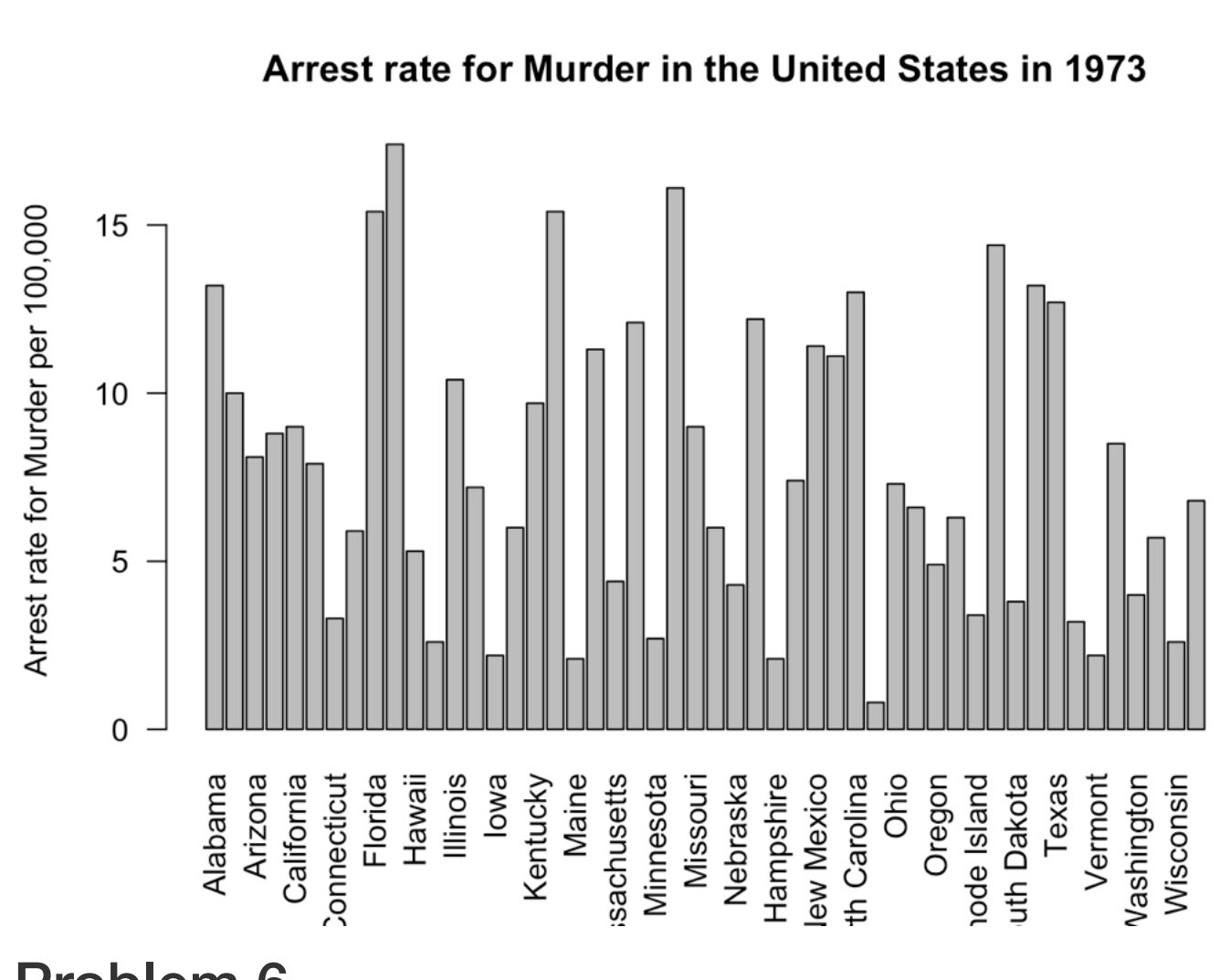
Answer: The data set shows the arrest rate per 100,000 in the US in 1973. The rows show each state and the columns show the type of arrest. Each number shows the amount of arrests of that type within that state per 100,000.

Problem 5

Draw a histogram of `Murder` with proper labels and title.

I chose to do a bar chart instead due to the categorical nature of the values.

```
  state.names = row.names(USArrests)
barplot(USArrests$Murder, names.arg = state.names, las = 2, ylab =
"Arrest rate for Murder per 100,000",
    main = "Arrest rate for Murder in the United States in 1973")
```



Problem 6

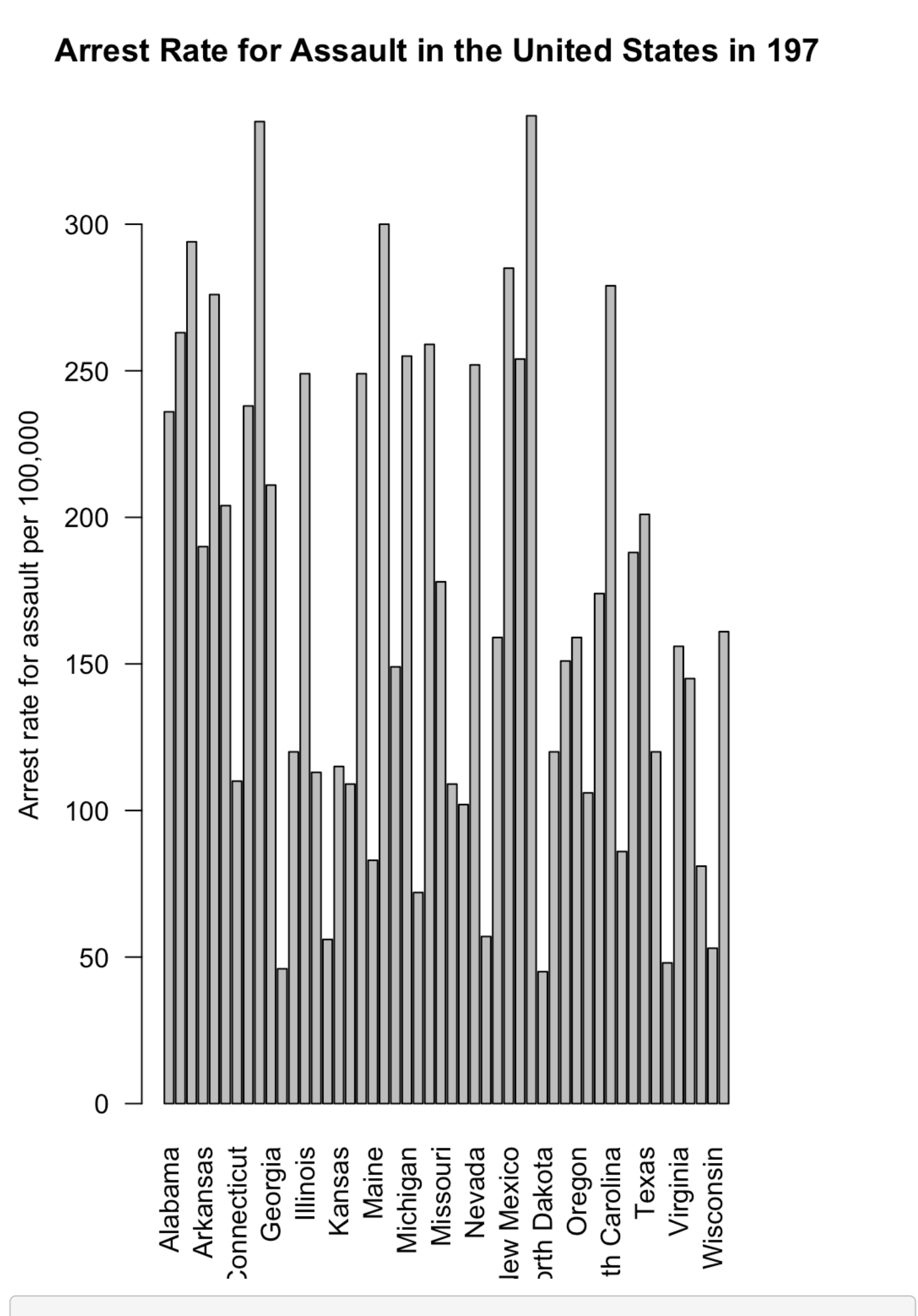
Please summarize `Murder` quantitatively. What are its mean and median? What is the difference between mean and median? What is a quartile, and why do you think R gives you the 1st Qu. and 3rd Qu.?

Answer: The mean for murder is 7.788 and the median for murder is 7.250. Mean is the average of the data (that is: if you were to add up all of the values then divide by the amount of values present). Median is the middle value (half of the values are above and half are below). If the data is well distributed, mean and median will be similar or the same, but the major differences occur when there are outliers: mean is impacted by outliers whereas median is not. In this data seet, mean and median appear rather similar. Quartiles are the data broken up into 4 parts. R gives the 1st quartile to give a sense of the values up until 25% of the data and the 3rd quartile to give values up until 75% of the data.

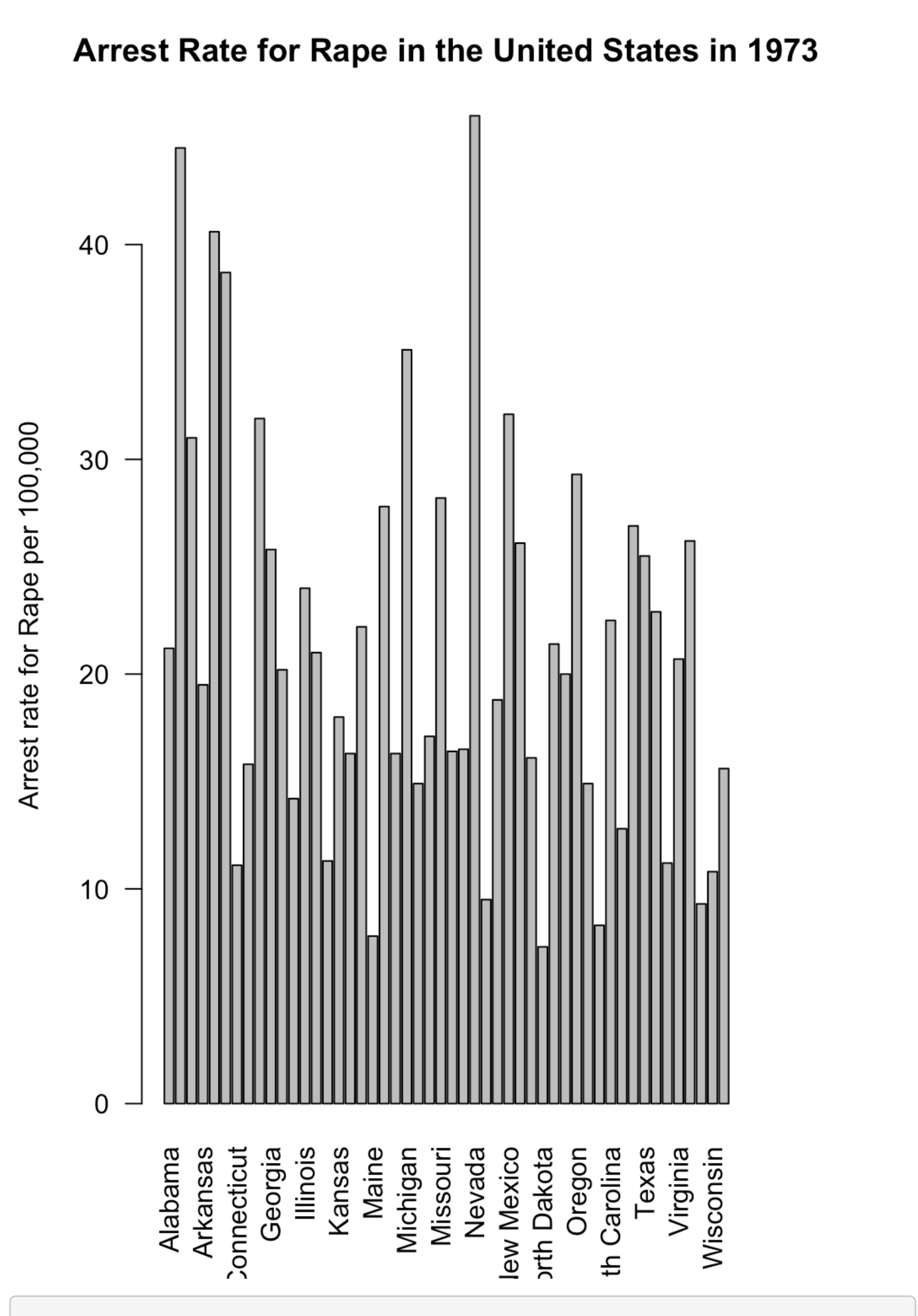
Problem 7

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.

```
  state.names = row.names(USArrests)
barplot(USArrests$Assault, names.arg = state.names, las = 2, ylab
= "Arrest rate for assault per 100,000",
    main = "Arrest Rate for Assault in the United States in 1973")
```



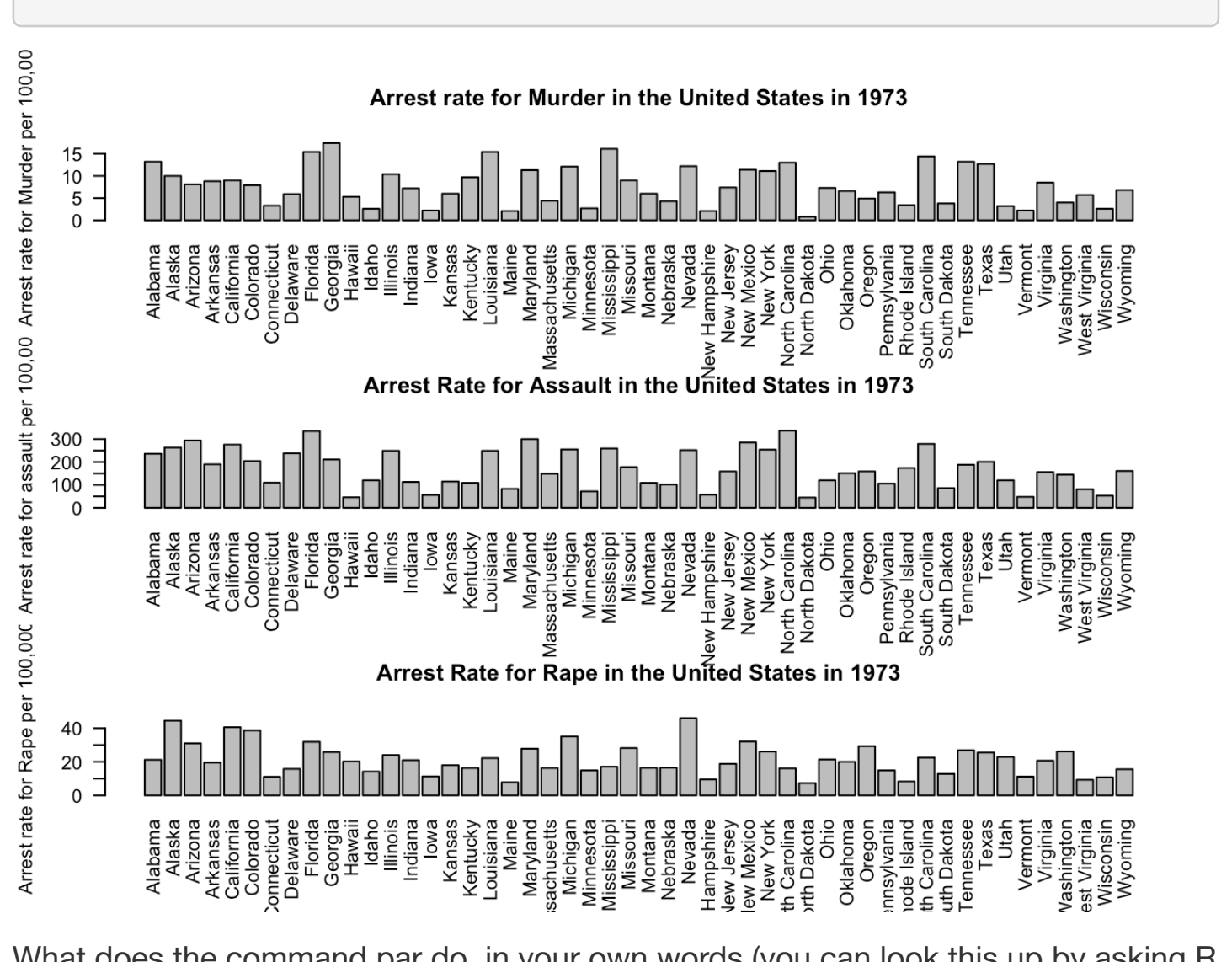

```
 state.names = row.names(USArrests)
barplot(USArrests$Rape, names.arg = state.names, las = 2, ylab = "
Arrest rate for Rape per 100,000",
    main = "Arrest Rate for Rape in the United States in 1973")
```




```
   par(mfrow=c(3,1))
     state.names = row.names(USArrests)
barplot(USArrests$Murder, names.arg = state.names, las = 2, ylab =
"Arrest rate for Murder per 100,000",
    main = "Arrest rate for Murder in the United States in 1973")

state.names = row.names(USArrests)
barplot(USArrests$Assault, names.arg = state.names, las = 2, ylab
= "Arrest rate for assault per 100,000",
    main = "Arrest Rate for Assault in the United States in 1973")

 state.names = row.names(USArrests)
barplot(USArrests$Rape, names.arg = state.names, las = 2, ylab = "
Arrest rate for Rape per 100,000",
    main = "Arrest Rate for Rape in the United States in 1973")
```



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

Answer: Command par allows for multiple graphs to be plotted together. This command makes this possible by defining parameters.

What can you learn from plotting the histograms together?

Answer: By plotting the histograms together it allows us to visually compare the rates for each. While it is useful to compare the numbers when looking at the table, plotting the values together allows for visual comparison.

Problem 8

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

Answer: This code creates a heat map of murders in the US. That is, this is a map of the country with darker shades of blue signifying higher murder rates and lighter shades of blue portraying lower murder rates. The first line tells R that you will be making a heat map, arranging by state and filling with arrests for murder rates. The next line sets up the map itself separating by state and the final line expands the range

Assignment 2

Collaborators: Carolina Herrera Figueroa, Niko Amber

Problem 1: Load data

Set your working directory to the folder where you downloaded the data.

```
setwd("/Users/elizaepstein/Desktop/testgithub/ElizalearnR")
```

Read the data

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

What are the dimensions of the dataset?

```
names(dat)
```

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

```
nrow(dat)
```

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

```
ncol(dat)
```

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

Answer: There are 7 columns and 171 rows.

Problem 2: Variables

Describe the variables in the dataset.

Answer: The variables in this dataset are the age that an individual began smoking cigarettes, the age they began drinking alcohol, their age, their sexual attraction, whether they speak english and their sex.

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

Answer: This data set shows the trends in substance abuse by age, sex, sexual attraction and their english language proficiency. This data was collected through the National Survey of Drug Use and Health; it is a sample of the first 1,000 individuals of the survey. The purpose of this data was to analyze trends in substance abuse. While it is not stated, these trends may be used to further understand which individuals to target for treatment.

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.

Answer: The age distribution starts from 12 and goes to 65+. The codebook explains how each age is labelled a number, so "17" represents individuals who are 65 or older.

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

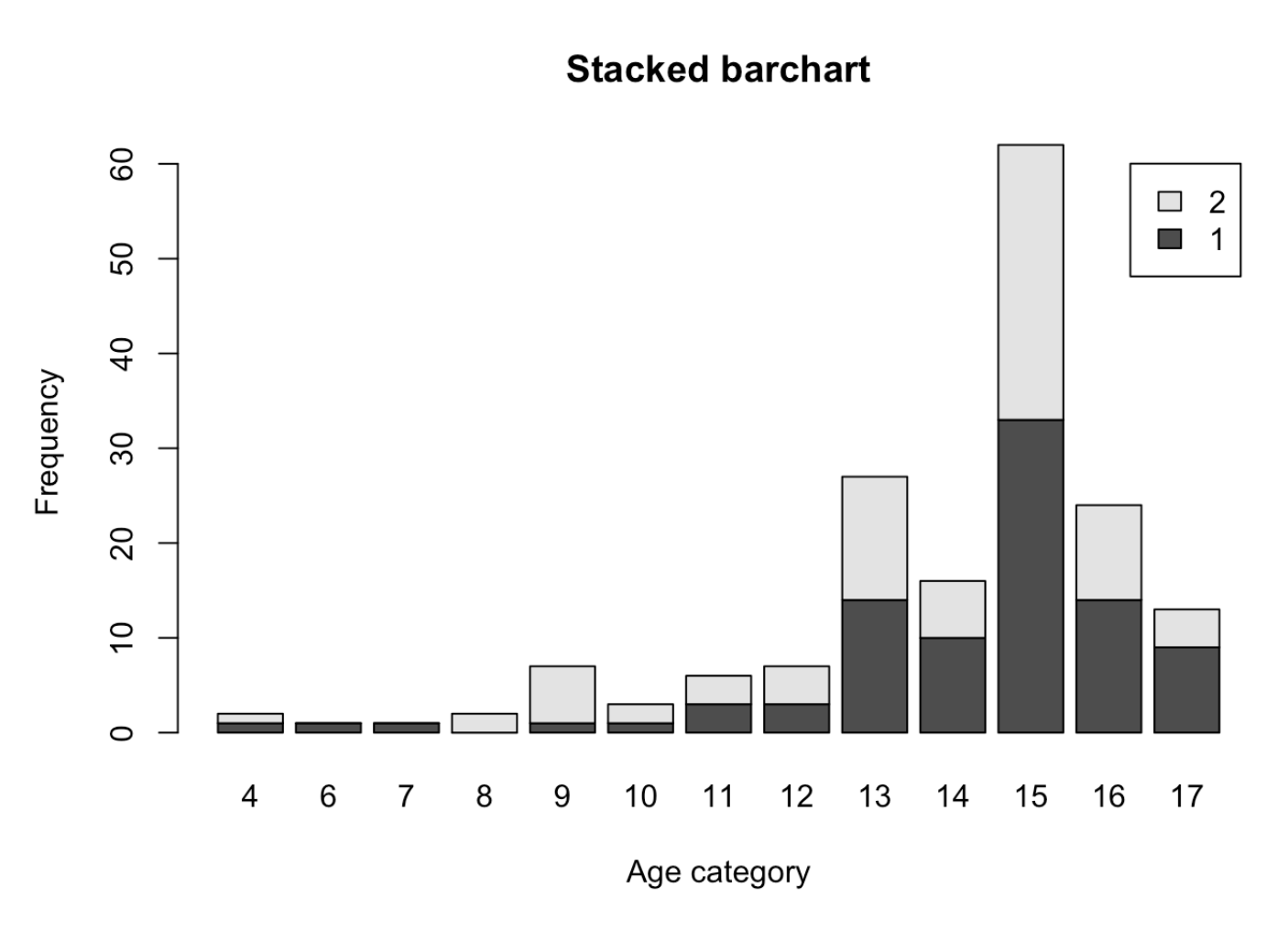
Answer: I do believe that the age distribution is representative of the US population because it covers all ages twelve and above. Due to the fact that this survey is questioning the ages someone began using substances, it is reasonable that it begins at 12.

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

Answer: I believe the sample is mostly balanced in terms of gender, but there are slightly more females. As seen in the codebook, the sample consists of 47.72% male and 52.28% 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)
```



Answer: This plot shows the frequency of sex of the respondent by age. For most of the younger age groups there seems to be more female respondents then the group between eight to twelve show more male respondents. Group 15 had the most respondents and seems to show a pretty even split between gendeers.

Problem 4: Substance use

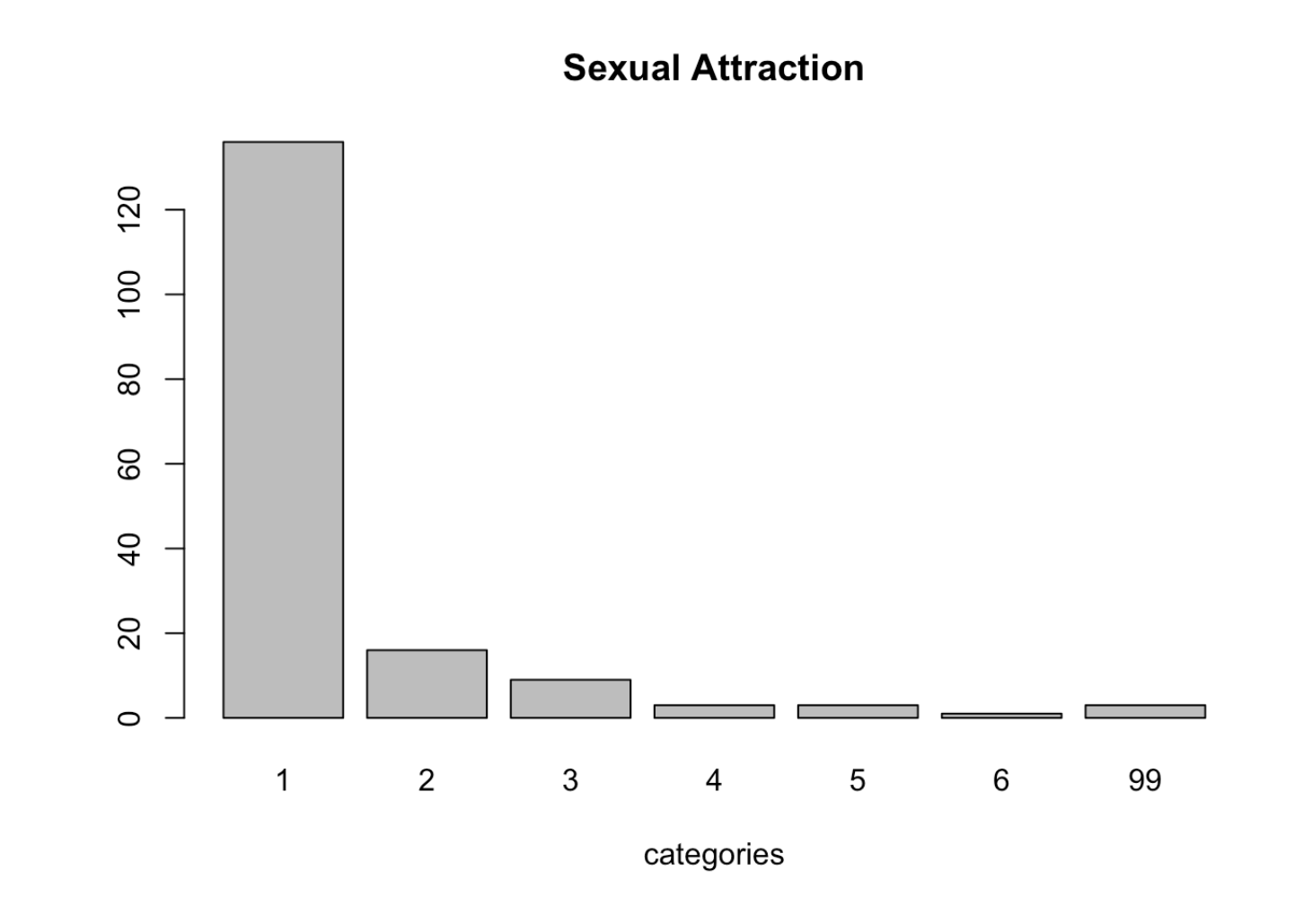
For which of the three substances included in the dataset (marijuana, alcohol, and cigarettes) do individuals tend to use the substance earlier?

Answer: Of the three substances included individuals tend to use alcohol the youngest.

Problem 5: Sexual attraction

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

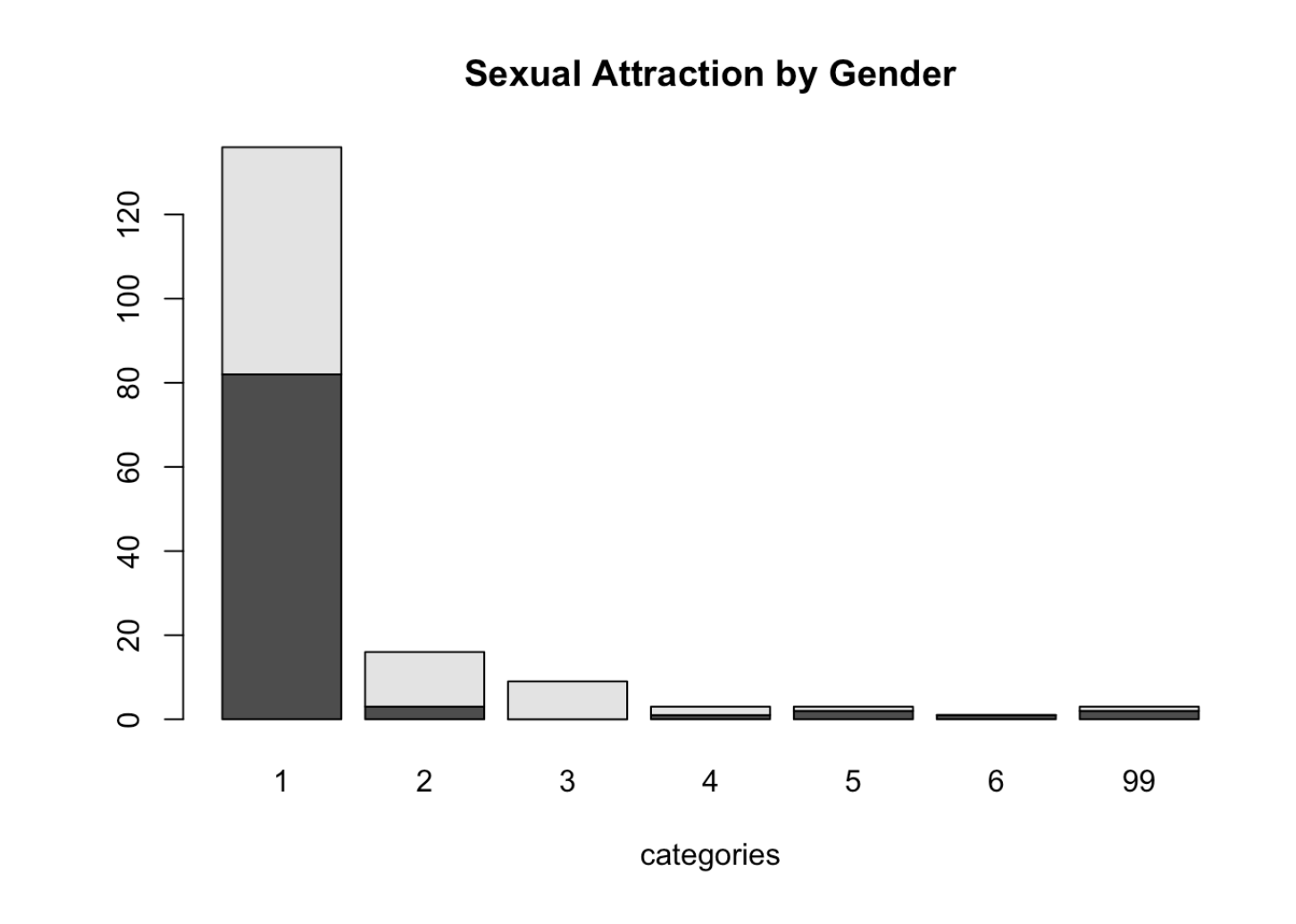
```
counts<- table(dat$sexatract)
barplot(counts,main= "Sexual Attraction", xlab="categories")
```



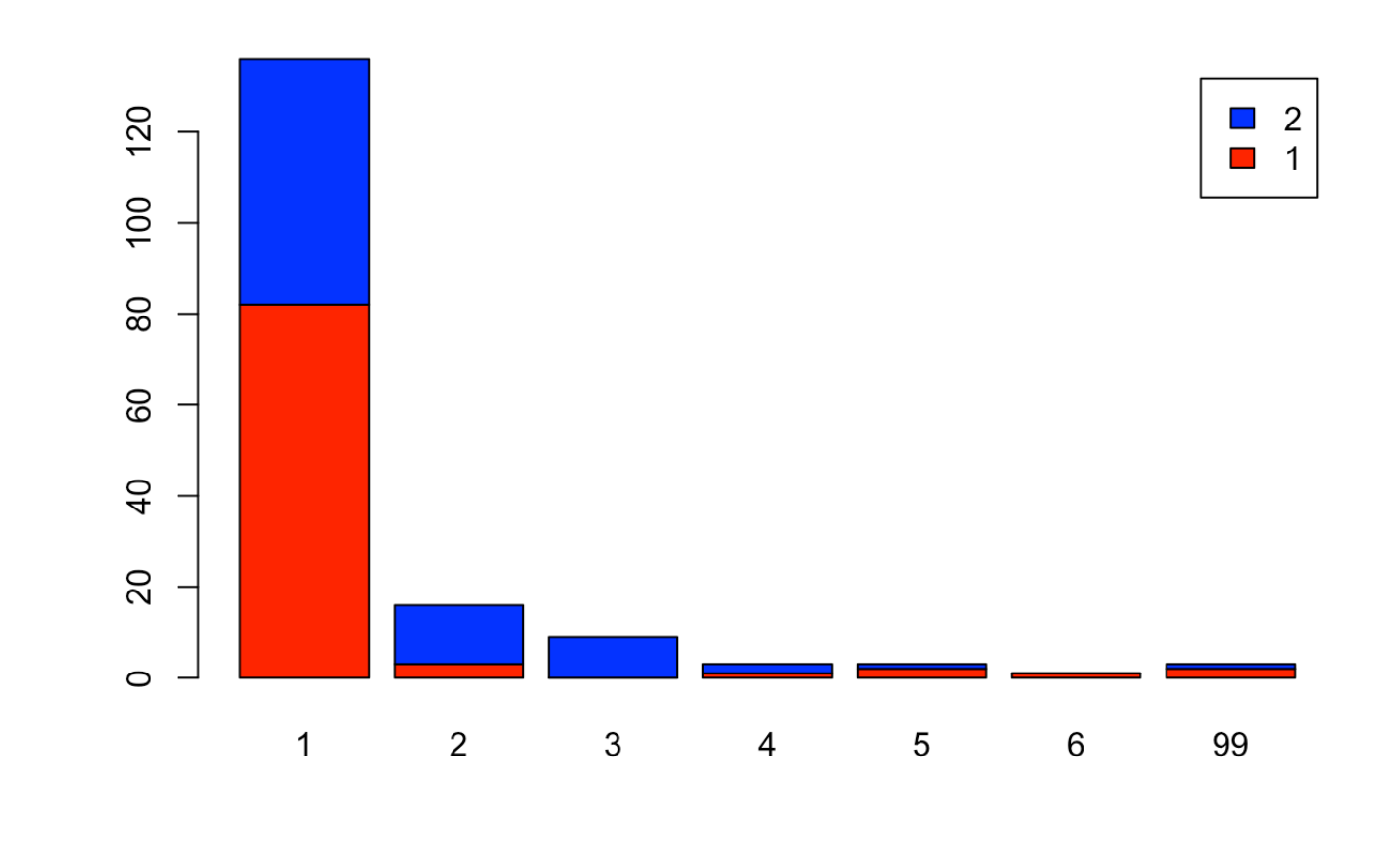
Answer: The distribution of sexual attraction is heavily weighted towards number 1 which indicated heterosexuality. I was not surprised by there being the greatest weight on heterosexuality, but I was slightly surprised quite how extreme the difference is.

What is the distribution of sexual attraction by gender?

```
counts <- table(dat$irsex, dat$sexatract)
barplot(counts,main= "Sexual Attraction by Gender", xlab="categori
es")
```




```
barplot(counts, col=c("red", "blue"), legend=TRUE)
```

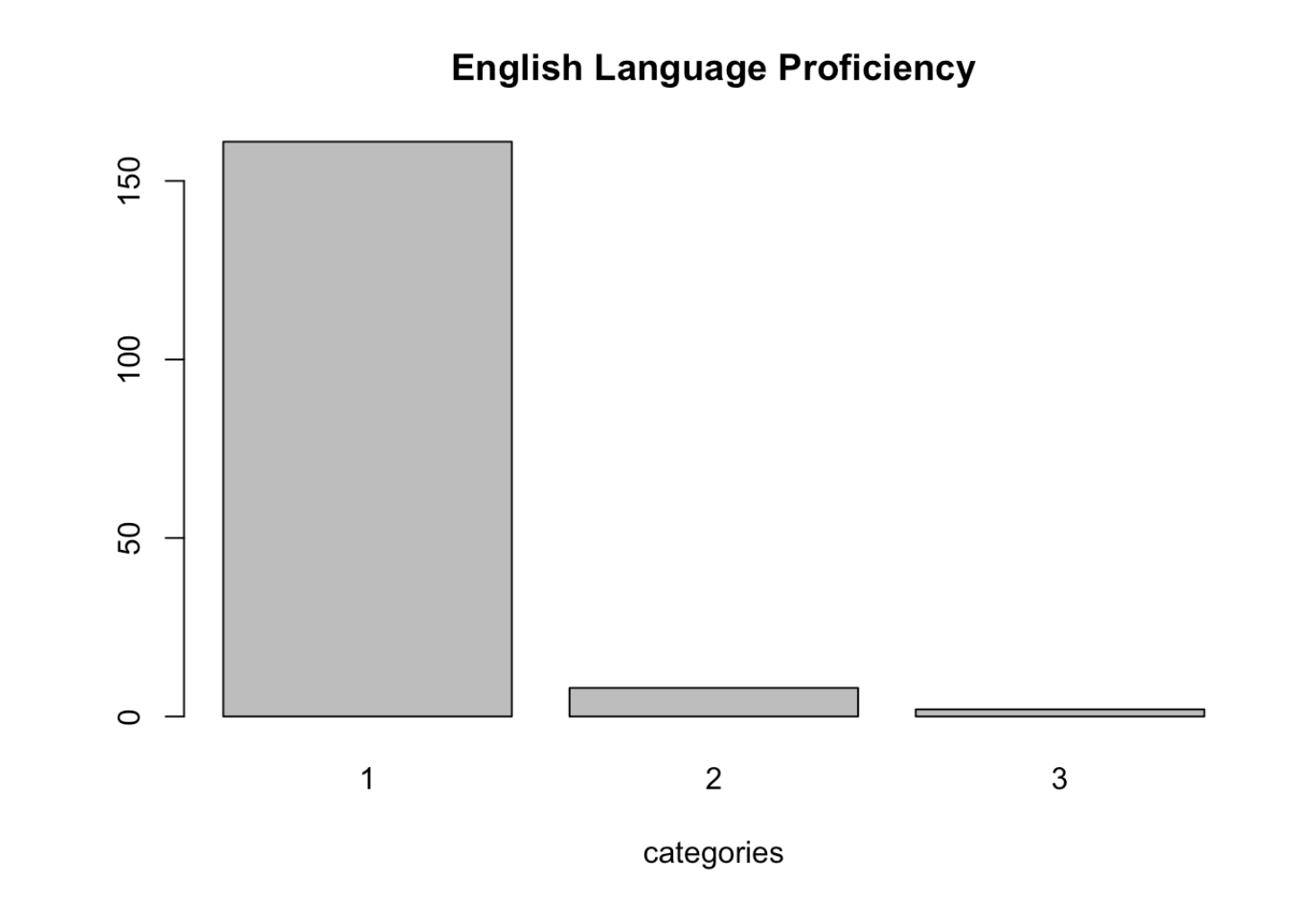


Answer: The distribution of sexual attraction by gender is intriguing to me because the first group (strongly heterosexual) appers mostly weighted towards males. The group showing bisexuality is heavily weighted towards females. The group identifying as homosexual is mostly male. The groups not knowing or leaving blank are all female and the group skipping the question is mostly 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?

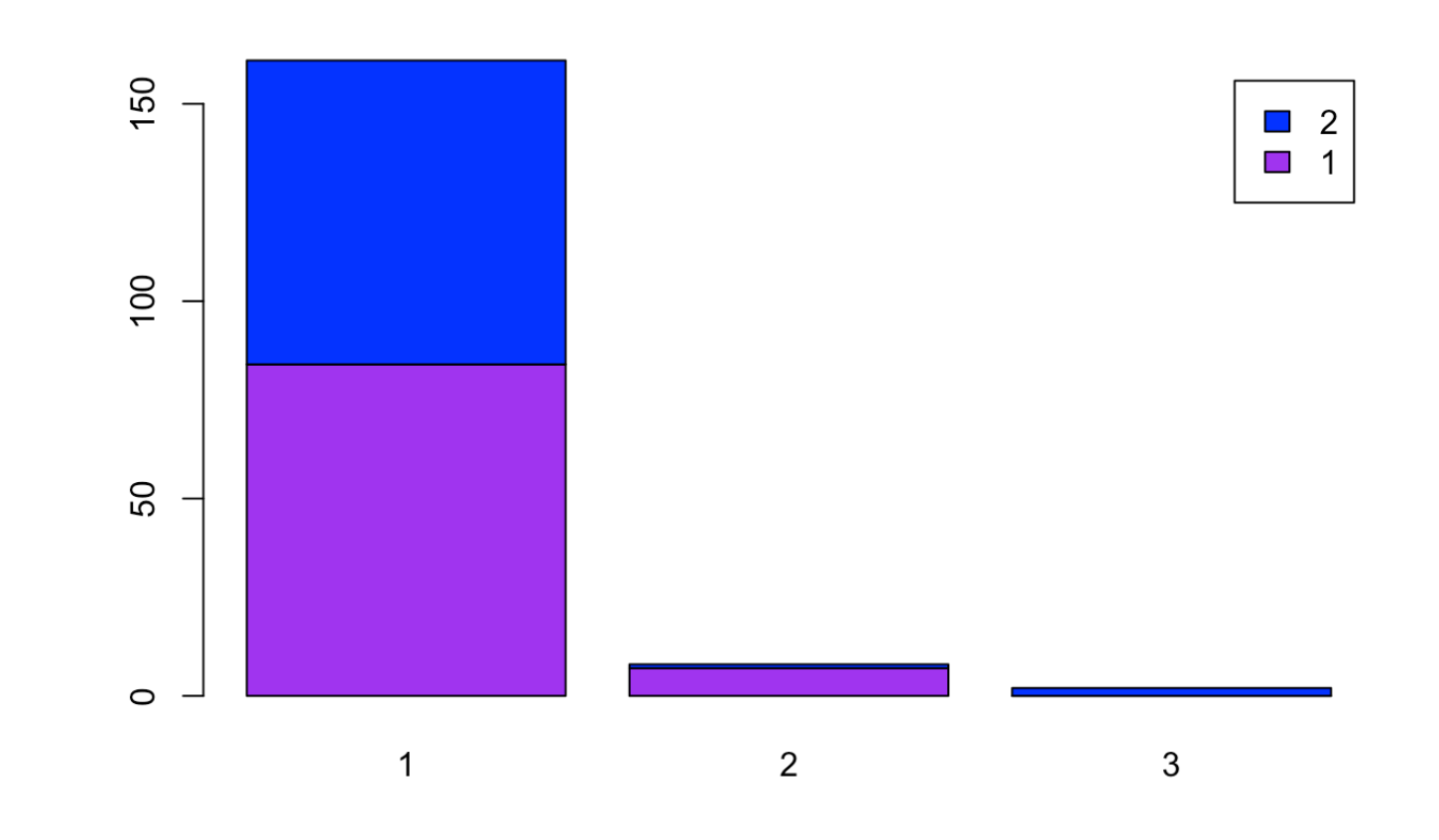
```
counts<- table(dat$speakengl)
barplot(counts,main= "English Language Proficiency", xlab="categor
ies")
```



Answer: The distribution of english speaking proficiency is heavily weighted towards the number 1 which indicates being able to speak english very well. I was not surpsied by this within the sample

Are there more English speaker females or males?

```
counts <- table(dat$irsex, dat$speakengl)
barplot(counts, col=c("purple", "blue"), legend=TRUE)
```



Answer: For those that speak english very well there is a somewhat even split between the sexes, but there are overall more females. That said, there are more males than females who answered that they speak english "well"