ADA Homework 2

Samantha Rabinowitz, sar4357

3/3/2020

Challenge 1

The R code below will load the 'movies.csv' dataset from GitHub and organize the data into a tibble.

```
f <- "https://raw.githubusercontent.com/difiore/ADA-datasets/master/IMDB-movies.csv"
d <- read_csv(f, col_names = T)
```

```
## Parsed with column specification:
## cols(
##   tconst = col_character(),
##   titleType = col_character(),
##   primaryTitle = col_character(),
##   startYear = col_double(),
##   runtimeMinutes = col_double(),
##   genres = col_character(),
##   averageRating = col_double(),
##   numVotes = col_double(),
##   nconst = col_character(),
##   director = col_character()
## )
```

```
glimpse(d)
```

```
## Observations: 28,938
## Variables: 10
## $ tconst         <chr> "tt0002130", "tt0002844", "tt0003037", "tt0003165", ...
## $ titleType      <chr> "movie", "movie", "movie", "movie", "movie", "movie"...
## $ primaryTitle   <chr> "Dante's Inferno", "Fantômas: In the Shadow of the G...
## $ startYear      <dbl> 1911, 1913, 1913, 1913, 1913, 1914, 1914, 1914, 1914...
## $ runtimeMinutes <dbl> 68, 54, 61, 90, 85, 78, 148, 59, 61, 82, 195, 59, 72...
## $ genres         <chr> "Adventure,Drama,Fantasy", "Crime,Drama", "Crime,Dra...
## $ averageRating  <dbl> 7.0, 7.0, 7.0, 7.0, 6.5, 6.5, 7.1, 6.9, 6.2, 6.3, 6....
## $ numVotes       <dbl> 2082, 1877, 1307, 1010, 1686, 1068, 2907, 1126, 1207...
## $ nconst         <chr> "nm0078205", "nm0275421", "nm0275421", "nm0275421", ...
## $ director       <chr> "Francesco Bertolini", "Louis Feuillade", "Louis Feu...
```

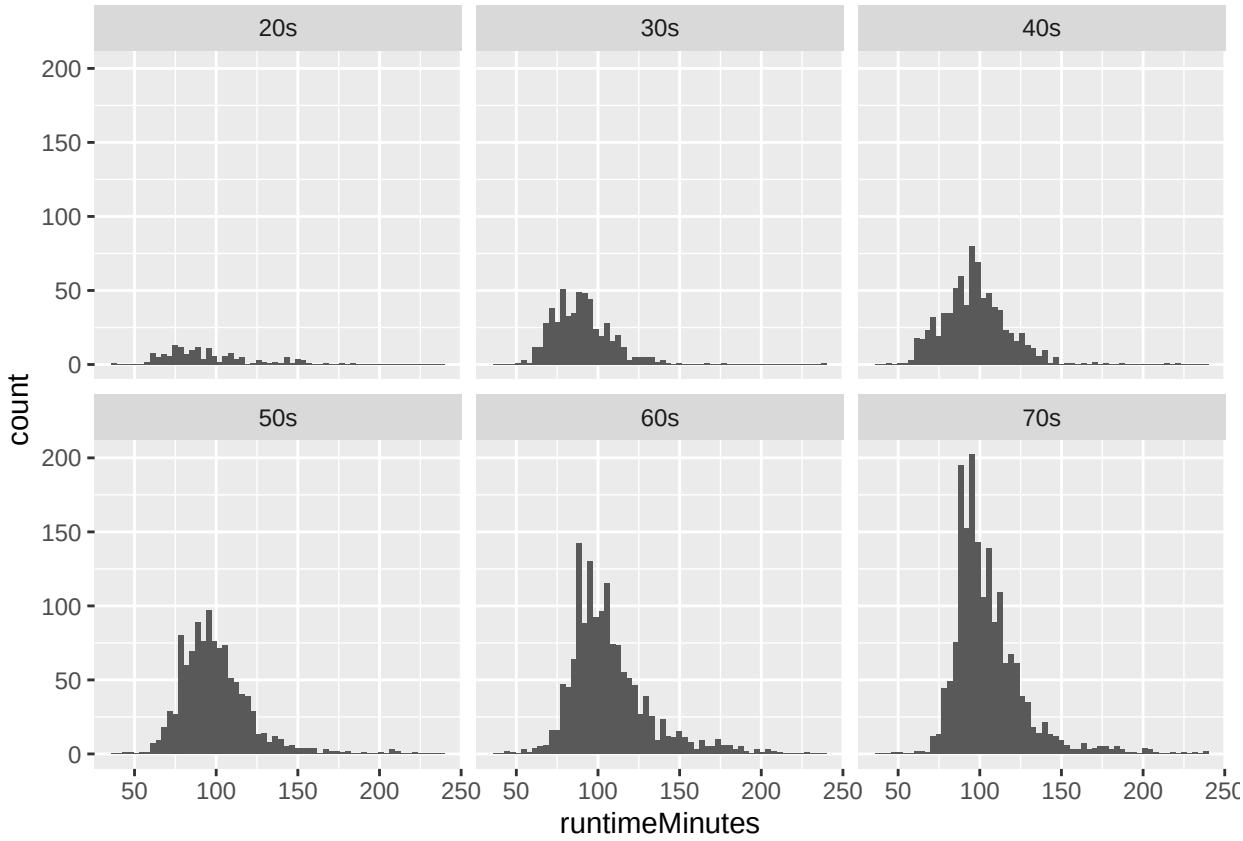
The following code will filter the dataset to just include movies from 1920 to 1979 and movies that are less than 4 hours long. Columns were also added to make **startYear** a new variable called **decade**.

```
d1 <- d %>%
  filter(startYear >= "1920" & startYear <="1979" & runtimeMinutes < 240) %>%
  mutate(decade = case_when(startYear >=1920 & startYear<=1929 ~ "20s",
                            startYear >=1930 & startYear<=1939 ~ "30s",
                            startYear >=1940 & startYear<=1949 ~ "40s",
                            startYear >=1950 & startYear<=1959 ~ "50s",
                            startYear >=1960 & startYear<=1969 ~ "60s",
                            startYear >=1970 & startYear<=1979 ~ "70s"))
d1 %>% glimpse()
```

```
## Observations: 5,741
## Variables: 11
## $ tconst         <chr> "tt0010323", "tt0011000", "tt0011130", "tt0011237", ...
## $ titleType      <chr> "movie", "movie", "movie", "movie", "movie", "movie"...
## $ primaryTitle   <chr> "The Cabinet of Dr. Caligari", "Leaves From Satan's ...
## $ startYear      <dbl> 1920, 1920, 1920, 1920, 1920, 1920, 1920, 1920, 1920...
## $ runtimeMinutes <dbl> 76, 167, 82, 76, 73, 107, 90, 77, 145, 90, 79, 75, 1...
## $ genres         <chr> "Fantasy,Horror,Mystery", "Drama", "Drama,Horror,Sci...
## $ averageRating  <dbl> 8.1, 6.7, 7.0, 7.2, 6.7, 7.1, 7.4, 6.2, 7.4, 6.7, 6....
## $ numVotes       <dbl> 52649, 1047, 4561, 6128, 1063, 2053, 1927, 1356, 479...
## $ nconst         <chr> "nm0927468", "nm0003433", "nm0731910", "nm0091380", ...
## $ director       <chr> "Robert Wiene", "Carl Theodor Dreyer", "John S. Robe...
## $ decade         <chr> "20s", "20s", "20s", "20s", "20s", "20s", "20s", "20...
```

The code below utilizes *ggplot* to plot histograms of the distribution of **runtimeMinutes** for each decade.

```
d1 %>%
  ggplot(aes(x=runtimeMinutes)) + geom_histogram(bins=60) + facet_wrap(~ decade)
```



The R code below will compute the population mean and population standard deviation in **runtimeMinutes** for each decade and store the values in a new dataframe, *results*.

```
results <- d1 %>% group_by(decade) %>% summarize(mean=mean(runtimeMinutes),
                                                 pop_sd=sdpop(runtimeMinutes))
results %>% glimpse()
```

```
## Observations: 6
## Variables: 3
## $ decade <chr> "20s", "30s", "40s", "50s", "60s", "70s"
## $ mean   <dbl> 95.95513, 90.24254, 97.30341, 99.64168, 106.82781, 105.06640
## $ pop_sd <dbl> 27.43508, 18.64468, 20.55356, 21.54956, 24.30888, 21.35976
```

The following code will generate a function to calculate the standard error of the mean for each decade as well as a single sample of 100 movies from each decade and calculate the sample mean and standard deviation for each decade. Additionally, the SE around each population mean for each decade will be estimated using the standard deviation and sample size of these samples.

```
std_error <- function(x) {
  sd(x) / sqrt(length(x))
}
d1 %>% group_by(decade) %>% sample_n(100, replace=FALSE) %>%
  summarize(mean(runtimeMinutes), sd(runtimeMinutes),std_error(runtimeMinutes))
```

```
## # A tibble: 6 x 4
```

```
##   decade `mean(runtimeMinutes)` `sd(runtimeMinutes)` `std_error(runtimeMinutes)`
##   <chr>                   <dbl>                <dbl>                        <dbl>
## 1 20s                      96.4                 28.1                         2.81
## 2 30s                      88.8                 16.7                         1.67
## 3 40s                      97.4                 19.5                         1.95
## 4 50s                      98.6                 22.0                         2.20
## 5 60s                     106.                  27.5                         2.75
## 6 70s                     106.                  22.0                         2.20
```

The code below will write a function to calculate the standard error of the mean for each deacde using the population standard deviation for purposes of comparison to the values obtained from the sample created above.

```
pop_std_error <- function(x) {
  sdpop(x) / sqrt(length(x))
}
d1 %>% group_by(decade) %>%
  summarize(mean = mean(runtimeMinutes),
            sdpop = sdpop(runtimeMinutes),
            pop_se = pop_std_error(runtimeMinutes),
            length(decade))
```

```
## # A tibble: 6 x 5
##   decade  mean sdpop pop_se `length(decade)`
##   <chr>  <dbl> <dbl>  <dbl>            <int>
## 1 20s     96.0  27.4  2.20               156
## 2 30s     90.2  18.6  0.805              536
## 3 40s     97.3  20.6  0.731              791
## 4 50s     99.6  21.5  0.652             1094
## 5 60s    107.   24.3  0.646             1417
## 6 70s    105.   21.4  0.511             1747
```

Challenge 3

The R code below will load the 'zombies.csv' dataset from GitHub and organize the data into a tibble.

```
f <- "https://raw.githubusercontent.com/difiore/ADA-datasets/master/zombies.csv"
d <- read_csv(f, col_names = T)
```

```
## Parsed with column specification:
## cols(
##   id = col_double(),
##   first_name = col_character(),
##   last_name = col_character(),
##   gender = col_character(),
##   height = col_double(),
##   weight = col_double(),
##   zombies_killed = col_double(),
##   years_of_education = col_double(),
##   major = col_character(),
##   age = col_double()
## )
```

```
glimpse(d)
```

```
## Observations: 1,000
## Variables: 10
## $ id                 <dbl> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 1...
## $ first_name         <chr> "Sarah", "Mark", "Brandon", "Roger", "Tammy", "A...
## $ last_name          <chr> "Little", "Duncan", "Perez", "Coleman", "Powell"...
## $ gender             <chr> "Female", "Male", "Male", "Male", "Female", "Mal...
## $ height             <dbl> 62.88951, 67.80277, 72.12908, 66.78484, 64.71832...
## $ weight             <dbl> 132.0872, 146.3753, 152.9370, 129.7418, 132.4265...
## $ zombies_killed     <dbl> 2, 5, 1, 5, 4, 1, 0, 4, 9, 2, 4, 4, 2, 5, 4, 2, ...
## $ years_of_education <dbl> 1, 3, 1, 6, 3, 4, 4, 0, 3, 3, 4, 3, 1, 5, 5, 2, ...
## $ major              <chr> "medicine/nursing", "criminal justice administra...
## $ age                <dbl> 17.64275, 22.58951, 21.91276, 18.19058, 21.10399...
```

The code below will calculate the population mean and standard deviation for each quantitative random variable.

```
d %>% summarize(height_mean=mean(height),
                weight_mean=mean(weight),
                age_mean=mean(age),
                n_zombies_mean=mean(zombies_killed),
                ed_mean=mean(years_of_education))
```

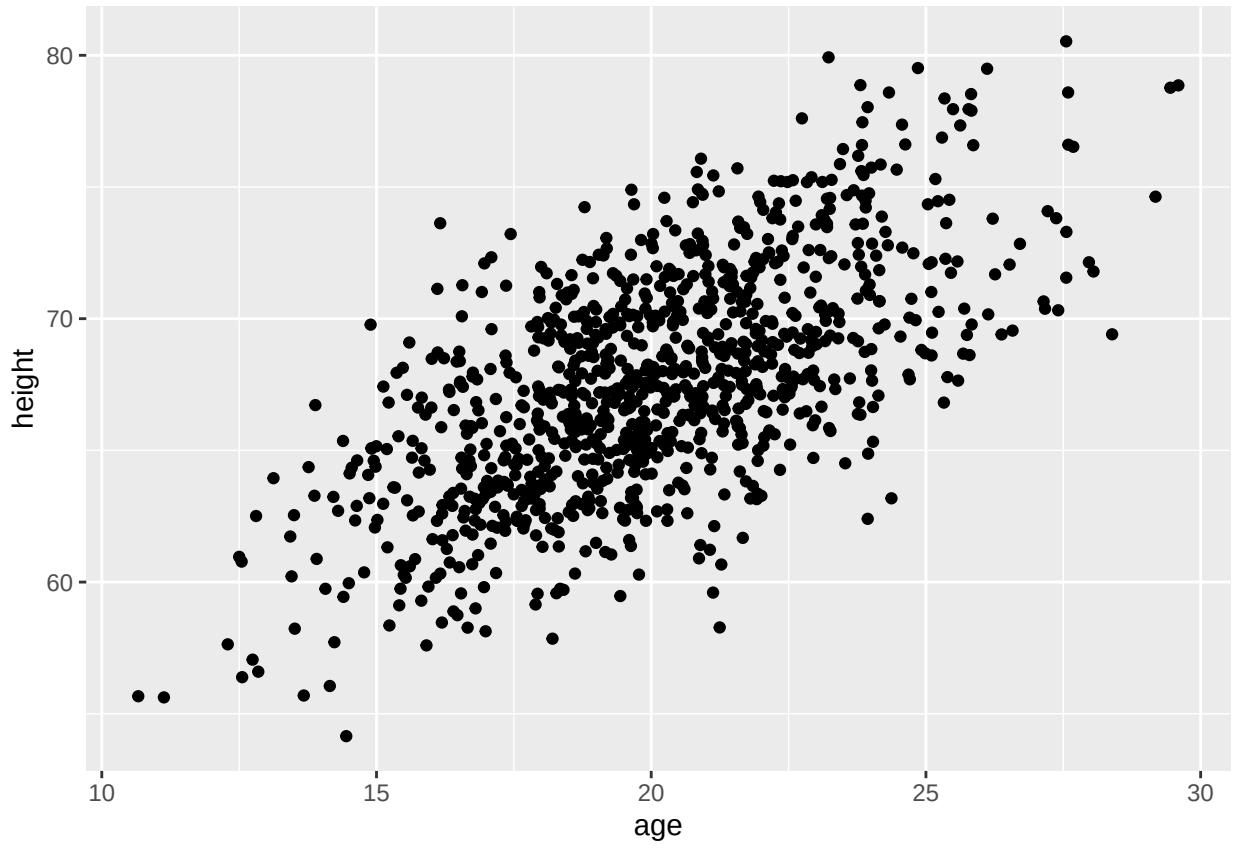
```
## # A tibble: 1 x 5
##   height_mean weight_mean age_mean n_zombies_mean ed_mean
##         <dbl>       <dbl>    <dbl>          <dbl>   <dbl>
## 1        67.6        144.     20.0           2.99    3.00
```

```
d %>% summarize(height_sd=sdpop(height),
                weight_sd=sdpop(weight),
                age_sd=sdpop(age),
                n_zombies_sd=sdpop(zombies_killed),
                ed_sd=sdpop(years_of_education))
```

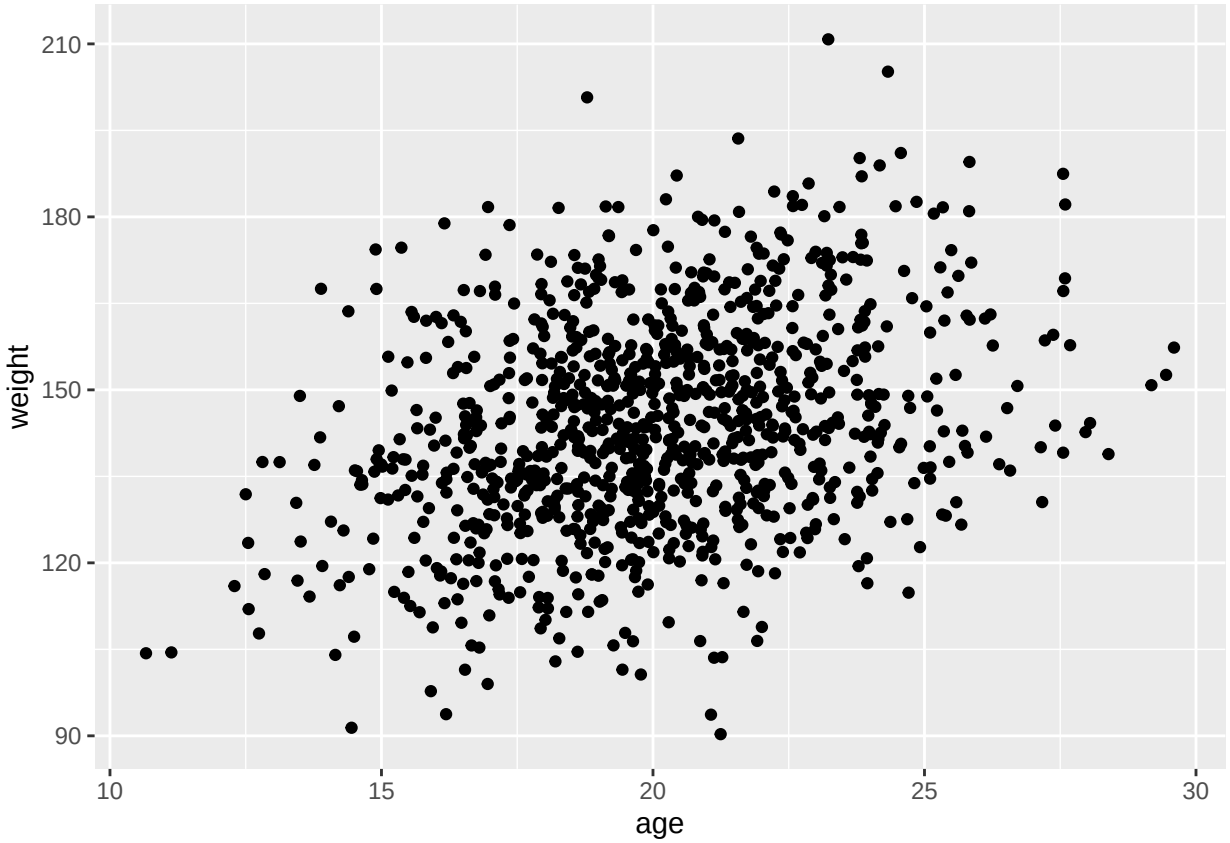
```
## # A tibble: 1 x 5
##   height_sd weight_sd age_sd n_zombies_sd ed_sd
##       <dbl>     <dbl>  <dbl>        <dbl> <dbl>
## 1      4.31      18.4   2.96         1.75  1.68
```

The following will utilize *ggplot2* to make scatterplots of height and weight in relation to age.

```
d %>% ggplot(aes(x=age,y=height)) + geom_point()
```




```
d %>% ggplot(aes(x=age,y=weight)) + geom_point()
```



The scatterplot generated for height in relation to age shows a distinct positive relationship. The scatterplot generated for weight in relation to age does not show as strong of a relationship however there is still a positive tendency to the relationship between the two variables.