STA2201-lab1

Kerry Hu

Lab Exercises

1. Plot the ratio of male to female mortality rates over time for ages 10,20,30 and 40 (different color for each age) and change the theme.

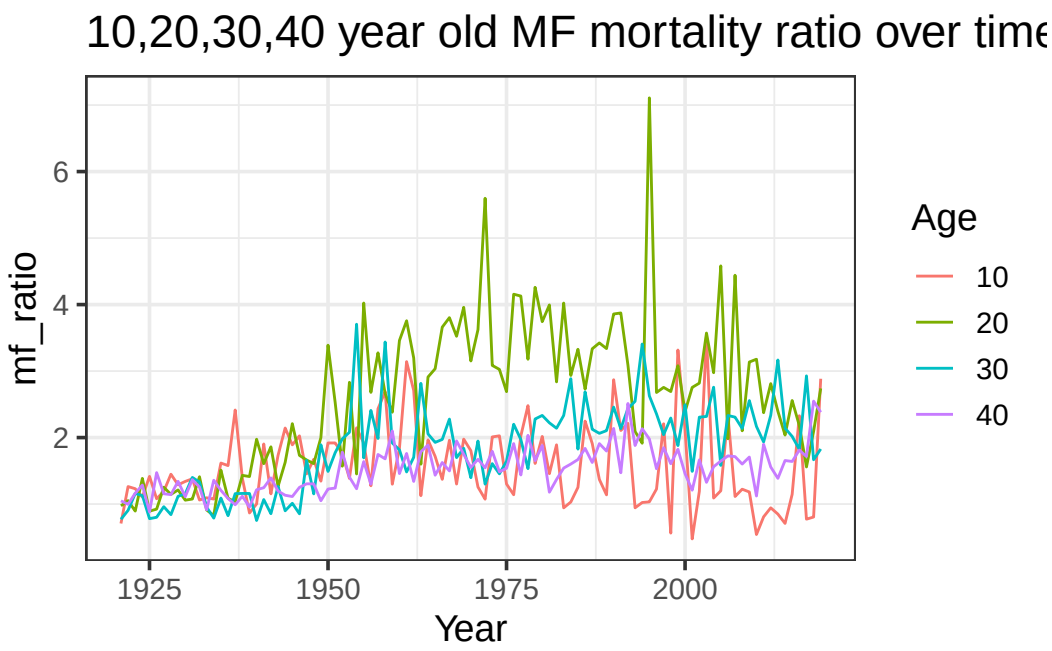
```
library(tidyverse)
```

```
-- Attaching packages --------------------------------------- tidyverse 1.3.2 --
v ggplot2 3.4.0      v purrr   0.3.4
v tibble  3.1.8      v dplyr   1.0.10
v tidyr   1.2.1      v stringr 1.5.0
v readr   2.1.3      v forcats 0.5.2
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
```

```
dm <- read_table("https://www.prdh.umontreal.ca/BDLC/data/ont/Mx_1x1.txt", skip = 2, col_t
```

```
Warning: 494 parsing failures.
row    col               expected actual
108 Female no trailing characters      . 'https://www.prdh.umontreal.ca/BDLC/data/ont/Mx_1x1
109 Female no trailing characters      . 'https://www.prdh.umontreal.ca/BDLC/data/ont/Mx_1x1
110 Female no trailing characters      . 'https://www.prdh.umontreal.ca/BDLC/data/ont/Mx_1x1
110 Male   no trailing characters      . 'https://www.prdh.umontreal.ca/BDLC/data/ont/Mx_1x1
110 Total  no trailing characters      . 'https://www.prdh.umontreal.ca/BDLC/data/ont/Mx_1x1
... ...... ...................... ...... ..............................................
See problems(...) for more details.
```

```
dp <- dm |>
      filter(Age==10|Age==20|Age==30|Age==40)|>
      mutate(mf_ratio = Male/Female)|>select(Year,Age,mf_ratio)
  dp|> ggplot(aes(x=Year,y=mf_ratio,color = Age))+geom_line()+labs(title = "10,20,30,40 ye
```



2. Find the age that has the highest female mortality rate each year.

```
summary_max <- dm |> group_by(Year)|>select(Year,Age,Female)|>
summarize(max_mortality = max(Female, na.rm = TRUE))
df_list1 = list(dm,summary_max)
dmf<- df_list1 |> reduce(left_join, by='Year') |>select(Year,Age,Female,max_mortality)
dmf <- dmf |>
    mutate_at(3, ~replace_na(.,0))
Year=rep(0,200)
Age=rep(0,200)
YearAge1<-data.frame(Year,Age)

j=1
for(i in 1:10989){
  if(dmf$Female[i]==dmf$max_mortality[i]) {YearAge1$Age[j]<-dmf$Age[i];YearAge1$Year[j]<-d
  }
```

```r
YearAge<-head(YearAge1,102)
YearAge
```

```
    Year  Age
1   1921  106
2   1922   98
3   1923  104
4   1924  107
5   1925   98
6   1926  106
7   1927  106
8   1928  104
9   1929  104
10  1930  105
11  1931  104
12  1932  105
13  1933  104
14  1934  106
15  1935  104
16  1936  106
17  1937  105
18  1938  104
19  1939  105
20  1940  104
21  1941  105
22  1942  104
23  1943  105
24  1944   98
25  1945  104
26  1946  105
27  1947  104
28  1948   99
29  1949  102
30  1950  102
31  1951 110+
32  1952  107
33  1953  106
34  1954 110+
35  1955  107
36  1956 110+
37  1957  107
38  1958 110+
```

39	1959	108
40	1960	107
41	1961	106
42	1962	108
43	1963	109
44	1964	109
45	1965	109
46	1966	105
47	1967	107
48	1968	97
49	1969	109
50	1970	107
51	1971	107
52	1972	107
53	1973	105
54	1974	107
55	1974	109
56	1975	108
57	1975	110+
58	1976	106
59	1976	108
60	1977	103
61	1978	109
62	1979	109
63	1980	110+
64	1981	107
65	1982	109
66	1983	110+
67	1984	110+
68	1985	110+
69	1986	109
70	1987	109
71	1988	108
72	1989	108
73	1990	108
74	1991	103
75	1992	108
76	1993	109
77	1994	109
78	1995	107
79	1996	109
80	1997	107
81	1998	110+

```
82  1999 110+
83  2000  106
84  2001 110+
85  2002  107
86  2003  109
87  2004  108
88  2005  108
89  2006 110+
90  2007  107
91  2008  109
92  2009 110+
93  2010  108
94  2011 110+
95  2012  109
96  2013 110+
97  2014 110+
98  2015 110+
99  2016 110+
100 2017 110+
101 2018 110+
102 2019 110+
```

3. Use the 'summarize(across())' syntax to calculate the standard deviation of mortality rates by age for the Male, Female and Total populations.

```
summary_SD <- dm |> group_by(Age)|>
  summarize(across(Female:Total, sd))
summary_SD
```

```
# A tibble: 111 x 4
   Age      Female      Male     Total
   <chr>     <dbl>     <dbl>     <dbl>
 1 0      0.0256    0.0330    0.0294
 2 1      0.00352   0.00396   0.00374
 3 10     0.000474  0.000561  0.000509
 4 100    0.0928    0.138     0.0729
 5 101    0.125     0.158     0.0995
 6 102    0.143     0.214     0.114
 7 103    0.252     0.371     0.208
 8 104    0.449    NA         0.363
 9 105   NA        NA        NA
10 106   NA        NA        NA
```

```
# ... with 101 more rows
```

4. The Canadian HMD also provides population sizes over time (https://www.prdh.umontreal.ca/BDLC/data/or
Use these to calculate the population weighted average mortality rate separately for males and females, for every year. Make a nice line plot showing the result (with meaningful labels/titles) and briefly comment on what you see (1 sentence). Hint: 'left_join' will probably be useful here.

```
df <- read_table("https://www.prdh.umontreal.ca/BDLC/data/ont/Population.txt",skip = 2, co
df_list1 = list(dm,df)
dmf<- df_list1 |> reduce(left_join, by=c('Year','Age'))
dmf <-dmf |> mutate(weighed_F=Female.x*Female.y,weighed_M=Male.x*Male.y)|> select(-Total.x
dmfsum<- dmf |>group_by(Year) |>summarize(total_F=sum(Female.y, na.rm = TRUE),total_M=sum(
df_list2 = list(dmf,dmfsum)
dmf<- df_list2|> reduce(left_join, by='Year')
dmf
```

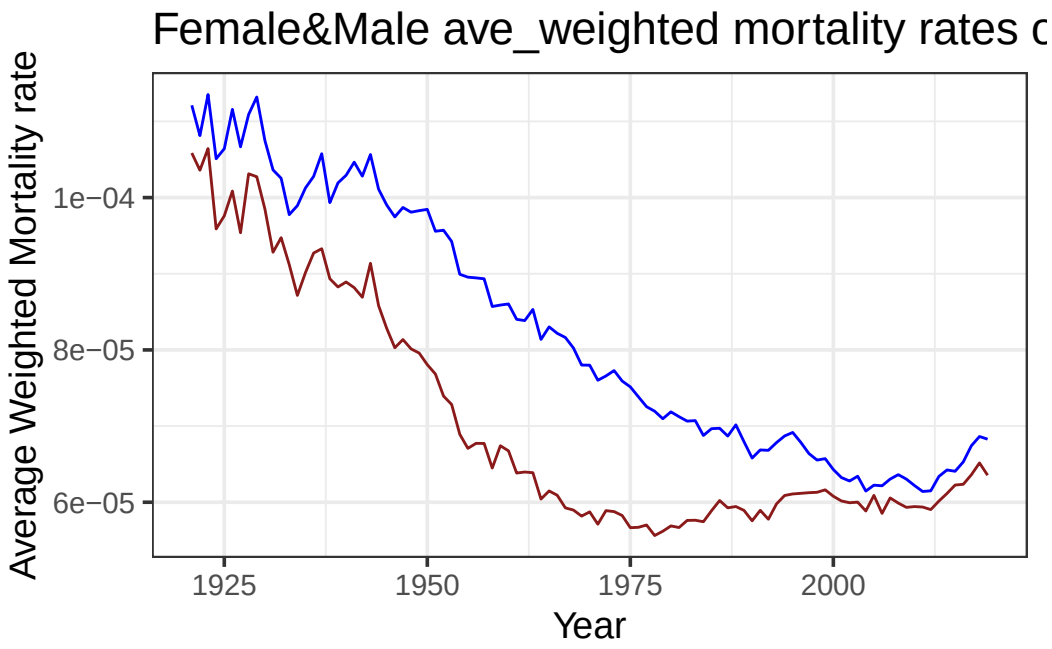
```
# A tibble: 10,989 x 10
    Year Age   Female.x  Male.x Female.y Male.y weighe~1 weigh~2 total_F total_M
   <dbl> <chr>    <dbl>   <dbl>    <dbl>  <dbl>    <dbl>   <dbl>   <dbl>   <dbl>
 1  1921 0      0.0978  0.129     30157. 31530.   2948.   4070.   1.46e6  1.48e6
 2  1921 1      0.0129  0.0144    30391. 31319.    394.    452.   1.46e6  1.48e6
 3  1921 2      0.00521 0.00737   30962. 31785.    161.    234.   1.46e6  1.48e6
 4  1921 3      0.00471 0.00457   31306. 32031.    147.    146.   1.46e6  1.48e6
 5  1921 4      0.00461 0.00433   31364. 32046.    145.    139.   1.46e6  1.48e6
 6  1921 5      0.00372 0.00361   31175. 31847.    116.    115.   1.46e6  1.48e6
 7  1921 6      0.00265 0.00393   30808. 31466.     81.7   124.   1.46e6  1.48e6
 8  1921 7      0.00295 0.00351   30295. 30922      89.5   108.   1.46e6  1.48e6
 9  1921 8      0.00237 0.00285   29660. 30270.     70.4    86.4  1.46e6  1.48e6
10  1921 9      0.00198 0.00255   28923  29494.     57.4    75.3  1.46e6  1.48e6
# ... with 10,979 more rows, and abbreviated variable names 1: weighed_F,
#   2: weighed_M
```

```
dmf <-dmf |> mutate(weighed_rate_F=Female.x*Female.y/total_F,weighed_rate_M=Male.x*Male.y/

summary_mean <- dmf |> group_by(Year) |>
  summarize(mean_mortality_f = mean(weighed_rate_F, na.rm = TRUE),
            mean_mortality_m = mean(weighed_rate_M, na.rm = TRUE))

summary_mean|> ggplot(aes(x = Year))+geom_line(aes(y=mean_mortality_f),colour ="firebrick4
  labs(title = "Female&Male ave_weighted mortality rates over time, Ontario",
```

```
y = "Average Weighted Mortality rate") + scale_color_manual("",values = c("Female"=
```



The trend of average weighted mortality rates over time of both gender was going down until 2000 year and after 2000 year,the trend became a little higher and stable.