Time Series

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Read in the data:

```
library(readr)
ages <- read_csv("Ch4Eg.csv")
ages
```

```
   Year Women  Men
1  1998  25.0 26.7
2  1997  25.0 26.8
3  1996  24.8 27.1
4  1995  24.5 26.9
5  1994  24.5 26.7
6  1993  24.5 26.5
7  1992  24.4 26.5
8  1991  24.1 26.3
9  1990  23.9 26.1
10 1989  23.8 26.2
11 1988  23.6 25.9
12 1987  23.6 25.8
13 1986  23.1 25.7
14 1985  23.3 25.5
15 1984  23.0 25.4
16 1983  22.8 25.4
17 1982  22.5 25.2
18 1981  22.3 24.8
19 1980  22.0 24.7
20 1979  22.1 24.4
21 1978  21.8 24.2
22 1977  21.6 24.0
23 1976  21.3 23.8
24 1975  21.1 23.5
25 1974  21.1 23.1
26 1973  21.0 23.2
27 1972  20.9 23.3
28 1971  20.9 23.1
29 1970  20.8 23.2
30 1969  20.8 23.2
31 1968  20.8 23.1
32 1967  20.6 23.1
33 1966  20.5 22.8
34 1965  20.6 22.8
35 1964  20.5 23.1
36 1963  20.5 22.8
37 1962  20.3 22.7
38 1961  20.3 22.8
39 1960  20.3 22.8
40 1959  20.2 22.5
```

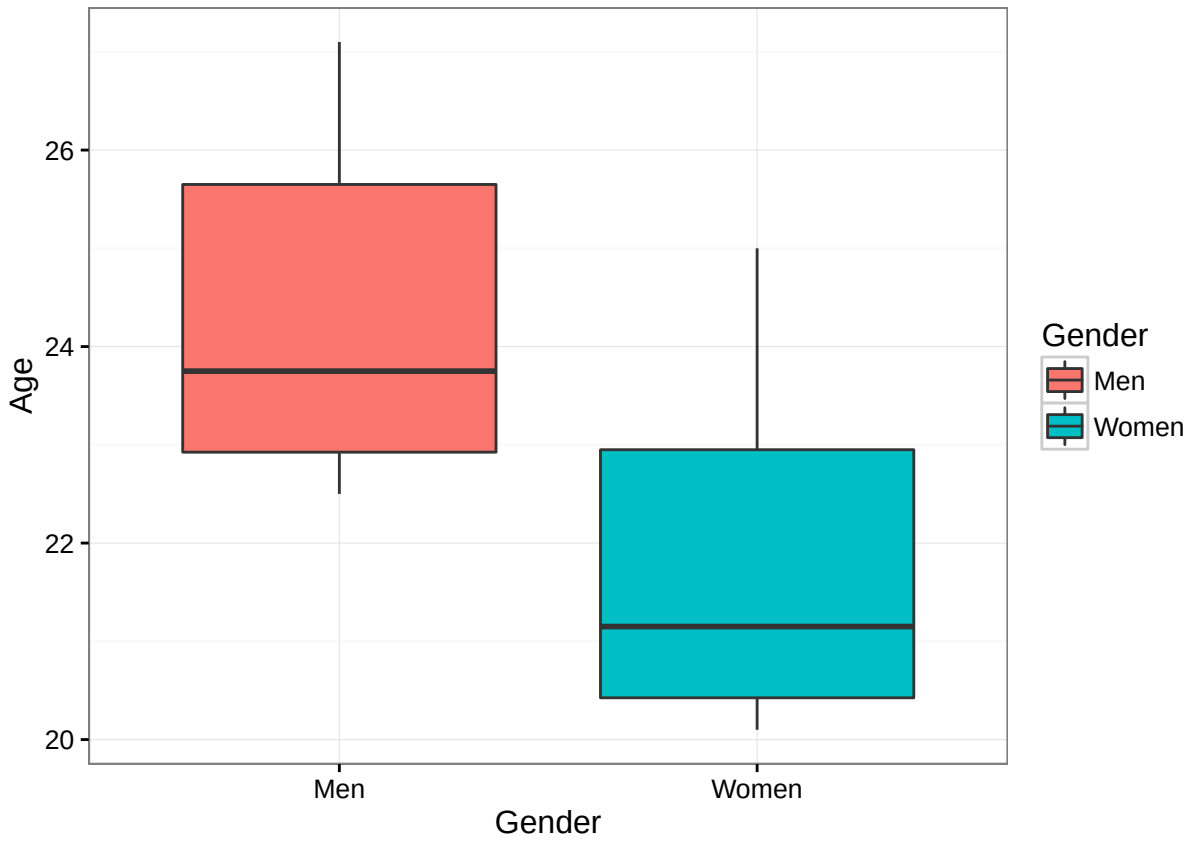
```
41 1958  20.2 22.6
42 1957  20.3 22.6
43 1956  20.1 22.5
44 1955  20.2 22.6
45 1954  20.3 23.0
46 1953  20.2 22.8
47 1952  20.2 23.0
48 1951  20.4 22.9
49 1950  20.3 22.8
50 1949  20.3 22.7
51 1948  20.4 23.3
52 1947  20.5 23.7
53 1940  21.5 24.3
54 1930  21.3 24.3
55 1920  21.2 24.6
56 1910  21.6 25.1
57 1900  21.9 25.9
58 1890  22.0 26.1
```

Create side-by-side boxplots:

```
library(tidyr)
NDF <- gather(ages, Gender, Age, -Year)
NDF
```

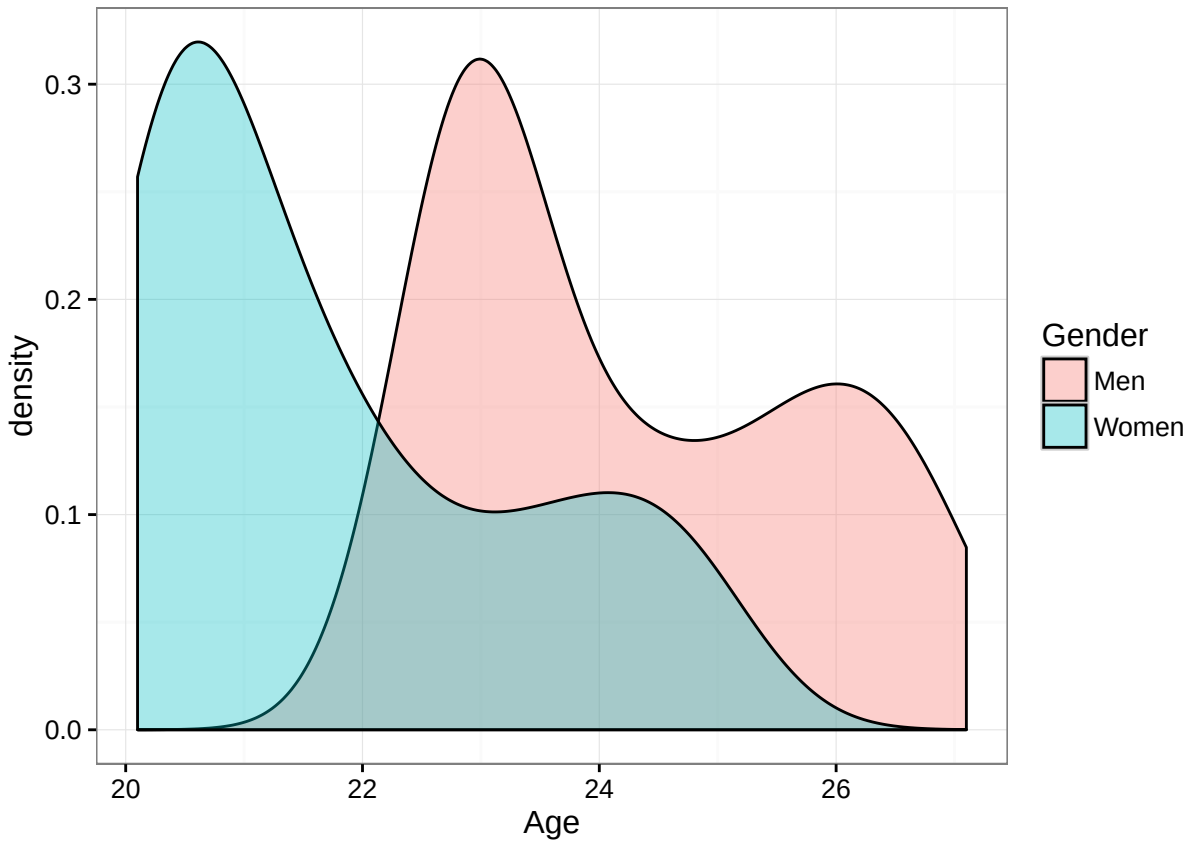
```
# A tibble: 116 x 3
    Year Gender   Age
   <int>  <chr> <dbl>
1   1998  Women  25.0
2   1997  Women  25.0
3   1996  Women  24.8
4   1995  Women  24.5
5   1994  Women  24.5
6   1993  Women  24.5
7   1992  Women  24.4
8   1991  Women  24.1
9   1990  Women  23.9
10  1989  Women  23.8
# ... with 106 more rows
```

```
library(ggplot2)
ggplot(data = NDF, aes(x = Gender, y = Age, fill = Gender)) + geom_boxplot() +
  theme_bw()
```



Density plots:

```
ggplot(data = NDF, aes(x = Age, fill = Gender)) +
  geom_density(alpha = 0.35) +
  theme_bw()
```



Summary information:

```
library(dplyr)
SI <- NDF %>%
  group_by(Gender) %>%
  summarise(av_age = mean(Age), md_age = median(Age), sd_age = sd(Age))
SI
```

```
# A tibble: 2 x 4
  Gender   av_age md_age   sd_age
   <chr>    <dbl>  <dbl>    <dbl>
1    Men 24.25000  23.75 1.490820
2  Women 21.75172  21.15 1.554421
```

Create a time-series plot:

```
ggplot(data = ages, aes(x = Year, y = Women)) +
  geom_line(color = "purple") +
  geom_point(color = "purple") +
  geom_smooth(color = "pink") +
  geom_line(aes(x = Year, y = Men), color = "blue") +
  geom_point(aes(x = Year, y = Men), color = "blue") +
  geom_smooth(aes(x = Year, y = Men), color = "lightblue") +
  labs(y = "Age") +
  theme_bw()
```

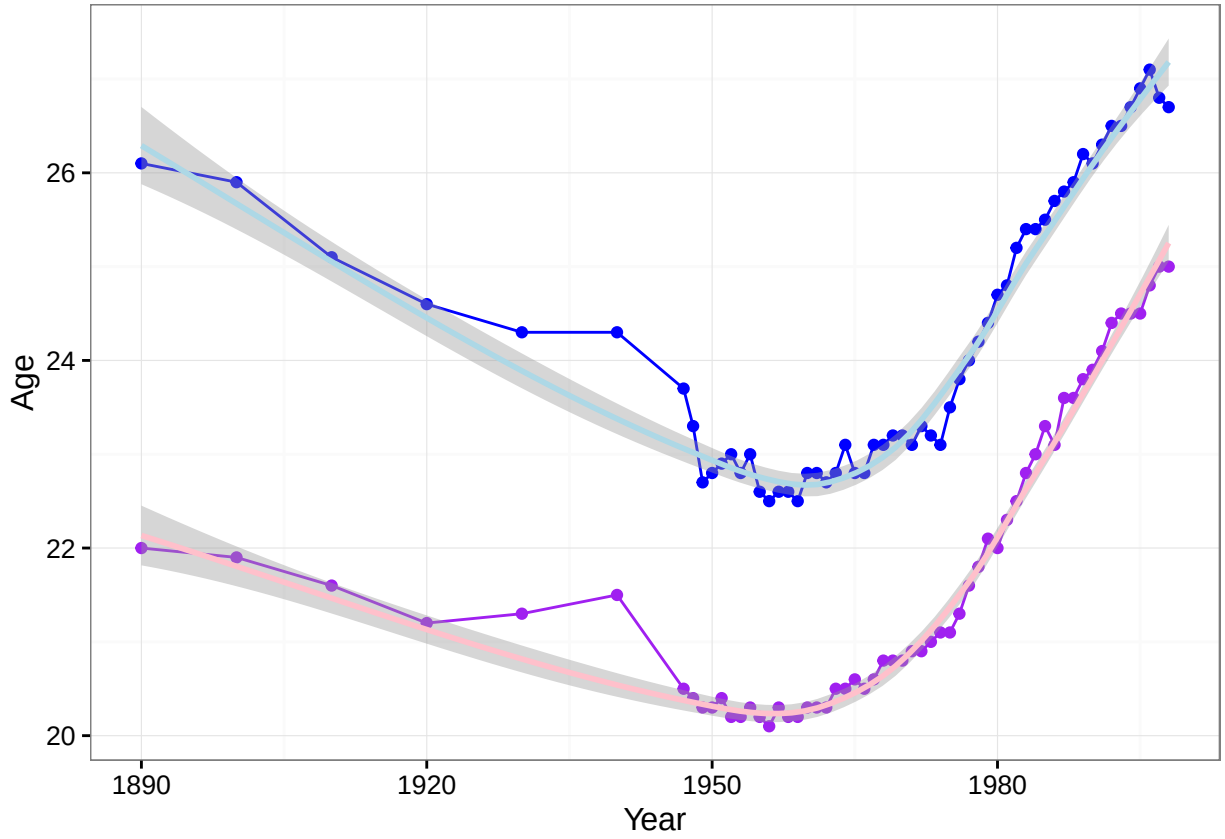


Figure 1: Time Series Plot

Another one using `NDF`:

```
ggplot(data = NDF, aes(x = Year, y = Age, color = Gender)) +
  geom_point() +
  geom_line() +
  geom_smooth() +
  theme_bw()
```