

# Time Series

*Alan Arnholt*

*8/30/2016*

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

```

```

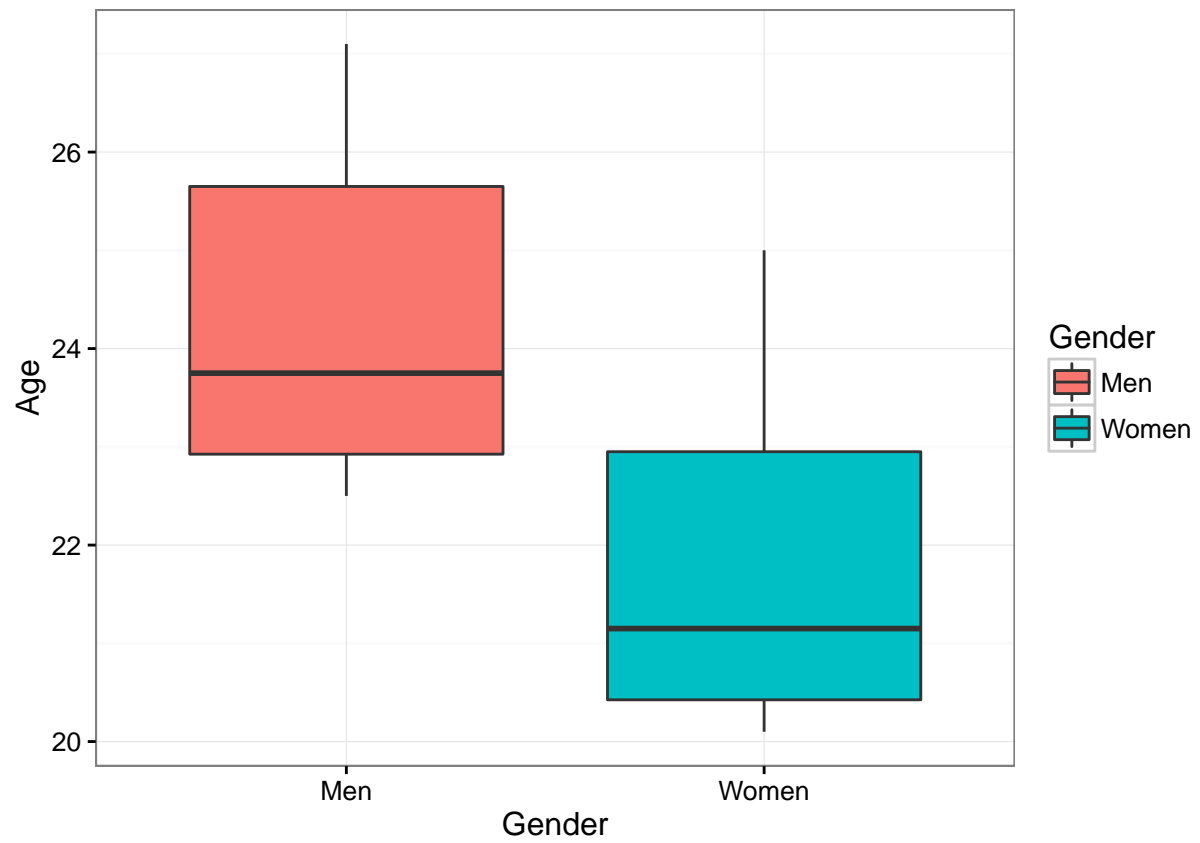
# A tibble: 116 x 3
   Year Gender  Age
  <int> <chr> <dbl>
1  1998 Women  25.0
2  1997 Women  25.0
3  1996 Women  24.8
4  1995 Women  24.5
5  1994 Women  24.5
6  1993 Women  24.5
7  1992 Women  24.4
8  1991 Women  24.1
9  1990 Women  23.9
10 1989 Women  23.8
# ... with 106 more rows

```

```

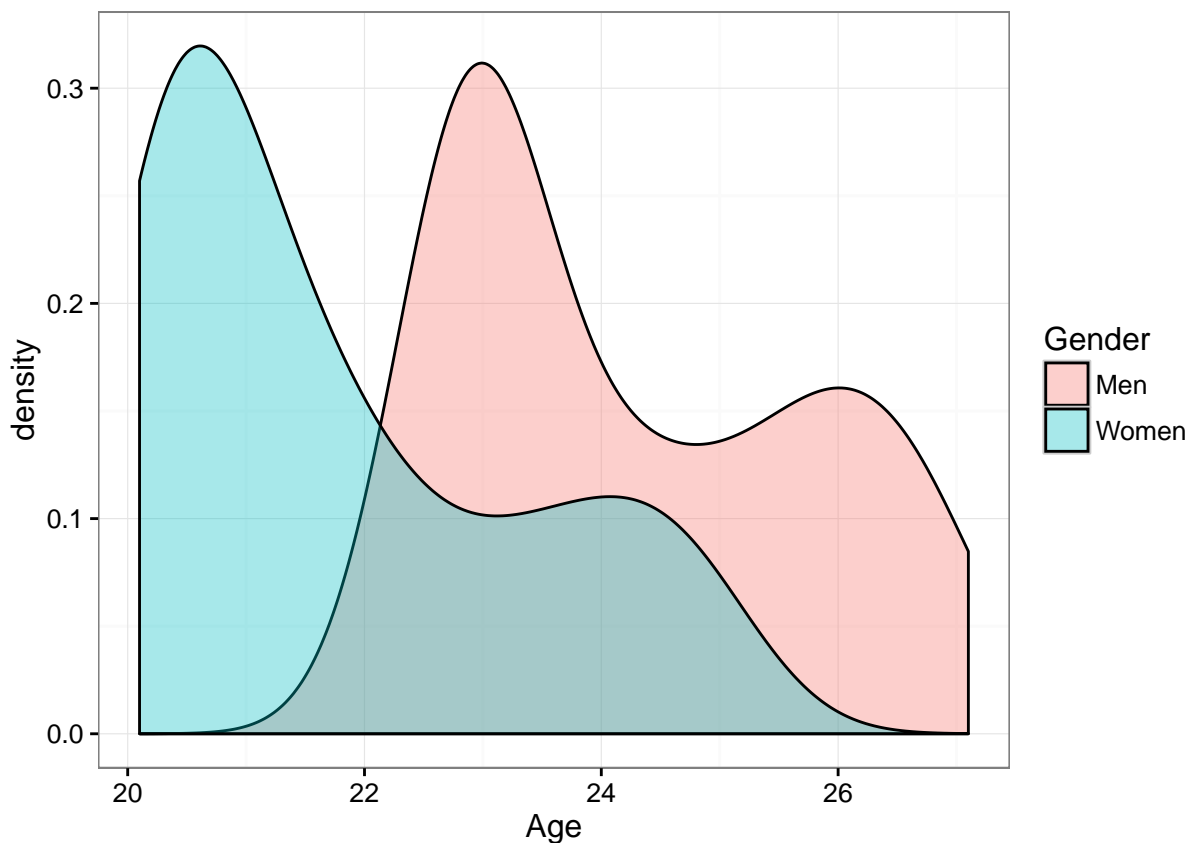
library(ggplot2)
ggplot(data = NDF, aes(x = Gender, y = Age, fill = Gender)) + geom_boxplot() +
  theme_bw()

```



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()
```

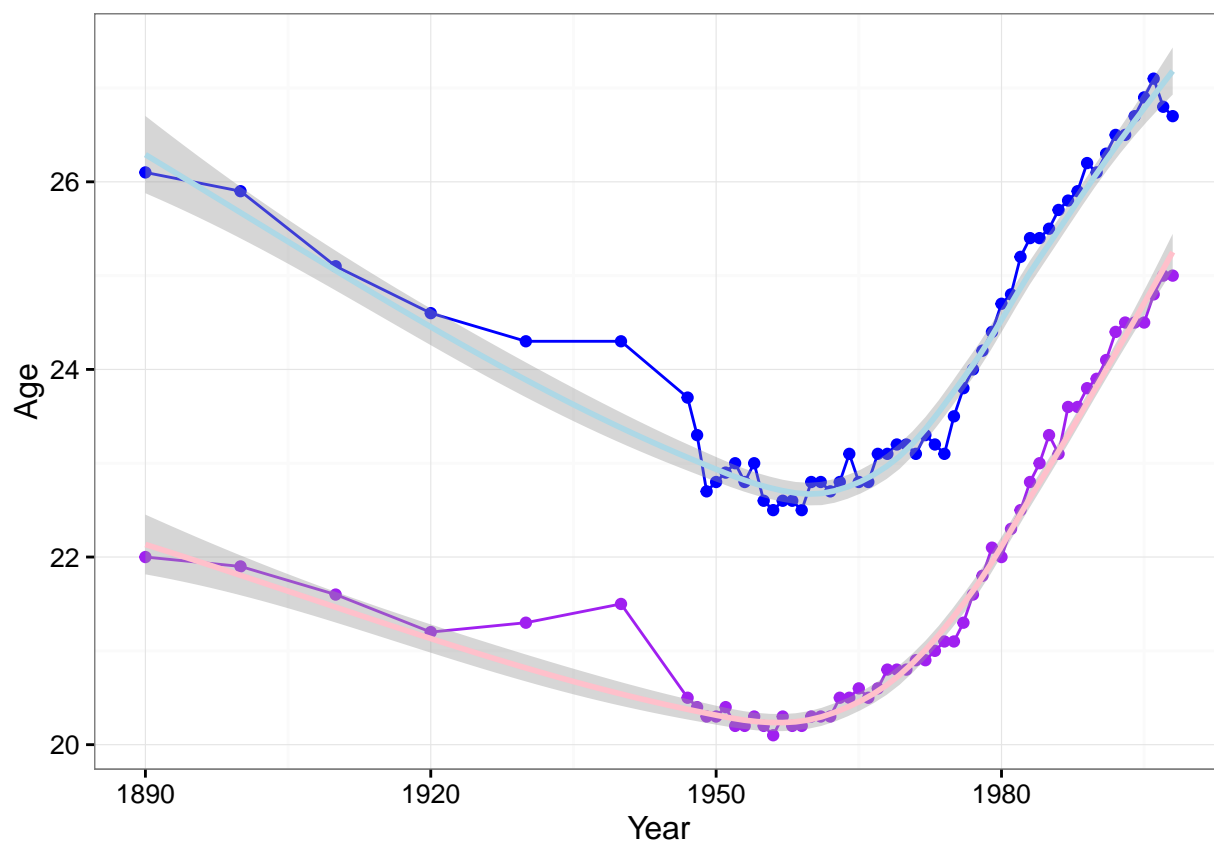


Figure 1: Time Series Plot

Another one using NDF:

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

