# The babynames data

DATA MANIPULATION WITH DPLYR

**Chris Cardillo**
Data Scientist

# The babynames data

```
babynames
```

```
# A tibble: 332,595 x 3
    year name    number
   <dbl> <chr>    <int>
 1  1880 Aaron      102
 2  1880 Ab           5
 3  1880 Abbie       71
 4  1880 Abbott       5
 5  1880 Abby         6
 6  1880 Abe         50
 7  1880 Abel         9
 8  1880 Abigail     12
 9  1880 Abner       27
10  1880 Abraham     81
# … with 332,585 more rows
```

# Frequency of a name

```
babynames %>%
  filter(name == "Amy")
```

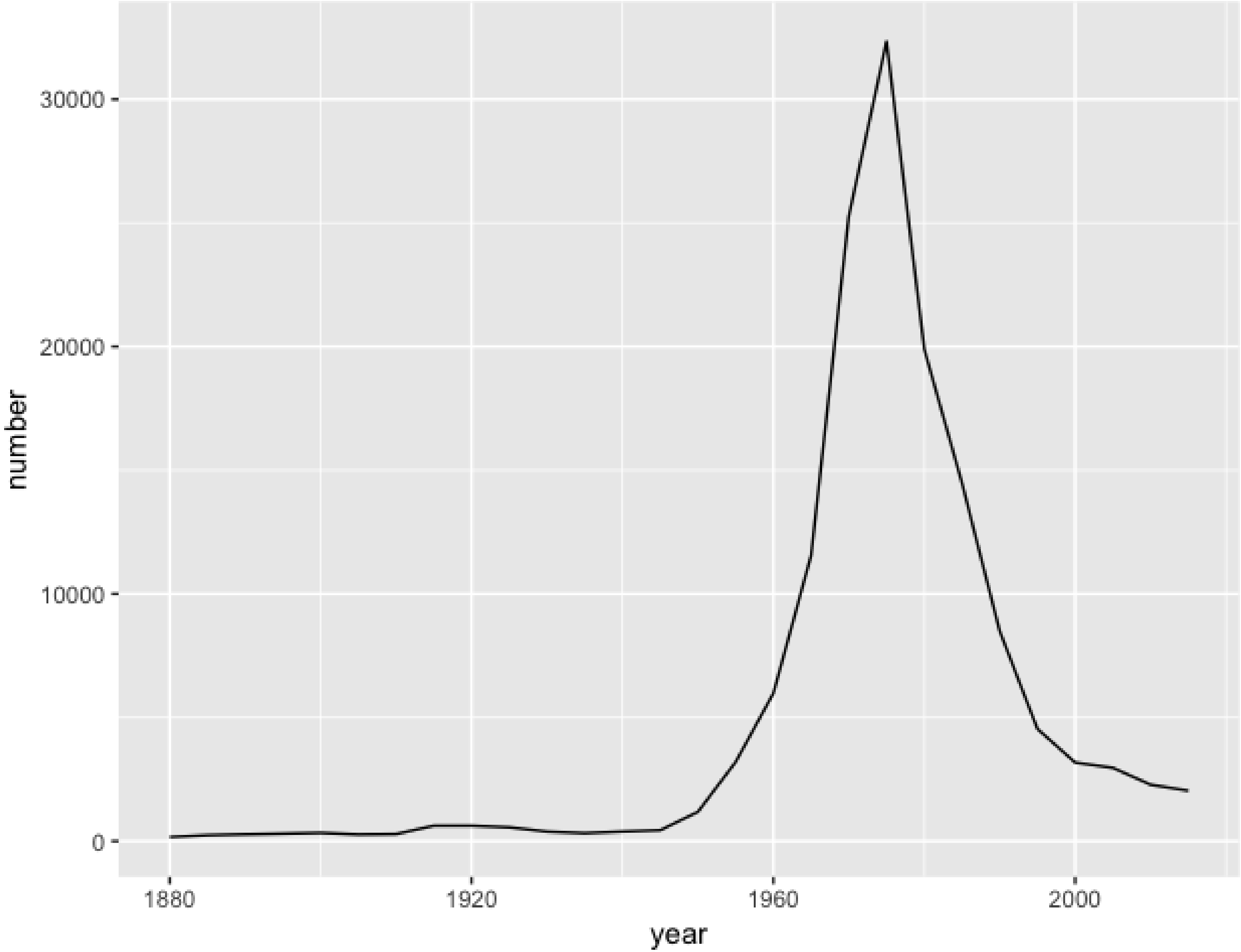
```
# A tibble: 28 x 3
    year name  number
   <dbl> <chr>  <int>
 1  1880 Amy      167
 2  1885 Amy      240
 3  1890 Amy      275
 4  1895 Amy      303
 5  1900 Amy      335
 6  1905 Amy      269
 7  1910 Amy      287
 8  1915 Amy      624
 9  1920 Amy      624
10  1925 Amy      560
# … with 18 more rows
```

# Amy plot

```r
library(ggplot2)
```

```r
babynames_filtered <- babynames %>%
  filter(name == "Amy")
```

```r
ggplot(babynames_filtered, aes(x = year, y = number)) +
  geom_line()
```


30000
20000
10000
0
number
1880
1920
1960
2000
year

# Filter for multiple names

```
babynames_multiple <- babynames %>%
  filter(name %in% c("Amy", "Christopher"))
```

# When was each name most common?

```
babynames %>%
  group_by(name) %>%
  top_n(1, number)
```

```
# A tibble: 54,881 x 3
# Groups:   name [48,040]
    year name     number
   <dbl> <chr>     <int>
 1  1880 Arch         61
 2  1880 Bird         17
 3  1880 Ednah         6
 4  1880 Erasmus       5
 5  1880 Garfield    122
 6  1880 Harve        17
 7  1880 Lidie         7
 8  1880 Loula        13
 9  1880 Lovisa        5
10  1880 Lulie         8
# … with 54,871 more rows
```

# Grouped mutates

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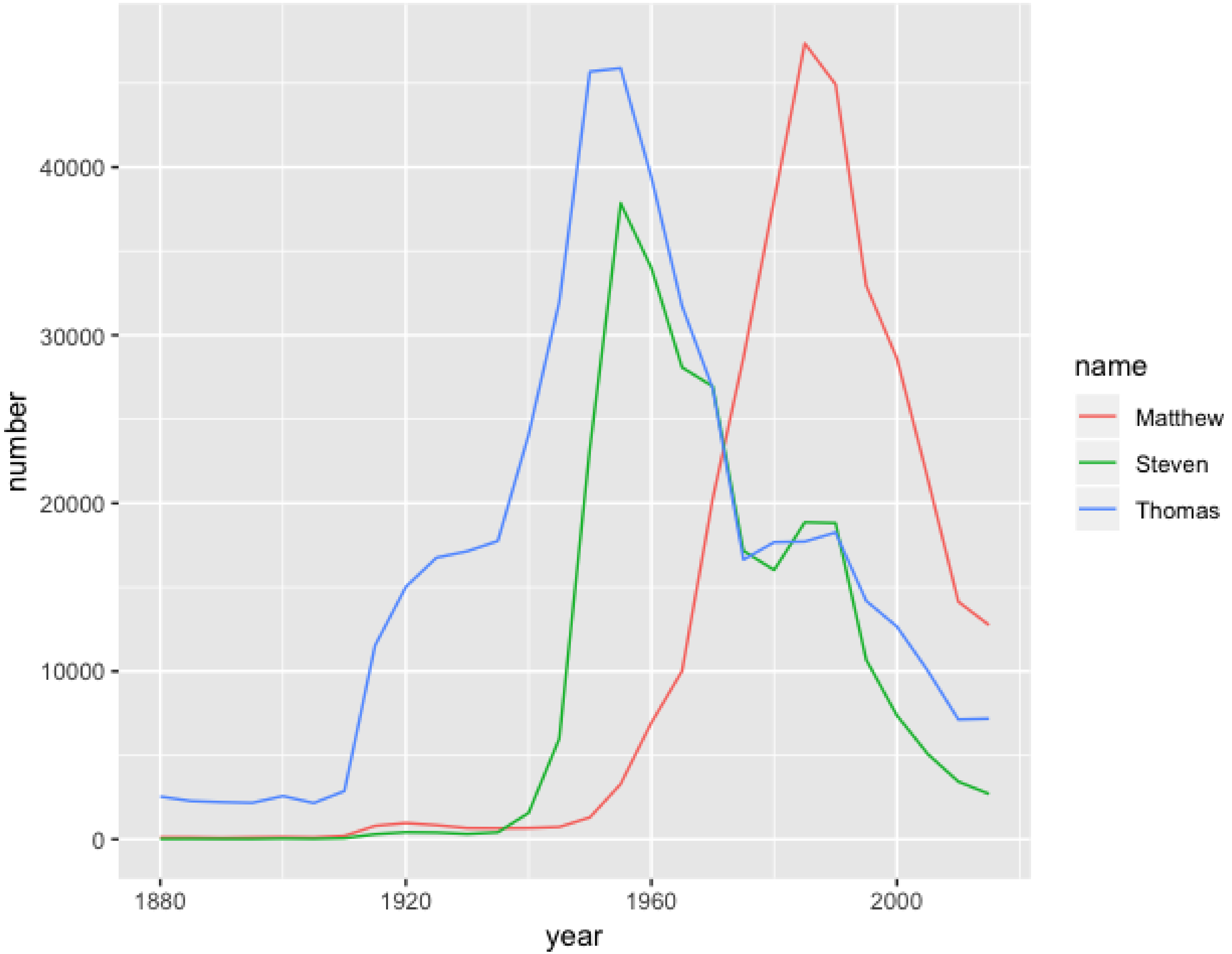

40000
30000
20000
10000
0
number
1880
1920
1960
2000
year
name
Matthew
Steven
Thomas

# Review: group_by() and summarize()

```
babynames %>%
  group_by(year) %>%
  summarize(year_total = sum(number))
```

```
# A tibble: 28 x 2
    year year_total
   <dbl>      <int>
 1  1880     201478
 2  1885     240822
 3  1890     301352
 4  1895     350934
 5  1900     450148
 6  1905     423875
 7  1910     590607
 8  1915    1830351
 9  1920    2259494
10  1925    2330750
# … with 18 more rows
```

# Combining group_by() and mutate()

```
babynames %>%
  group_by(year) %>%
  mutate(year_total = sum(number))
```

```
# A tibble: 332,595 x 4
# Groups:   year [28]
    year name    number year_total
   <dbl> <chr>    <int>      <int>
 1  1880 Aaron      102     201478
 2  1880 Ab           5     201478
 3  1880 Abbie       71     201478
 4  1880 Abbott       5     201478
 5  1880 Abby         6     201478
 6  1880 Abe         50     201478
 7  1880 Abel         9     201478
 8  1880 Abigail     12     201478
 9  1880 Abner       27     201478
10  1880 Abraham     81     201478
# … with 332,585 more rows
```

# ungroup()

```
babynames %>%
  group_by(year) %>%
  mutate(year_total = sum(number)) %>%
  ungroup()
```

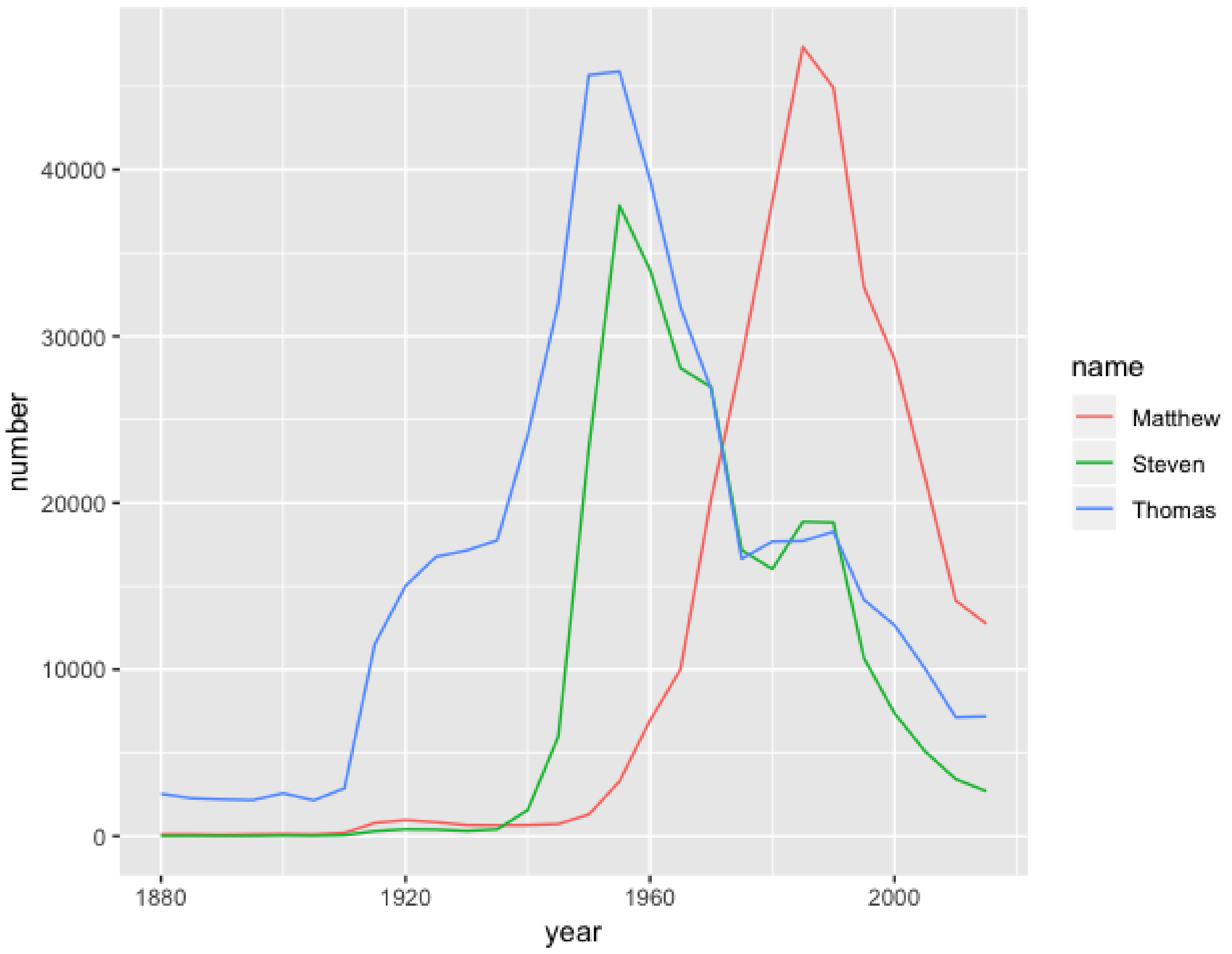
```
# A tibble: 332,595 x 4
    year name    number year_total
   <dbl> <chr>    <int>      <int>
 1  1880 Aaron      102     201478
 2  1880 Ab           5     201478
 3  1880 Abbie       71     201478
 4  1880 Abbott       5     201478
 5  1880 Abby         6     201478
 6  1880 Abe         50     201478
 7  1880 Abel         9     201478
 8  1880 Abigail     12     201478
 9  1880 Abner       27     201478
10  1880 Abraham     81     201478
# … with 332,585 more rows
```

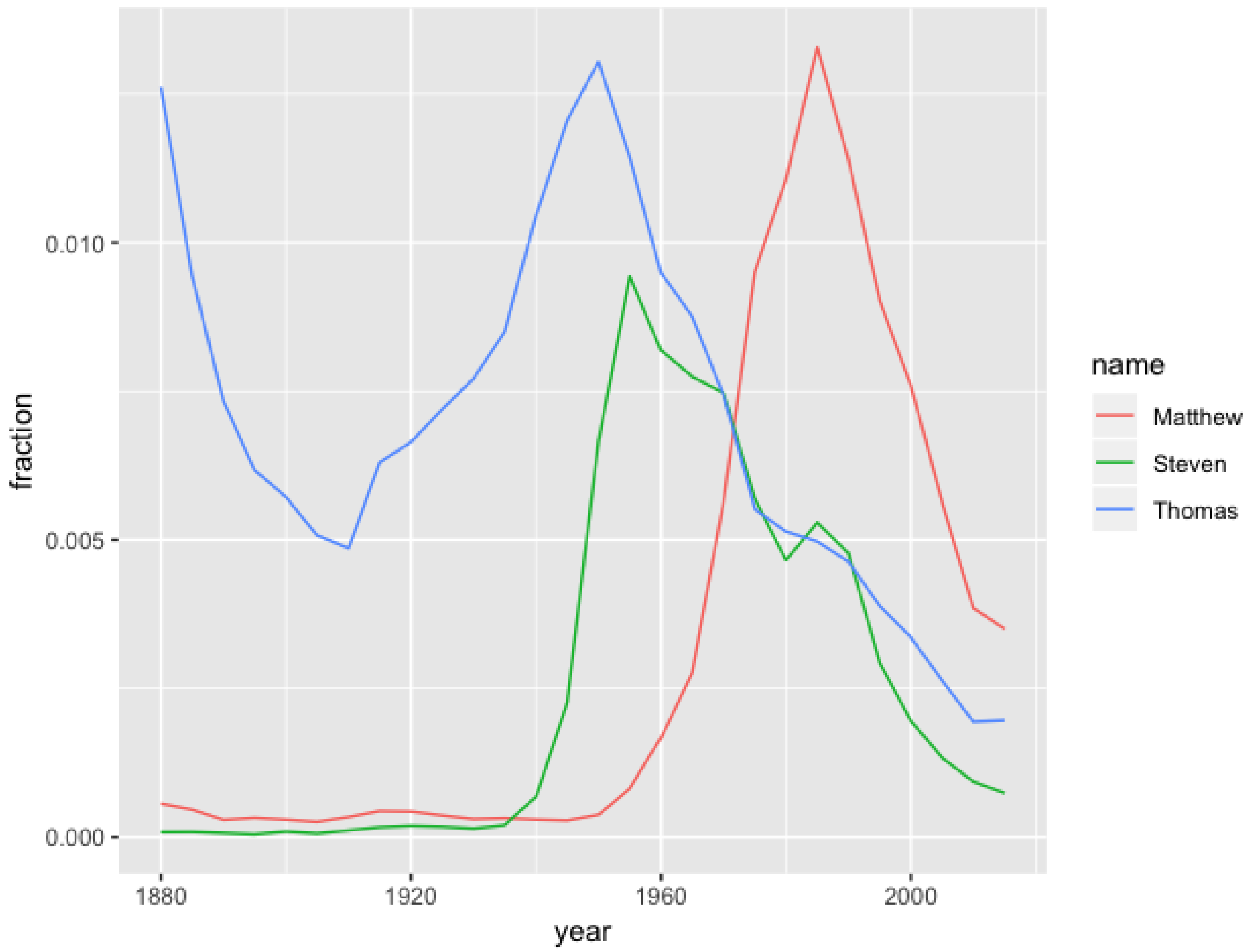
# Add the fraction column

```
babynames %>%
  group_by(year) %>%
  mutate(year_total = sum(number)) %>%
  ungroup() %>%
  mutate(fraction = number / year_total)
```

```
# A tibble: 332,595 x 5
    year name    number year_total  fraction
   <dbl> <chr>    <int>      <int>     <dbl>
 1  1880 Aaron      102     201478 0.000506
 2  1880 Ab           5     201478 0.0000248
 3  1880 Abbie       71     201478 0.000352
 4  1880 Abbott       5     201478 0.0000248
 5  1880 Abby         6     201478 0.0000298
 6  1880 Abe         50     201478 0.000248
 7  1880 Abel         9     201478 0.0000447
 8  1880 Abigail     12     201478 0.0000596
 9  1880 Abner       27     201478 0.000134
10  1880 Abraham     81     201478 0.000402
# … with 332,585 more rows
```

# Comparing visualizations





# Window functions

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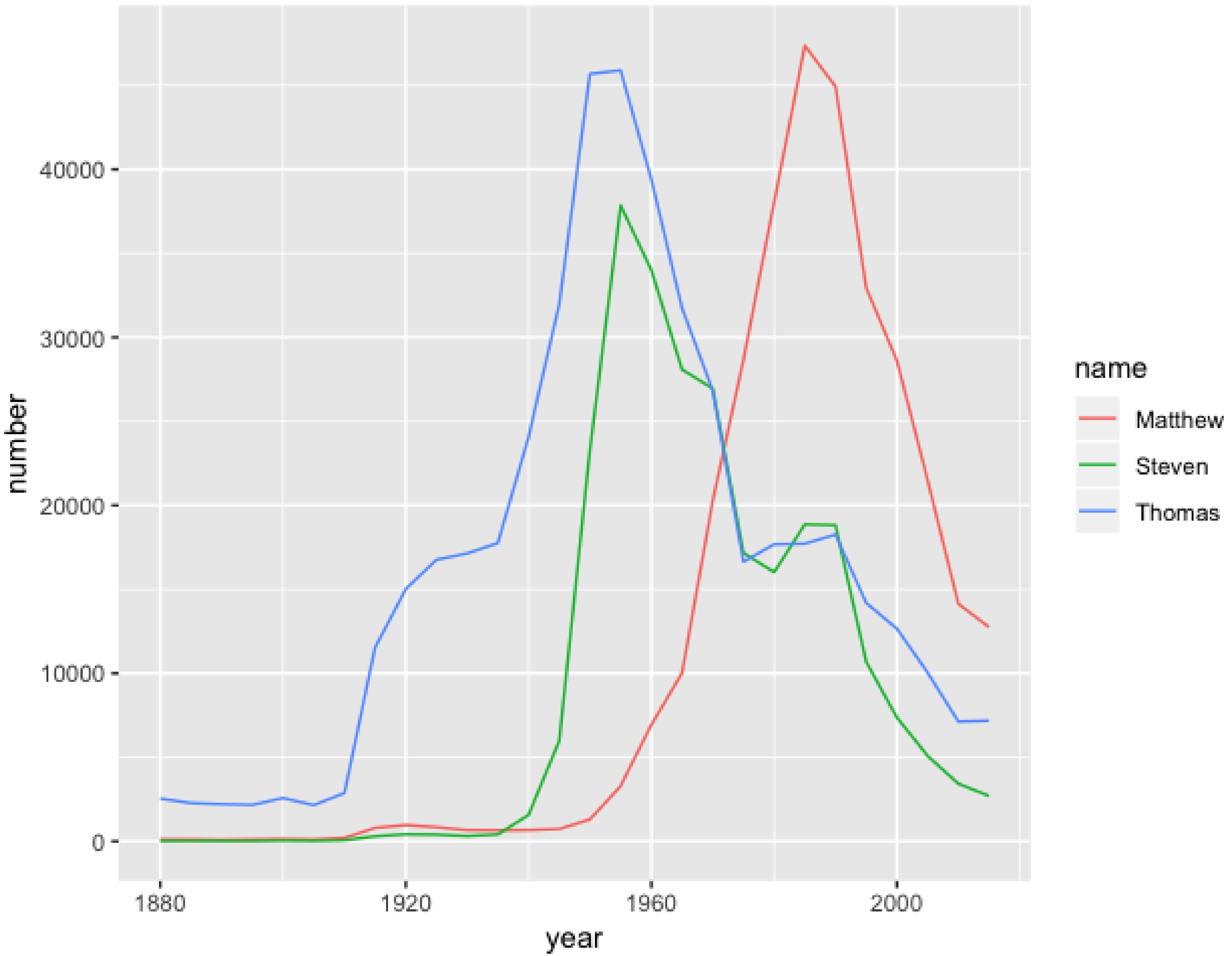

40000
30000
20000
10000
0
number
1880
1920
1960
2000
year
name
Matthew
Steven
Thomas

# Window function

```r
v <- c(1, 3, 6, 14)
v
```

```
[1]  1  3  6 14
```

```r
lag(v)
```

```
[1] NA  1  3  6
```

# Compare consecutive steps

```
v - lag(v)
```

```
[1] NA  2  3  8
```

# Changes in popularity of a name

```
babynames_fraction <- babynames %>%
  group_by(year) %>%
  mutate(year_total = sum(number)) %>%
  ungroup() %>%
  mutate(fraction = number / year_total)
```

# Matthew

```
babynames_fraction %>%
  filter(name == "Matthew") %>%
  arrange(year)
```

```
# A tibble: 28 x 5
    year name    number year_total fraction
   <dbl> <chr>    <int>      <int>    <dbl>
 1  1880 Matthew    113     201478 0.000561
 2  1885 Matthew    111     240822 0.000461
 3  1890 Matthew     86     301352 0.000285
 4  1895 Matthew    112     350934 0.000319
 5  1900 Matthew    130     450148 0.000289
 6  1905 Matthew    107     423875 0.000252
 7  1910 Matthew    197     590607 0.000334
 8  1915 Matthew    798    1830351 0.000436
 9  1920 Matthew    967    2259494 0.000428
10  1925 Matthew    840    2330750 0.000360
# … with 18 more rows
```

# Matthew over time

```
babynames_fraction %>%
  filter(name == "Matthew") %>%
  arrange(year) %>%
  mutate(difference = fraction - lag(fraction))
```

```
# A tibble: 28 x 6
    year name    number year_total fraction  difference
   <dbl> <chr>    <int>      <int>    <dbl>       <dbl>
 1  1880 Matthew    113     201478 0.000561 NA
 2  1885 Matthew    111     240822 0.000461 -0.0000999
 3  1890 Matthew     86     301352 0.000285 -0.000176
 4  1895 Matthew    112     350934 0.000319  0.0000338
 5  1900 Matthew    130     450148 0.000289 -0.0000304
 6  1905 Matthew    107     423875 0.000252 -0.0000364
 7  1910 Matthew    197     590607 0.000334  0.0000811
 8  1915 Matthew    798    1830351 0.000436  0.000102
 9  1920 Matthew    967    2259494 0.000428 -0.00000801
10  1925 Matthew    840    2330750 0.000360 -0.0000676
# … with 18 more rows
```

# Biggest jump in popularity

```
babynames_fraction %>%
  filter(name == "Matthew") %>%
  arrange(year) %>%
  mutate(difference = fraction - lag(fraction)) %>%
  arrange(desc(difference))
```

```
# A tibble: 28 x 6
    year name    number year_total fraction difference
   <dbl> <chr>    <int>      <int>    <dbl>      <dbl>
 1  1975 Matthew  28665    3014943 0.00951   0.00389
 2  1970 Matthew  20265    3604252 0.00562   0.00286
 3  1985 Matthew  47367    3563364 0.0133    0.00223
 4  1980 Matthew  38054    3439117 0.0111    0.00156
 5  1965 Matthew  10015    3624610 0.00276   0.00109
 6  1960 Matthew   6942    4152075 0.00167   0.000853
 7  1955 Matthew   3287    4012691 0.000819  0.000447
 8  1915 Matthew    798    1830351 0.000436  0.000102
 9  1950 Matthew   1303    3502592 0.000372  0.0000967
10  1910 Matthew    197     590607 0.000334  0.0000811
# … with 18 more rows
```

# Changes within every name

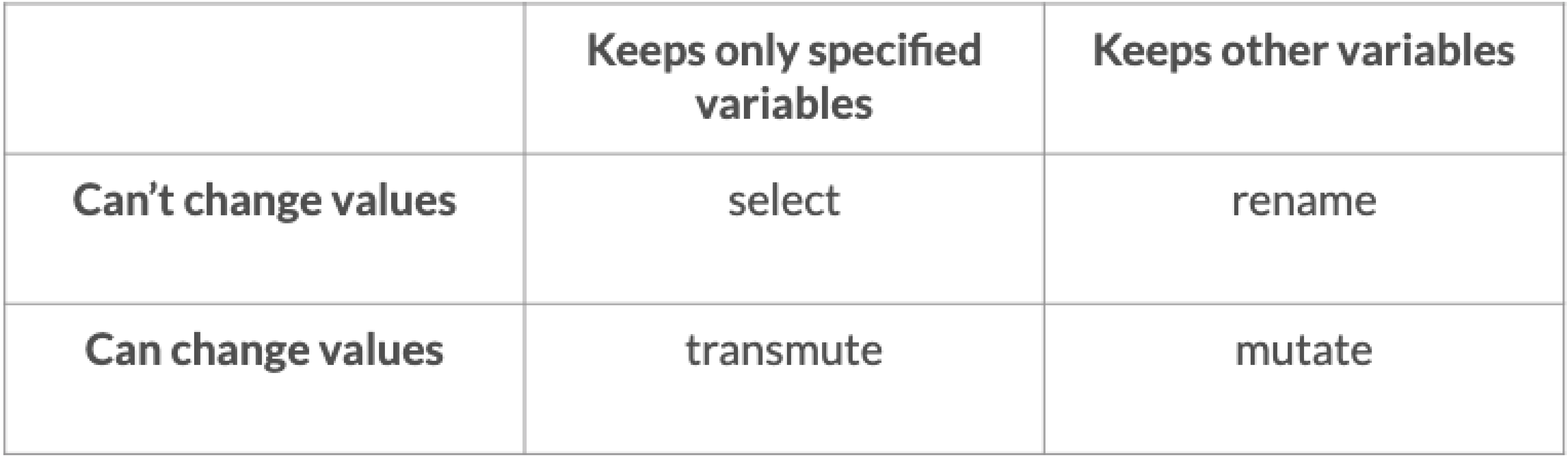
```
babynames_fraction %>%
  arrange(name, year) %>%
  mutate(difference = fraction - lag(fraction)) %>%
  group_by(name) %>%
  arrange(desc(difference))
```

```
# A tibble: 332,595 x 6
# Groups:   name [48,040]
    year name     number year_total fraction difference
   <dbl> <chr>     <int>      <int>    <dbl>      <dbl>
 1  1880 John       9701     201478   0.0481     0.0481
 2  1880 William    9562     201478   0.0475     0.0475
 3  1880 Mary       7092     201478   0.0352     0.0352
 4  1880 James      5949     201478   0.0295     0.0295
 5  1880 Charles    5359     201478   0.0266     0.0266
 6  1880 George     5152     201478   0.0256     0.0256
 7  1880 Frank      3255     201478   0.0162     0.0162
 8  1935 Shirley   42790    2088487   0.0205     0.0137
 9  1880 Joseph     2642     201478   0.0131     0.0131
10  1880 Anna       2616     201478   0.0130     0.0129
# … with 332,585 more rows
```

# Summary

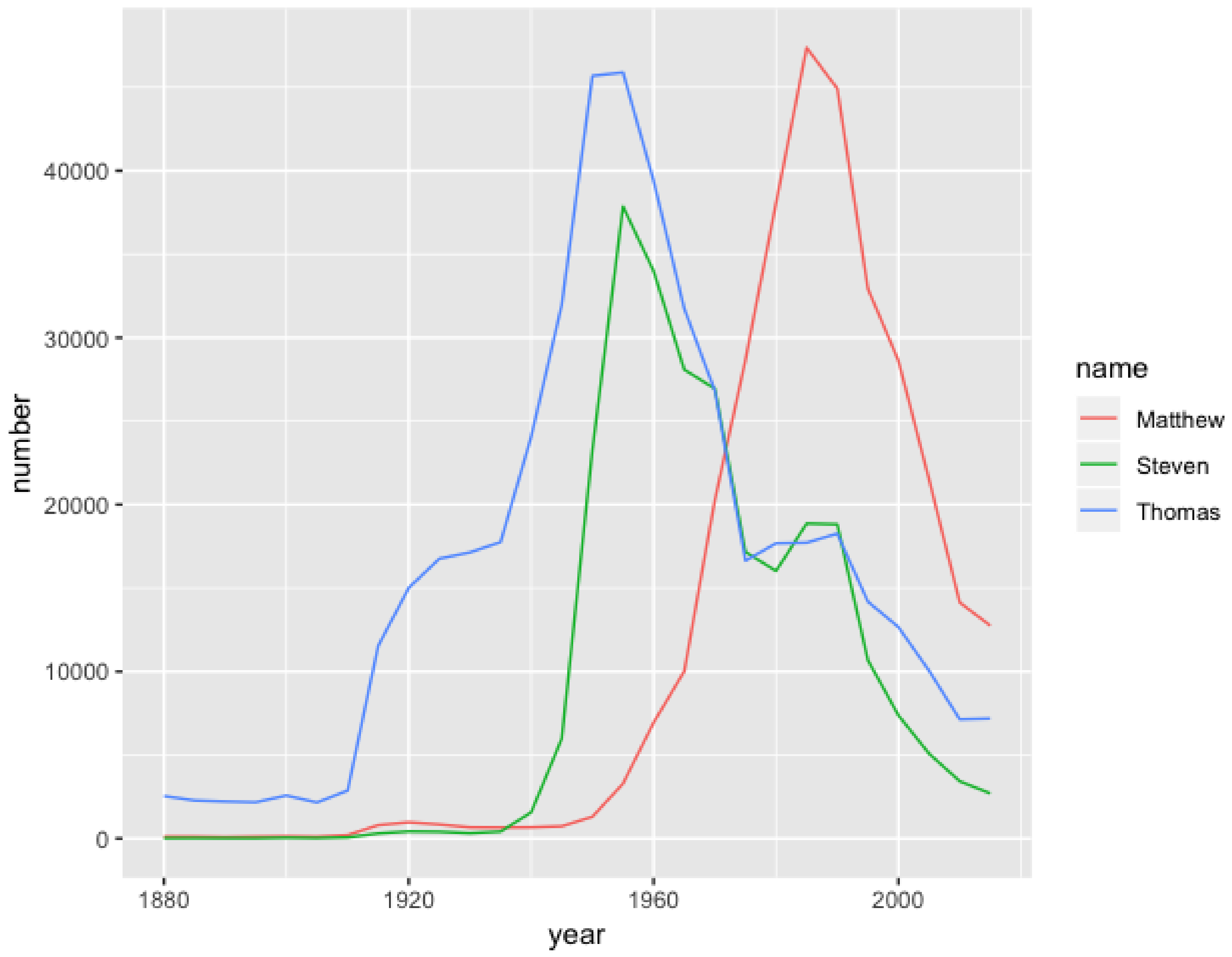
- `select()`
- `filter()`
- `mutate()`
- `arrange()`
- `count()`
- `group_by()`
- `summarize()`

# Verbs table



| | Keeps only specified variables | Keeps other variables |
|---|---|---|
| Can't change values | select | rename |
| Can change values | transmute | mutate |

# babynames data



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- Categorical Data in the Tidyverse