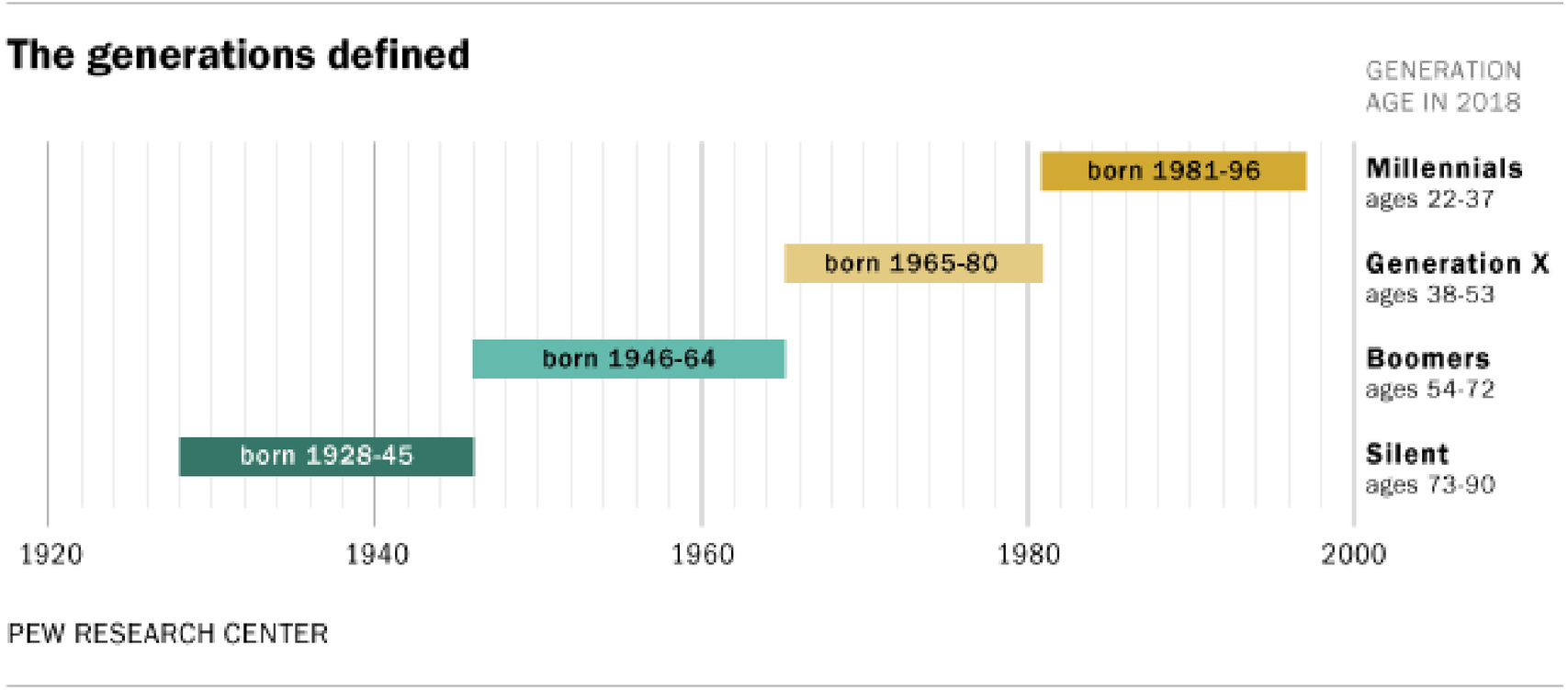
WORKING WITH DATA IN THE TIDYVERSE

Complex recoding with case_when

Alison Hill
Professor & Data Scientist

Generations & age



[1] http://www.pewresearch.org/topics/generations-and-age/

```
?case_when
```

Usage

```
case_when(...)
```

Arguments

...	A sequence of two-sided formulas. The left hand side (LHS) determines which values match this case. The right hand side (RHS) provides the replacement value. The LHS must evaluate to a logical vector. Each logical vector can either have length 1 or a common length. All RHSs must evaluate to the same type of vector. These dots are evaluated with explicit splicing.

Bakers

```
bakers

# A tibble: 10 x 2
   baker   birth_year
   <chr>        <dbl>
 1 Liam         1998.
 2 Martha       1997.
 3 Jason        1992.
 4 Stuart       1986.
 5 Manisha      1985.
 6 Simon        1980.
 7 Natasha      1976.
 8 Richard      1976.
 9 Robert       1959.
10 Diana        1945.
```

Simple if_else

```
bakers %>%
   mutate(gen = if_else(between(birth_year, 1981, 1996),
                        "millenial",
                        "not millenial"))

# A tibble: 10 x 3
   baker   birth_year gen
   <chr>        <dbl> <chr>
 1 Liam         1998. not millenial
 2 Martha       1997. not millenial
 3 Jason        1992. millenial
 4 Stuart       1986. millenial
 5 Manisha      1985. millenial
 6 Simon        1980. not millenial
 7 Natasha      1976. not millenial
 8 Richard      1976. not millenial
 9 Robert       1959. not millenial
10 Diana        1945. not millenial
```

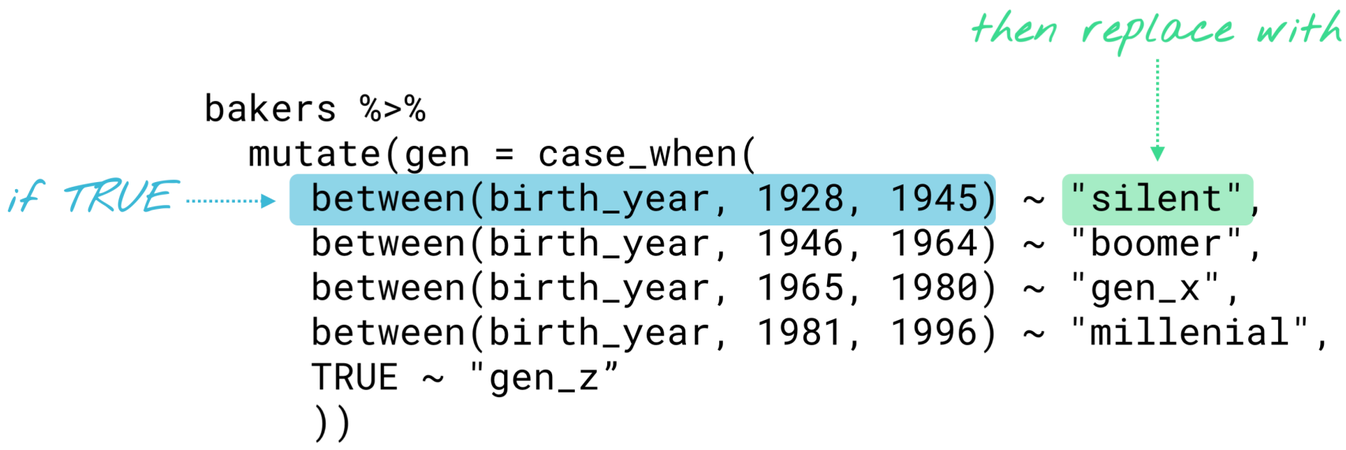
Multiple if_else pairs

```
bakers %>%
  mutate(gen = case_when(
    between(birth_year, 1965, 1980) ~ "gen_x",
    between(birth_year, 1981, 1996) ~ "millenial"
    ))

# A tibble: 10 x 3
   baker   birth_year gen
   <chr>        <dbl> <chr>
 1 Liam         1998. NA
 2 Martha       1997. NA
 3 Jason        1992. millenial
 4 Stuart       1986. millenial
 5 Manisha      1985. millenial
 6 Simon        1980. gen_x
 7 Natasha      1976. gen_x
 8 Richard      1976. gen_x
 9 Robert       1959. NA
10 Diana        1945. NA
```

Make multiple bins

```
bakers %>%
  mutate(gen = case_when(
    between(birth_year, 1928, 1945) ~ "silent",
    between(birth_year, 1946, 1964) ~ "boomer",
    between(birth_year, 1965, 1980) ~ "gen_x",
    between(birth_year, 1981, 1996) ~ "millenial",
    TRUE ~ "gen_z"
    ))

# A tibble: 10 x 3
   baker   birth_year gen
   <chr>         <dbl> <chr>
 1 Liam          1998. gen_z
 2 Martha        1997. gen_z
 3 Jason         1992. millenial
 4 Stuart        1986. millenial
 5 Manisha       1985. millenial
 6 Simon         1980. gen_x
 7 Natasha       1976. gen_x
 8 Richard       1976. gen_x
 9 Robert        1959. boomer
10 Diana         1945. silent
```

List of "if-then" pairs



The last "if-then" pair

```
bakers %>%
  mutate(gen = case_when(
     between(birth_year, 1928, 1945) ~ "silent",
     between(birth_year, 1946, 1964) ~ "boomer",
     between(birth_year, 1965, 1980) ~ "gen_x",
     between(birth_year, 1981, 1996) ~ "millenial",
     TRUE ~ "gen_z"
     ))
```

ELSE

replace with

Know your new variable!

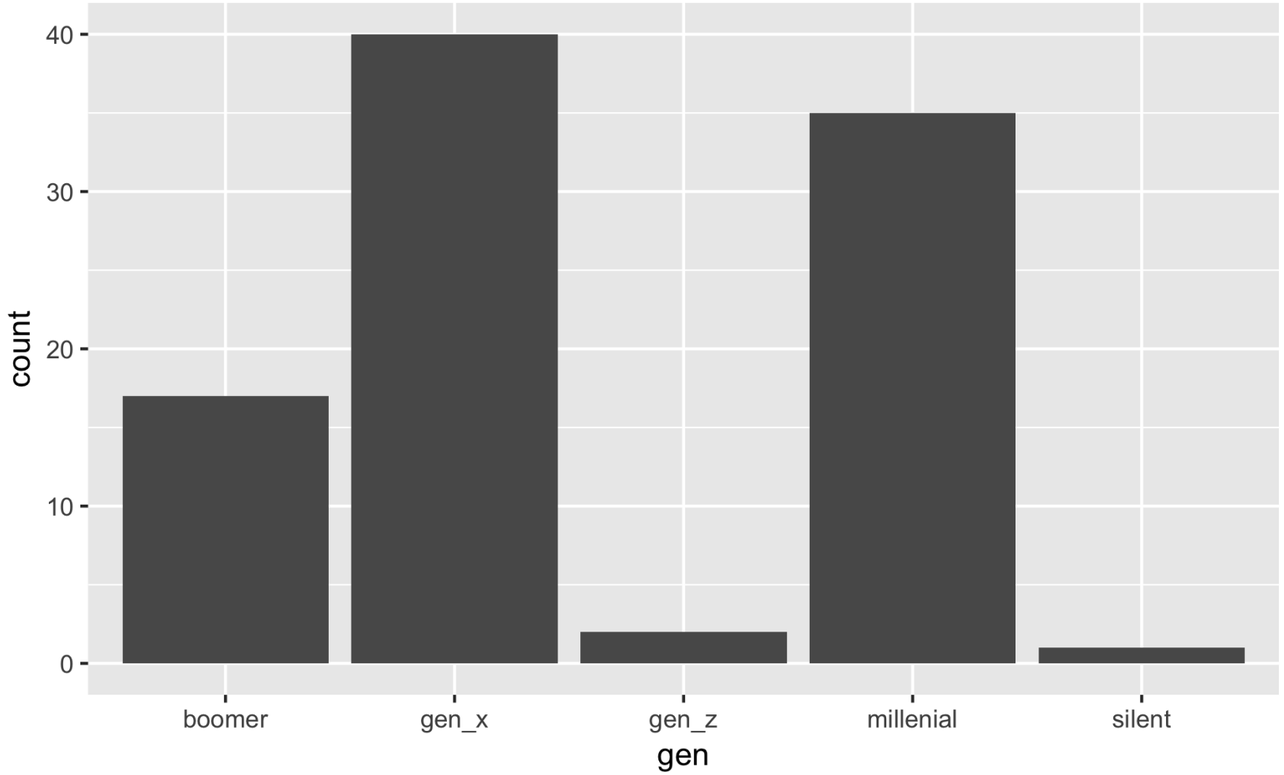
```
bakers

# A tibble: 95 x 3
   baker     birth_year gen
   <chr>          <dbl> <chr>
 1 Liam           1998. gen_z
 2 Martha         1997. gen_z
 3 Flora          1996. millenial
 4 Michael        1996. millenial
 5 Julia          1996. millenial
 6 Ruby           1993. millenial
 7 Benjamina      1993. millenial
 8 Jason          1992. millenial
 9 James          1991. millenial
10 Andrew         1991. millenial
# ... with 85 more rows
```

Count bakers by generation

```
bakers %>%
  count(gen, sort = TRUE) %>%
  mutate(prop = n / sum(n))

# A tibble: 5 x 3
  gen           n   prop
  <chr>     <int>  <dbl>
1 gen_x        40 0.421
2 millenial    35 0.368
3 boomer       17 0.179
4 gen_z         2 0.0211
5 silent        1 0.0105
```

Plot bakers by generation

```
ggplot(bakers, aes(x = gen)) + geom_bar()
```



WORKING WITH DATA IN THE TIDYVERSE

Let's practice!

WORKING WITH DATA IN THE TIDYVERSE

Factors

Alison Hill
Professor & Data Scientist

The forcats package

```
library(forcats) # once per work session
```

[1] http://forcats.tidyverse.org

What is a factor?

"In R, factors are used to work with categorical variables, variables that have a fixed and known set of possible values."

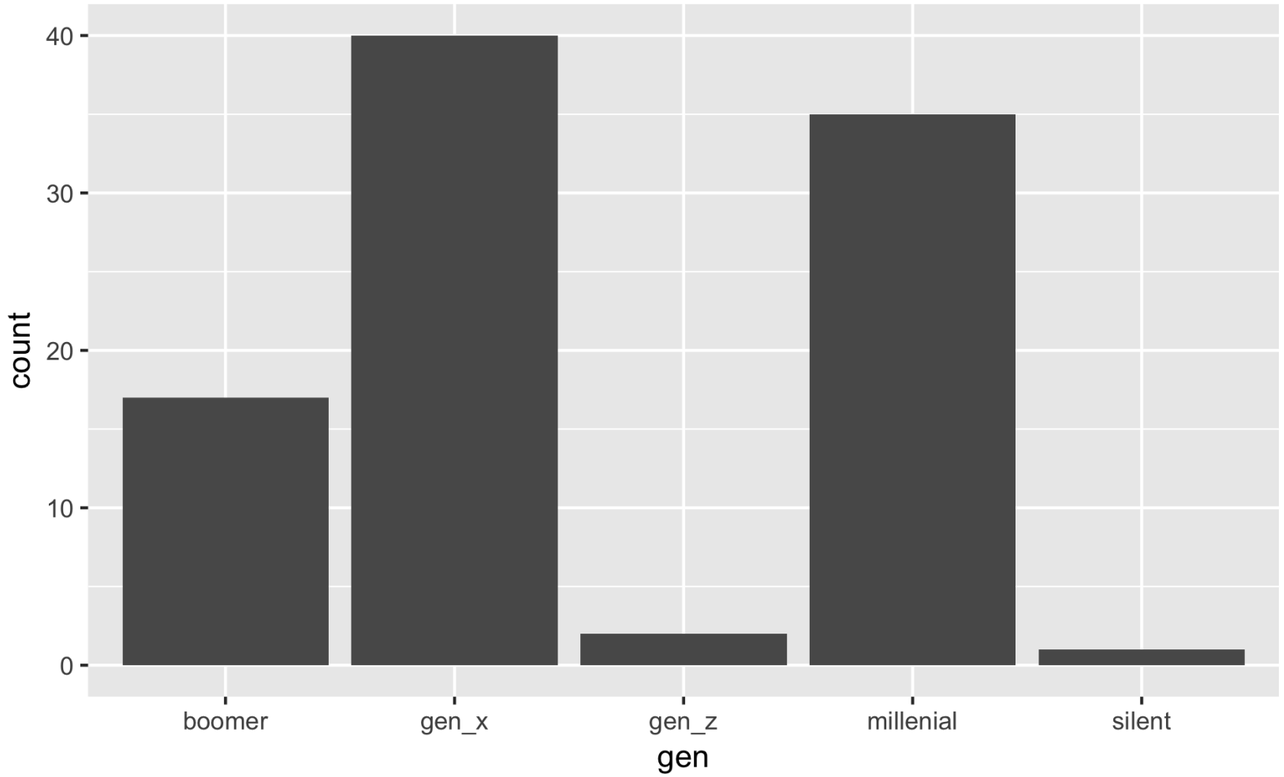
[1] Garrett Grolemund & Hadley Wickham, http://r4ds.had.co.nz/factors.html

Count bakers by generation

```
bakers %>%
  count(gen, sort = TRUE) %>%
  mutate(prop = n / sum(n))
# A tibble: 5 x 3
  gen           n   prop
  <chr>     <int>  <dbl>
1 gen_x        40 0.421
2 millenial    35 0.368
3 boomer       17 0.179
4 gen_z         2 0.0211
5 silent        1 0.0105
```

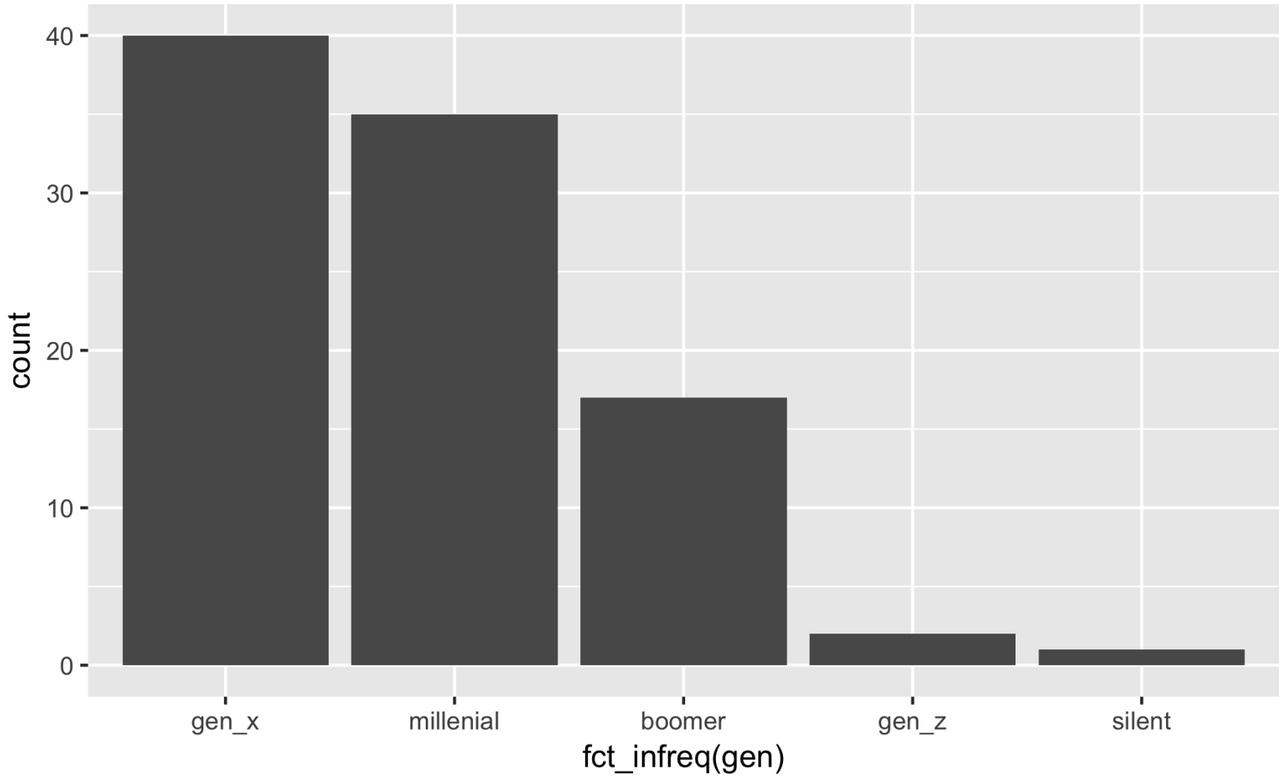
Plot bakers by generation

```
ggplot(bakers, aes(x = gen)) +
    geom_bar()
```



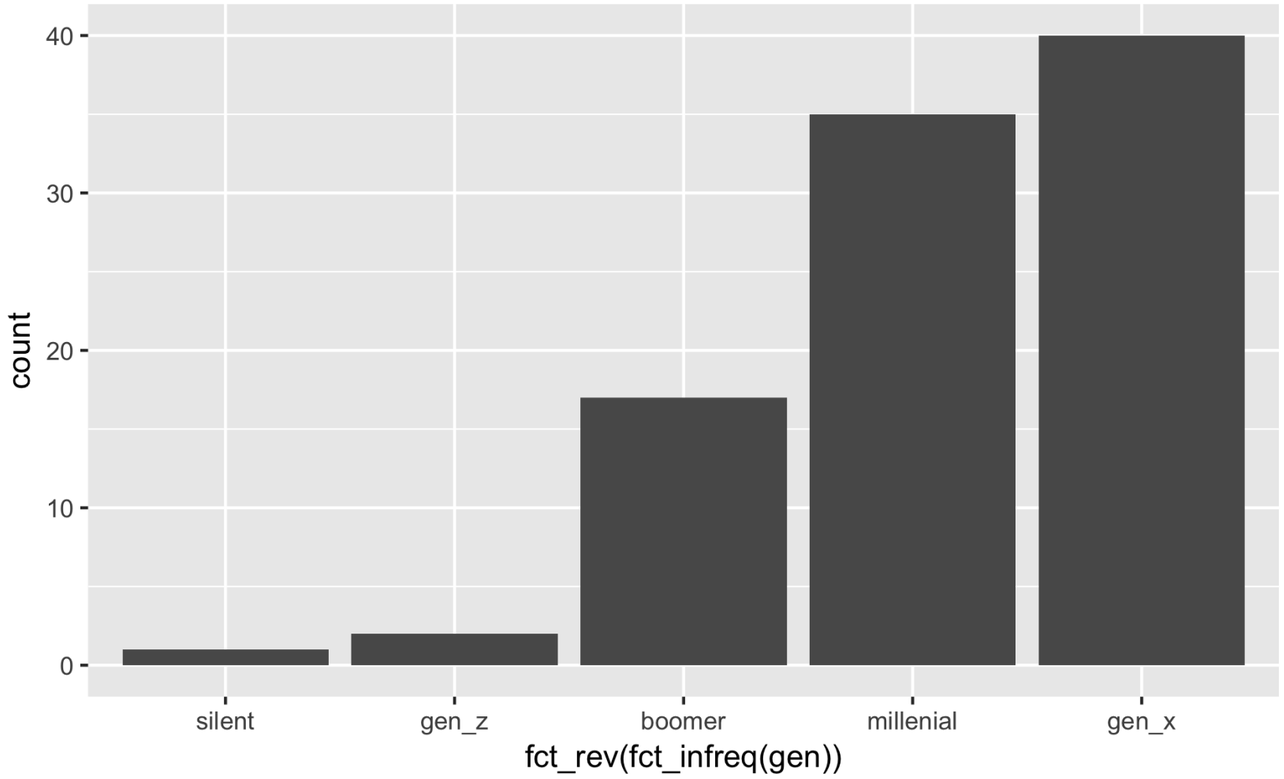
Reorder from most to least bakers

```
ggplot(bakers, aes(x = fct_infreq(gen))) +
  geom_bar()
```

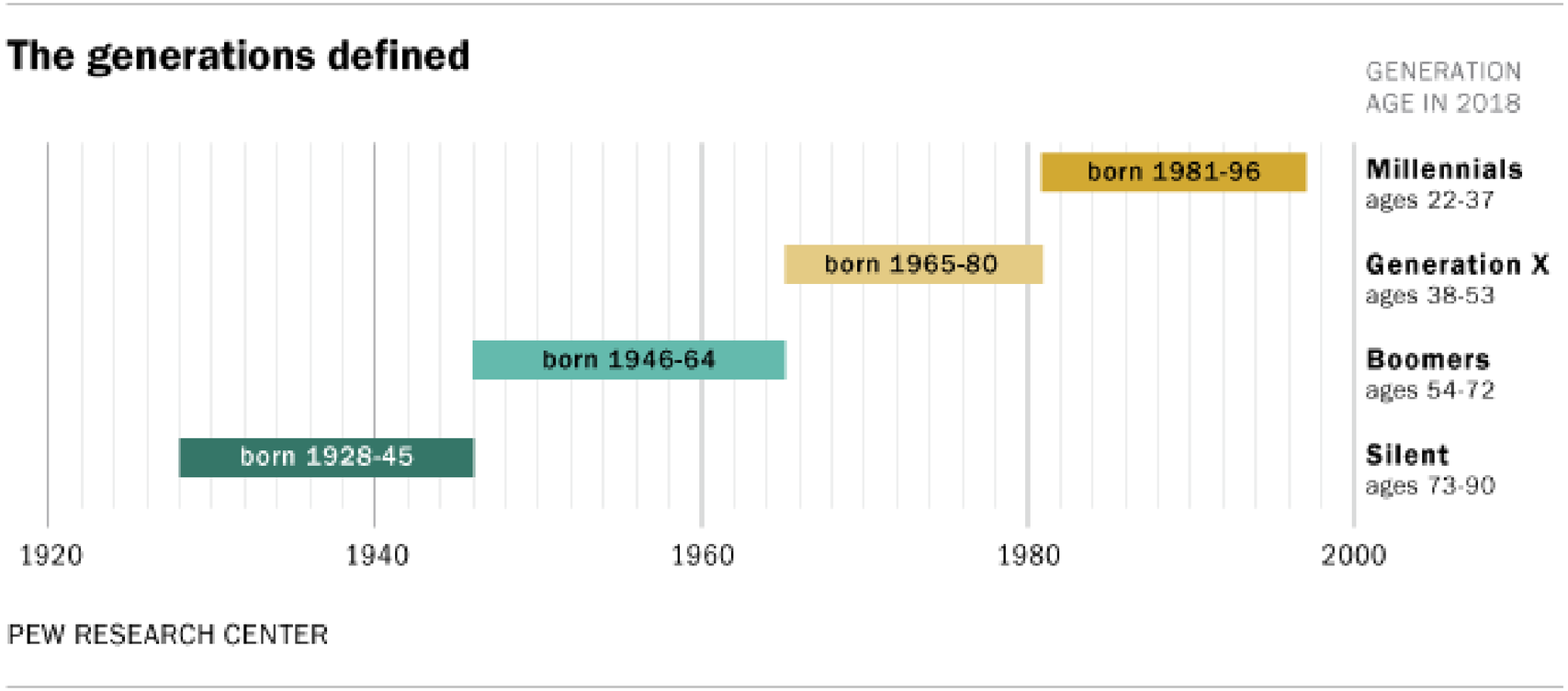


Reorder from least to most bakers

```
ggplot(bakers, aes(x = fct_rev(fct_infreq(gen)))) +
  geom_bar()
```



Relevel using natural order



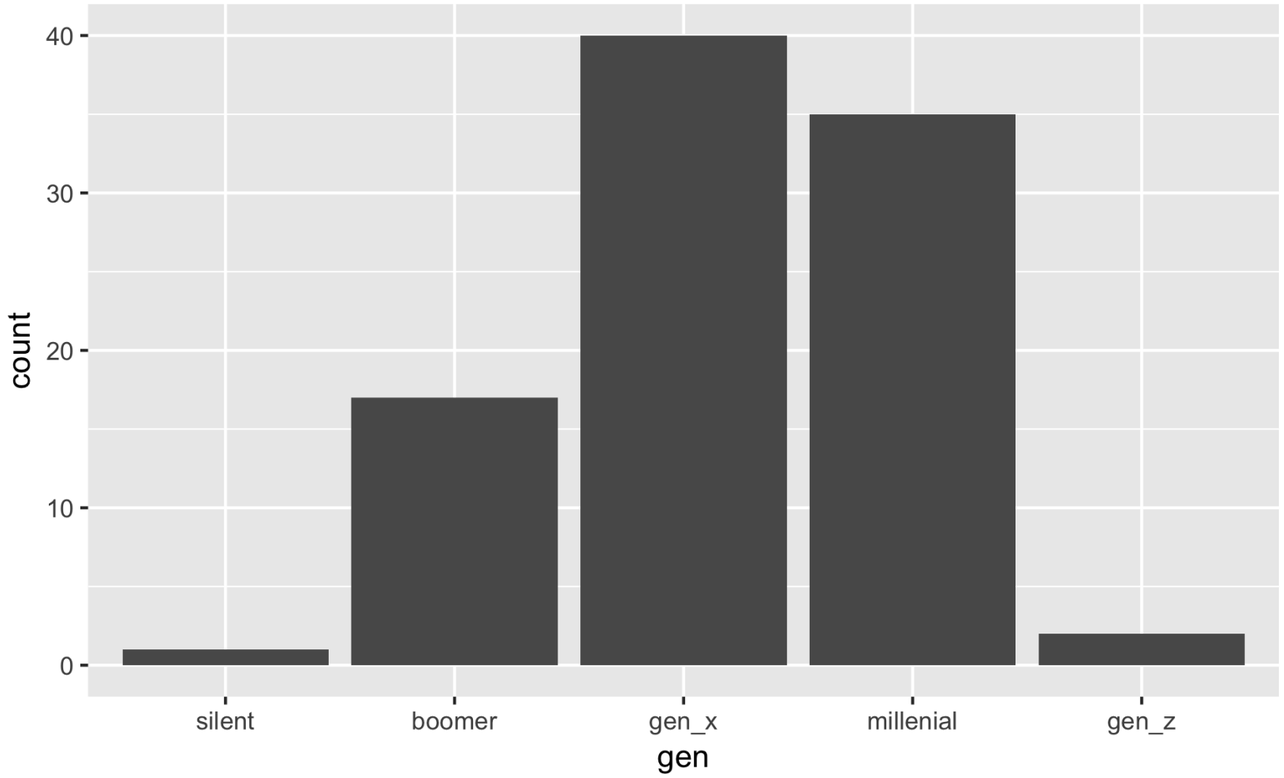
[1] http://www.pewresearch.org/topics/generations-and-age/

Reorder by hand

```
bakers <- bakers %>%
    mutate(gen = fct_relevel(gen, "silent", "boomer",
                             "gen_x", "millenial", "gen_z"))

bakers %>%
  dplyr::pull(gen) %>%
  levels()
[1] "silent"    "boomer"    "gen_x"     "millenial" "gen_z"
```

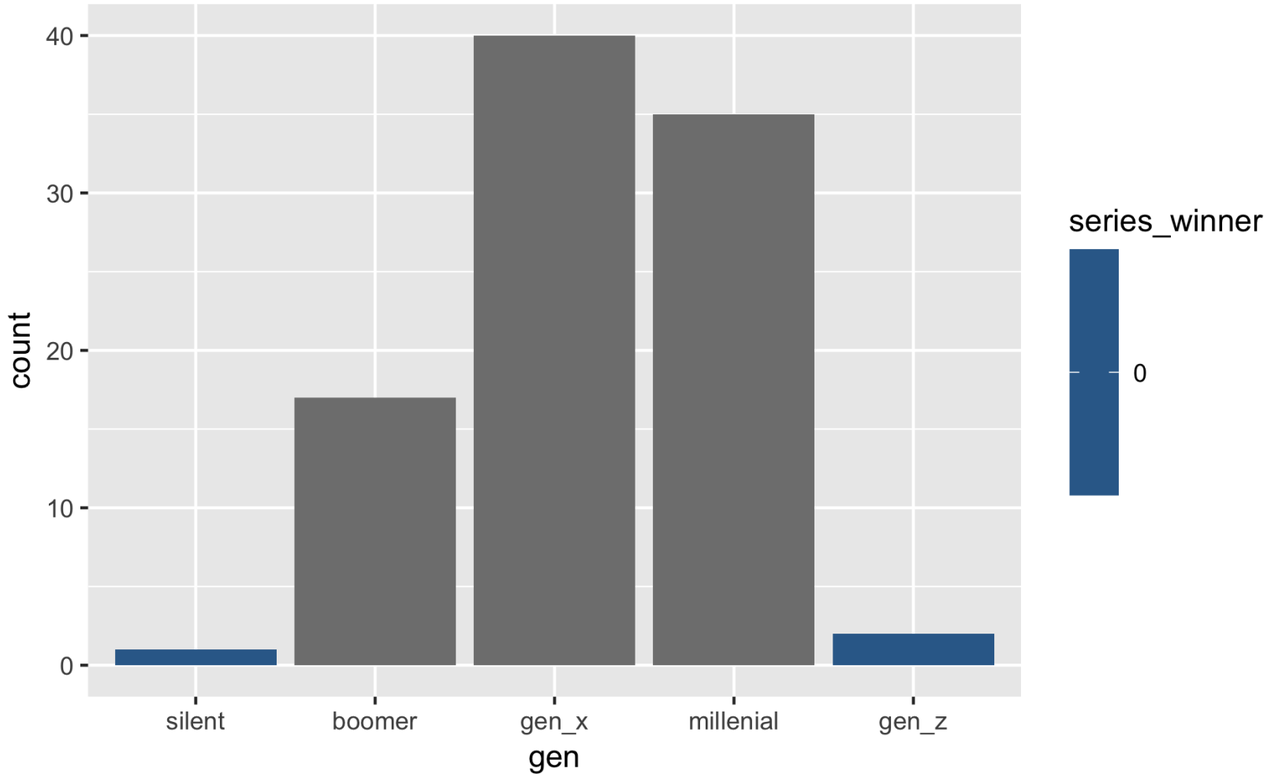
Reorder generations chronologically

```
bakers <- bakers %>%
    mutate(gen = fct_relevel(gen, "silent", "boomer",
                             "gen_x", "millenial", "gen_z"))

ggplot(bakers, aes(x = gen)) + geom_bar()
```



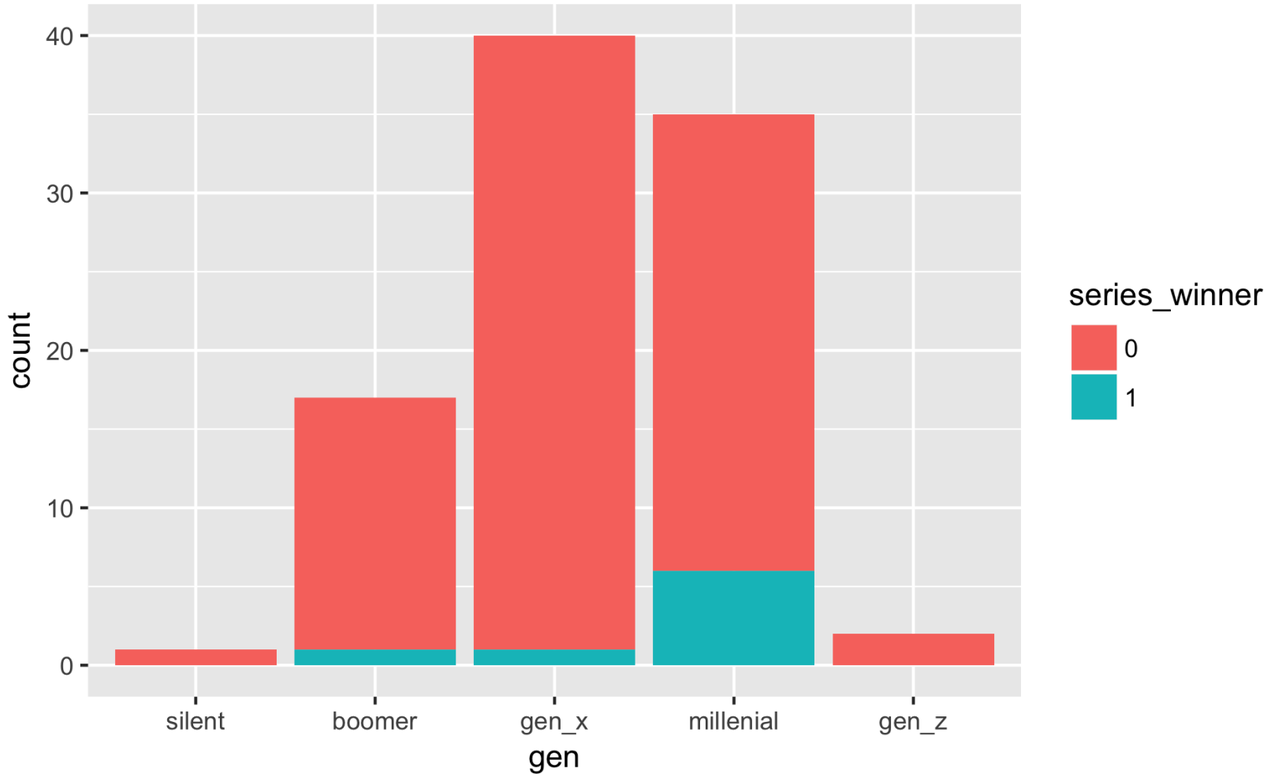
Fill fail

```
ggplot(bakers, aes(x = gen, fill = series_winner)) +
    geom_bar()
```



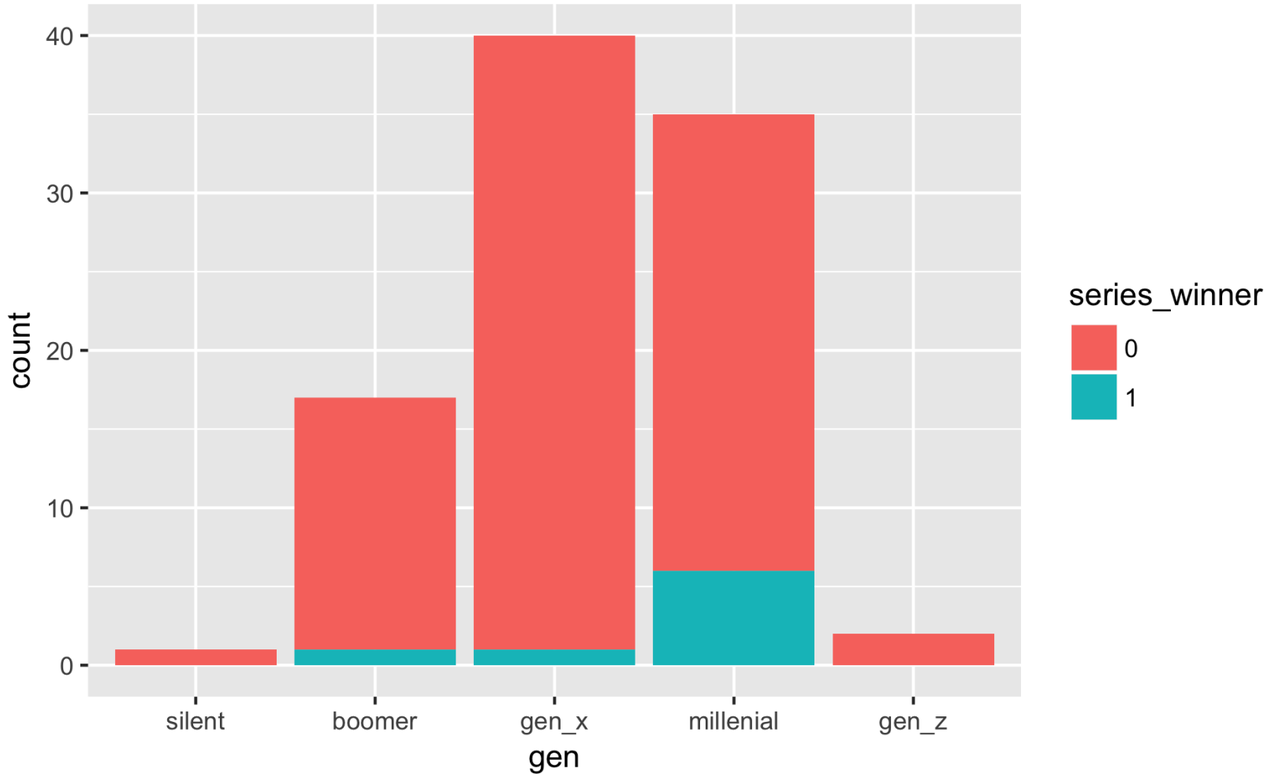
Fill win!

```
bakers <- bakers %>%
    mutate(series_winner = as.factor(series_winner))

ggplot(bakers, aes(x = gen, fill = series_winner)) + geom_bar()
```



Fill win!

```
ggplot(bakers, aes(x = gen, fill = as.factor(series_winner))) +
    geom_bar()
```



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Let's practice!

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Dates

Alison Hill
Professor & Data Scientist

The lubridate package

```
library(lubridate) # once per work session
```

[1] http://lubridate.tidyverse.org

Cast character as a date

```
?ymd
```

```
ymd(..., quiet = FALSE, tz = NULL, locale = Sys.getlocale("LC_TIME"),
  truncated = 0)

ydm(..., quiet = FALSE, tz = NULL, locale = Sys.getlocale("LC_TIME"),
  truncated = 0)

mdy(..., quiet = FALSE, tz = NULL, locale = Sys.getlocale("LC_TIME"),
  truncated = 0)

myd(..., quiet = FALSE, tz = NULL, locale = Sys.getlocale("LC_TIME"),
  truncated = 0)

dmy(..., quiet = FALSE, tz = NULL, locale = Sys.getlocale("LC_TIME"),
  truncated = 0)

dym(..., quiet = FALSE, tz = NULL, locale = Sys.getlocale("LC_TIME"),
  truncated = 0)
```

ymd: Arguments

```
?ymd
```

Arguments

...	a character or numeric vector of suspected dates

Examples

```
ymd("2010-08-17")
mdy(c("08/17/2010", "January 01, 2018"))
dmy("17 08 2010")
```

Parse Dates

```
dmy("17 August 2010") # does this work?
[1] "2010-08-17"

mdy("17 August 2010") # what about this?
[1] NA
Warning message:
All formats failed to parse. No formats found.

ymd("17 August 2010") # what about this?
[1] NA
Warning message:
All formats failed to parse. No formats found.
```

Dates in a data frame

```
hosts <- tibble::tribble(
  ~host, ~bday, ~premiere,
  "Mary", "24 March 1935", "August 17th, 2010",
  "Paul", "1 March 1966", "August 17th, 2010")

hosts

# A tibble: 2 x 3
  host  bday          premiere
  <chr> <chr>         <chr>
1 Mary  24 March 1935 August 17th, 2010
2 Paul  1 March 1966  August 17th, 2010
```

Cast as dates

```
hosts

# A tibble: 2 x 3
  host  bday          premiere
  <chr> <chr>         <chr>
1 Mary  24 March 1935 August 17th, 2010
2 Paul  1 March 1966  August 17th, 2010

hosts <- hosts %>%
  mutate(bday = dmy(bday),
         premiere = mdy(premiere))

hosts

# A tibble: 2 x 3
  host  bday       premiere
  <chr> <date>     <date>
1 Mary  1935-03-24 2010-08-17
2 Paul  1966-03-01 2010-08-17
```

Types of timespans

- `interval`: time spans bound by two real date-times.
- `duration`: the exact number of seconds in an interval.
- `period`: the change in the clock time in an interval.

[1] Lubridate Reference Manual (http://lubridate.tidyverse.org/reference/timespan.html)

Calculating an interval

```
hosts <- hosts %>%
  mutate(age_int = interval(bday, premiere))

hosts

# A tibble: 2 x 4
  host  bday       premiere   age_int
  <chr> <date>     <date>     <S4: Interval>
1 Mary  1935-03-24 2010-08-17 1935-03-24 UTC--2010-08-17 UTC
2 Paul  1966-03-01 2010-08-17 1966-03-01 UTC--2010-08-17 UTC
```

Converting units of timespans

```
years(1)
[1] "1y 0m 0d 0H 0M 0S"

hosts %>%
  mutate(years_decimal = age_int / years(1),
         years_whole = age_int %/% years(1))
# A tibble: 2 x 4
  host  age_int                       years_decimal years_whole
  <chr> <S4: Interval>                        <dbl>       <dbl>
1 Mary  1935-03-24 UTC--2010-08-17 UTC         75.4         75.
2 Paul  1966-03-01 UTC--2010-08-17 UTC         44.5         44.
```

Converting units of timespans

```
hosts %>%
  mutate(age_y = age_int %/% years(1),
         age_m = age_int %/% months(12))

# A tibble: 2 x 6
  host  bday       premiere   age_int                          age_y age_m
  <chr> <date>     <date>     <S4: Interval>                   <dbl> <dbl>
1 Mary  1935-03-24 2010-08-17 1935-03-24 UTC--2010-08-17 UTC   75.   75.
2 Paul  1966-03-01 2010-08-17 1966-03-01 UTC--2010-08-17 UTC   44.   44.
```

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Let's practice!

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Strings

Alison Hill
Professor & Data Scientist

String wrangling

```
series5
# A tibble: 7 x 3
  baker   about                           showstopper
  <chr>   <chr>                           <chr>
1 Chetna  35 years, Fashion designer      Fusion Tiered Pies
2 Luis    42 years, Graphic designer      Four Fruity Seasons Tower
3 Martha  17 years, Student               Three Little Pigs Pie
4 Nancy   60 years, Retired manager       Trio of Apple Pies
5 Richard 38 years, Builder               Three Course Autumn Pie Feast
6 Norman  66 years, Retired naval officer Pieful Tower
7 Kate    41 years, Furniture restorer    Rhubarb, Prune & Apple Pork Pies
```

tidyr::separate

```
series5 <- series5 %>%
  separate(about, into = c("age", "occupation"), sep = ", ")

series5
# A tibble: 7 x 4
  baker   age      occupation             showstopper
  <chr>   <chr>    <chr>                  <chr>
1 Chetna  35 years Fashion designer       Fusion Tiered Pies
2 Luis    42 years Graphic designer       Four Fruity Seasons Tower
3 Martha  17 years Student                Three Little Pigs Pie
4 Nancy   60 years Retired manager        Trio of Apple Pies
5 Richard 38 years Builder                Three Course Autumn Pie Feast
6 Norman  66 years Retired naval officer  Pieful Tower
7 Kate    41 years Furniture restorer     Rhubarb, Prune & Apple Pork Pies
```

readr::parse_number

```
series5 <- series5 %>%
  separate(about, into = c("age", "occupation"), sep = ", ") %>%
  mutate(age = parse_number(age))

series5
# A tibble: 7 x 4
  baker     age occupation            showstopper
  <chr>   <dbl> <chr>                 <chr>
1 Chetna     35. Fashion designer      Fusion Tiered Pies
2 Luis       42. Graphic designer      Four Fruity Seasons Tower
3 Martha     17. Student               Three Little Pigs Pie
4 Nancy      60. Retired manager       Trio of Apple Pies
5 Richard    38. Builder               Three Course Autumn Pie Feast
6 Norman     66. Retired naval officer Pieful Tower
7 Kate       41. Furniture restorer    Rhubarb, Prune & Apple Pork Pies
```

The stringr package

```
library(stringr) # once per work session
```

[1] http://stringr.tidyverse.org

String Basics

```
series5 <- series5 %>%
  mutate(baker = str_to_upper(baker),
         showstopper = str_to_lower(showstopper))
series5
# A tibble: 7 x 4
  baker     age occupation             showstopper
  <chr>   <dbl> <chr>                  <chr>
1 CHETNA     35. Fashion designer       fusion tiered pies
2 LUIS       42. Graphic designer       four fruity seasons tower
3 MARTHA     17. Student                three little pigs pie
4 NANCY      60. Retired manager        trio of apple pies
5 RICHARD    38. Builder                three course autumn pie feast
6 NORMAN     66. Retired naval officer  pieful tower
7 KATE       41. Furniture restorer     rhubarb, prune & apple pork pies
```

Detect String Patterns

```
series5 %>%
  mutate(pie = str_detect(showstopper, "pie"))

# A tibble: 7 x 5
  baker     age occupation            showstopper                       pie
  <chr>   <dbl> <chr>                 <chr>                             <lgl>
1 CHETNA     35. Fashion designer      fusion tiered pies                TRUE
2 LUIS       42. Graphic designer      four fruity seasons tower         FALSE
3 MARTHA     17. Student               three little pigs pie             TRUE
4 NANCY      60. Retired manager       trio of apple pies                TRUE
5 RICHARD    38. Builder               three course autumn pie feast     TRUE
6 NORMAN     66. Retired naval officer pieful tower                      TRUE
7 KATE       41. Furniture restorer    rhubarb, prune & apple pork pies  TRUE
```

Replace String Patterns

```
series5 %>%
  mutate(showstopper = str_replace(showstopper, "pie", "tart"))

# A tibble: 7 x 4
  baker     age occupation            showstopper
  <chr>   <dbl> <chr>                 <chr>
1 CHETNA     35. Fashion designer      fusion tiered tarts
2 LUIS       42. Graphic designer      four fruity seasons tower
3 MARTHA     17. Student               three little pigs tart
4 NANCY      60. Retired manager       trio of apple tarts
5 RICHARD    38. Builder               three course autumn tart feast
6 NORMAN     66. Retired naval officer tartful tower
7 KATE       41. Furniture restorer    rhubarb, prune & apple pork tarts
```

Remove String Patterns

```
series5 %>%
  mutate(showstopper = str_remove(showstopper, "pie"))

# A tibble: 7 x 4
  baker     age occupation            showstopper
  <chr>   <dbl> <chr>                 <chr>
1 CHETNA     35. Fashion designer      fusion tiered s
2 LUIS       42. Graphic designer      four fruity seasons tower
3 MARTHA     17. Student               "three little pigs "
4 NANCY      60. Retired manager       trio of apple s
5 RICHARD    38. Builder               three course autumn  feast
6 NORMAN     66. Retired naval officer ful tower
7 KATE       41. Furniture restorer    rhubarb, prune & apple pork s
```

Trim white space

```
series5 %>%
  mutate(showstopper = str_remove(showstopper, "pie"),
         showstopper = str_trim(showstopper))

# A tibble: 7 x 4
  baker     age occupation            showstopper
  <chr>   <dbl> <chr>                 <chr>
1 CHETNA     35. Fashion designer      fusion tiered s
2 LUIS       42. Graphic designer      four fruity seasons tower
3 MARTHA     17. Student               three little pigs
4 NANCY      60. Retired manager       trio of apple s
5 RICHARD    38. Builder               three course autumn  feast
6 NORMAN     66. Retired naval officer ful tower
7 KATE       41. Furniture restorer    rhubarb, prune & apple pork s
```

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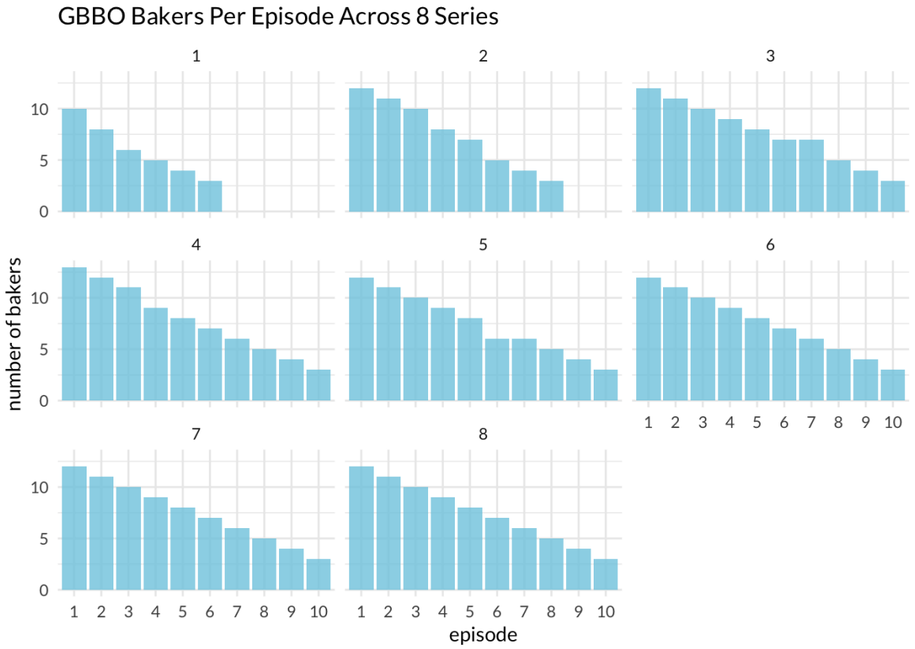
Final thoughts

Alison Hill
Professor & Data Scientist

Explore your data

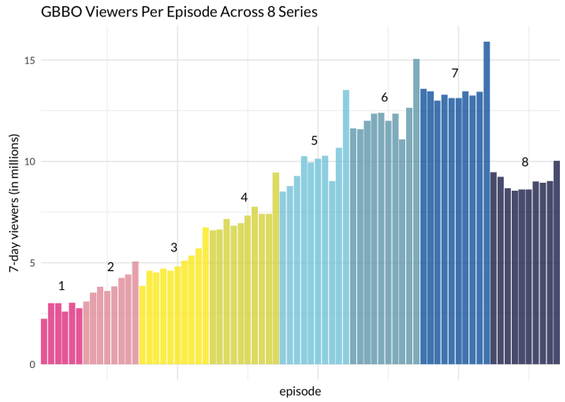
```
bakeoff <- read_csv("bakeoff.csv")

glimpse(bakeoff)

skim(bakeoff)

bakeoff %>%
  count(series, baker) %>%
  count(series)

ggplot(bakeoff, aes(episode)) +
    geom_bar() +
    facet_wrap(~series)

?read_csv
```

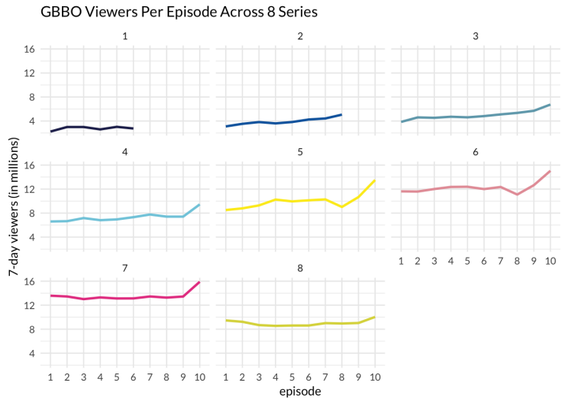


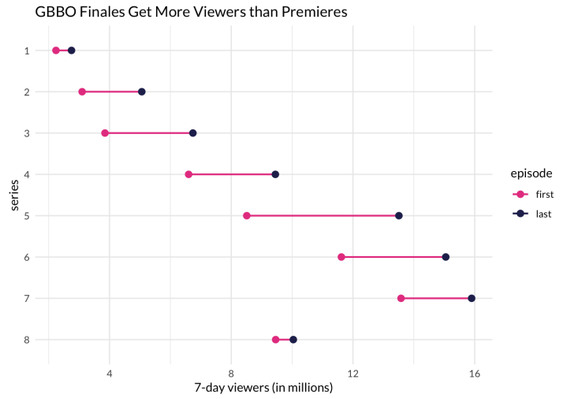
Tame your data

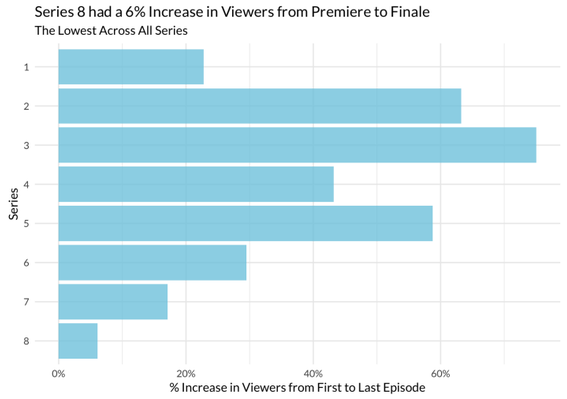
```
ratings <- read_csv("ratings.csv",
                    col_types = cols(
                      series = col_factor(levels = NULL))) %>%
           clean_names()
viewers_7day <- ratings %>%
  mutate(bbc = recode(channel, "Channel 4" = 0,
                      .default = 1)) %>%
  select(series, bbc, viewers_7day_ = ends_with("7day"))
```

Tidy your data









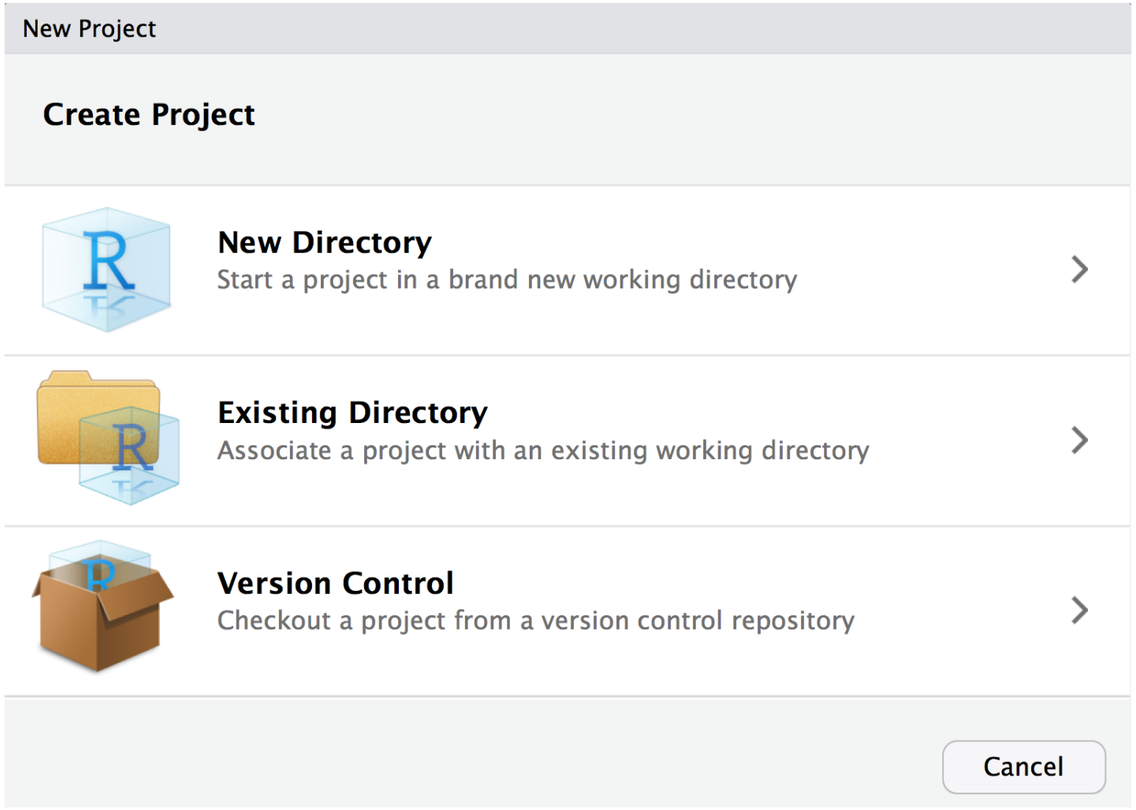
Transform your data

```
bakers <- bakers %>%
  mutate(gen = case_when(
    between(birth_year, 1928, 1945) ~ "silent",
    between(birth_year, 1946, 1964) ~ "boomer",
    between(birth_year, 1965, 1980) ~ "gen_x",
    between(birth_year, 1981, 1996) ~ "millenial",
    TRUE ~ "gen_z"
    ))

bakers <- bakers %>%
    mutate(gen = fct_relevel(gen, "silent", "boomer",
                             "gen_x", "millenial", "gen_z"))

ggplot(bakers, aes(x = gen)) + geom_bar()

bakers <- bakers %>%
  mutate(last_date_appeared_us = dmy(last_date_appeared_us),
         occupation = str_to_lower(occupation),
         student = str_detect(occupation, "student"))
```

On your own

https://www.datacamp.com/courses/working-with-the-rstudio-ide-part-1

R Projects in RStudio



https://www.datacamp.com/courses/working-with-the-rstudio-ide-part-1

Project-oriented workflows

```
bakeoff
├── bakeoff.Rproj
├── data
│   └──  bakers.csv <-- this is my file!
└── figures
```

```
# install.packages("here")
library(here)
bakers <- read_csv(here("data", "bakers.csv"))
```

The `here` package: https://here.r-lib.org/

What's next?

What's next?


WORKING WITH
DATES AND TIMES


STRING
MANIPULATION
WITH STRINGR


QUALITATIVE DATA
IN THE TIDYVERSE

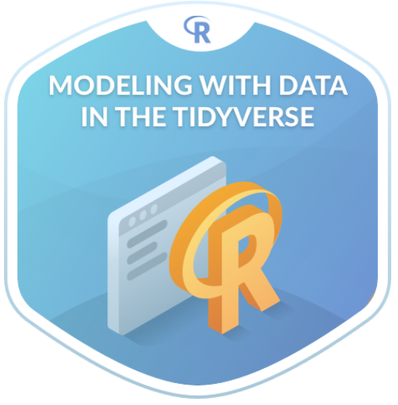

COMMUNICATING
WITH DATA IN THE
TIDYVERSE

What's next?


WORKING WITH
DATES AND TIMES


STRING
MANIPULATION
WITH STRINGR


QUALITATIVE DATA
IN THE TIDYVERSE


MODELING WITH DATA
IN THE TIDYVERSE

WORKING WITH DATA IN THE TIDYVERSE

Congratulations!