Manipulating Tables with dplyr (contd)

Data Wrangling: Session 3

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Window functions and moving averages

Load our libraries

```r
library(here)      # manage file paths
library(socviz)    # data and some useful functions
library(tidyverse) # your friend and mine
```

dplyr's window functions

Ranking and cumulation within groups.

```r
## Data on COVID-19
library(covdata)

covnat_weekly
```

```
## # A tibble: 4,020 × 11
##    date       year_week cname  iso3      pop cases deaths cu_ca…¹ cu_de…² r14_c…³
##    <date>     <chr>     <chr>  <chr>   <dbl> <dbl>  <dbl>   <dbl>   <dbl>   <dbl>
##  1 2019-12-30 2020-01   Austr… AUT    8.93e6     0      0       0       0  NA    
##  2 2020-01-06 2020-02   Austr… AUT    8.93e6     0      0       0       0   0    
##  3 2020-01-13 2020-03   Austr… AUT    8.93e6     0      0       0       0   0    
##  4 2020-01-20 2020-04   Austr… AUT    8.93e6     0      0       0       0   0    
##  5 2020-01-27 2020-05   Austr… AUT    8.93e6     0      0       0       0   0    
##  6 2020-02-03 2020-06   Austr… AUT    8.93e6     0      0       0       0   0    
##  7 2020-02-10 2020-07   Austr… AUT    8.93e6     0      0       0       0   0    
##  8 2020-02-17 2020-08   Austr… AUT    8.93e6     0      0       0       0   0    
##  9 2020-02-24 2020-09   Austr… AUT    8.93e6    12      0      12       0   0.134
## 10 2020-03-02 2020-10   Austr… AUT    8.93e6   114      0     126       0   1.41 
## # … with 4,010 more rows, 1 more variable: r14_deaths <dbl>, and abbreviated
## #   variable names ¹cu_cases, ²cu_deaths, ³r14_cases
```

dplyr's **window** functions

cumsum() gives cumulative sums

```r
covnat_weekly |>
  filter(iso3 == "USA") |>
  select(date, cname, iso3, cases) |>
  mutate(cumulative = cumsum(cases))
```

```
## # A tibble: 0 × 5
## # … with 5 variables: date <date>, cname <chr>, iso3 <chr>, cases <dbl>,
## #   cumulative <dbl>
```

dplyr's window functions

`cume_dist()` gives the proportion of values less than or equal to the current value.

```r
covnat_weekly |>
  select(date, cname, iso3, deaths) |>
  filter(iso3 == "USA") |>
  filter(cume_dist(desc(deaths)) < 0.1) # i.e. Top 10%
```

```
## # A tibble: 0 × 4
## # … with 4 variables: date <date>, cname <chr>, iso3 <chr>, deaths <dbl>
```

The `dplyr` vignette on Window functions is good.

An application

```r
covus |>
  filter(measure == "death") |>
  group_by(state) |>
  arrange(state, desc(date)) |>
  filter(state %in% "NY")
```

```
## # A tibble: 371 × 7
## # Groups:   state [1]
##    date       state fips  data_quality_grade measure count measure_label
##    <date>     <chr> <chr> <lgl>              <chr>   <dbl> <chr>        
##  1 2021-03-07 NY    36    NA                 death   39029 Deaths       
##  2 2021-03-06 NY    36    NA                 death   38970 Deaths       
##  3 2021-03-05 NY    36    NA                 death   38891 Deaths       
##  4 2021-03-04 NY    36    NA                 death   38796 Deaths       
##  5 2021-03-03 NY    36    NA                 death   38735 Deaths       
##  6 2021-03-02 NY    36    NA                 death   38660 Deaths       
##  7 2021-03-01 NY    36    NA                 death   38577 Deaths       
##  8 2021-02-28 NY    36    NA                 death   38497 Deaths       
##  9 2021-02-27 NY    36    NA                 death   38407 Deaths       
## 10 2021-02-26 NY    36    NA                 death   38321 Deaths       
## # … with 361 more rows
```

Here the `count` measure is *cumulative* deaths. What if we want to recover the daily count for all the states in the data?

An application

`dplyr` has **`lead()`** and **`lag()`** functions. These allow you to access the previous and next values in a vector. You can calculate offsets this way.

```
my_vec <- c(1:20)
my_vec
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
```

```
lag(my_vec) # first element has no lag
```

```
##  [1] NA  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19
```

```
my_vec - lag(my_vec)
```

```
##  [1] NA  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1  1
```

An application

We can write the expression directly:

```r
covus |>
  select(-data_quality_grade) |>
  filter(measure == "death") |>
  group_by(state) |>
  arrange(date) |>
  mutate(deaths_daily = count - lag(count, order_by = date)) |>
  arrange(state, desc(date)) |>
  filter(state %in% "NY")
```

```
## # A tibble: 371 × 7
## # Groups:   state [1]
##    date       state fips  measure count measure_label deaths_daily
##    <date>     <chr> <chr> <chr>   <dbl> <chr>                <dbl>
##  1 2021-03-07 NY    36    death   39029 Deaths                  59
##  2 2021-03-06 NY    36    death   38970 Deaths                  79
##  3 2021-03-05 NY    36    death   38891 Deaths                  95
##  4 2021-03-04 NY    36    death   38796 Deaths                  61
##  5 2021-03-03 NY    36    death   38735 Deaths                  75
##  6 2021-03-02 NY    36    death   38660 Deaths                  83
##  7 2021-03-01 NY    36    death   38577 Deaths                  80
##  8 2021-02-28 NY    36    death   38497 Deaths                  90
##  9 2021-02-27 NY    36    death   38407 Deaths                  86
## 10 2021-02-26 NY    36    death   38321 Deaths                  94
## # … with 361 more rows
```

Writing our own functions

But we could also write a function to do this.

We write functions using the special `function()` function.*

```r
my_fun <- function(x) {
  x + 1
}

my_fun # we've created the function; it's just an object
```

```
## function(x) {
##   x + 1
## }
```

```r
my_fun(x = 1) # But we can supply it with an input!
```

```
## [1] 2
```

```r
my_fun(10)
```

```
## [1] 11
```

*Nerds love this sort of stuff.

Writing our own functions

We write our function. It's just the expression we originally wrote, wrapped up.

```r
get_daily_count <- function(count, date){
  count - lag(count, order_by = date)
}
```

This function has no generality, error-handling, or anything else. It's a once-off.

Writing our own functions

Now we can use it like any other:

```
covus |>
  filter(measure == "death") |>
  select(-data_quality_grade) |>
  group_by(state) |>
  arrange(date) |>
  mutate(deaths_daily = get_daily_count(count, date)) |>
  arrange(state, desc(date)) |>
  filter(state %in% "NY")
```

```
## # A tibble: 371 × 7
## # Groups:   state [1]
##    date       state fips  measure count measure_label deaths_daily
##    <date>     <chr> <chr> <chr>   <dbl> <chr>                <dbl>
##  1 2021-03-07 NY    36    death   39029 Deaths                  59
##  2 2021-03-06 NY    36    death   38970 Deaths                  79
##  3 2021-03-05 NY    36    death   38891 Deaths                  95
##  4 2021-03-04 NY    36    death   38796 Deaths                  61
##  5 2021-03-03 NY    36    death   38735 Deaths                  75
##  6 2021-03-02 NY    36    death   38660 Deaths                  83
##  7 2021-03-01 NY    36    death   38577 Deaths                  80
##  8 2021-02-28 NY    36    death   38497 Deaths                  90
##  9 2021-02-27 NY    36    death   38407 Deaths                  86
## 10 2021-02-26 NY    36    death   38321 Deaths                  94
## # … with 361 more rows
```

Not super-useful quite yet, but if our task had more steps …

Tidy moving averages with `slider`

`dplyr`'s window functions don't include moving averages.

There are several options, notably `RcppRoll`

We'll use the `slider` package.

```r
# install.packages("slider")
library(slider)
```

Tidy moving averages with `slider`

```r
covus |>
  filter(measure == "death") |>
  select(-data_quality_grade) |>
  group_by(state) |>
  arrange(date) |>
  mutate(
    deaths_daily = get_daily_count(count, date),
    deaths7 = slide_mean(deaths_daily,
                         before = 7,
                         na_rm = TRUE)) |>
  arrange(state, desc(date)) |>
  filter(state %in% "NY")
```

```
## # A tibble: 371 × 8
## # Groups:   state [1]
##    date       state fips  measure count measure_label deaths_daily deaths7
##    <date>     <chr> <chr> <chr>   <dbl> <chr>                <dbl>   <dbl>
##  1 2021-03-07 NY    36    death   39029 Deaths                  59    77.8
##  2 2021-03-06 NY    36    death   38970 Deaths                  79    81.1
##  3 2021-03-05 NY    36    death   38891 Deaths                  95    83  
##  4 2021-03-04 NY    36    death   38796 Deaths                  61    82.6
##  5 2021-03-03 NY    36    death   38735 Deaths                  75    88  
##  6 2021-03-02 NY    36    death   38660 Deaths                  83    89.9
##  7 2021-03-01 NY    36    death   38577 Deaths                  80    90.8
##  8 2021-02-28 NY    36    death   38497 Deaths                  90    90.1
##  9 2021-02-27 NY    36    death   38407 Deaths                  86    91.5
## 10 2021-02-26 NY    36    death   38321 Deaths                  94    95.6
## # … with 361 more rows
```

Tidy moving averages with `slider`

```
    deaths7 = slide_mean(deaths_daily,
                         before = 7,
                         na_rm = TRUE)) |>
```

Notice the Tidyverse-style `na_rm` argument rather than the usual base `na.rm`

The package provides a lot of different functions, from general-purpose **`slide_max()`**, **`slide_min()`** to more specialized sliding functions. In particular note e.g. **`slide_index_mean()`** that addresses some subtleties in averaging over dates with gaps.

Tidy up after yourself with `relocate()`

```r
gss_sm
```

```
## # A tibble: 2,867 × 32
##     year    id ballot   age childs sibs  degree race  sex   region incom…¹ relig
##    <dbl> <dbl> <labe> <dbl>  <dbl> <lab> <fct>  <fct> <fct> <fct>  <fct>   <fct>
##  1  2016     1 1         47      3 2     Bache… White Male  New E… $17000… None
##  2  2016     2 2         61      0 3     High … White Male  New E… $50000… None
##  3  2016     3 3         72      2 3     Bache… White Male  New E… $75000… Cath…
##  4  2016     4 1         43      4 3     High … White Fema… New E… $17000… Cath…
##  5  2016     5 3         55      2 2     Gradu… White Fema… New E… $17000… None
##  6  2016     6 2         53      2 2     Junio… White Fema… New E… $60000… None
##  7  2016     7 1         50      2 2     High … White Male  New E… $17000… None
##  8  2016     8 3         23      3 6     High … Other Fema… Middl… $30000… Cath…
##  9  2016     9 1         45      3 5     High … Black Male  Middl… $60000… Prot…
## 10  2016    10 3         71      4 1     Junio… White Male  Middl… $60000… None
## # … with 2,857 more rows, 20 more variables: marital <fct>, padeg <fct>,
## #   madeg <fct>, partyid <fct>, polviews <fct>, happy <fct>, partners <fct>,
## #   grass <fct>, zodiac <fct>, pres12 <labelled>, wtssall <dbl>,
## #   income_rc <fct>, agegrp <fct>, ageq <fct>, siblings <fct>, kids <fct>,
## #   religion <fct>, bigregion <fct>, partners_rc <fct>, obama <dbl>, and
## #   abbreviated variable name ¹income16
```

Shuffle columns around

```r
gss_sm
```

```
## # A tibble: 2,867 × 32
##     year    id ballot   age childs sibs  degree race  sex   region incom…¹ relig
##    <dbl> <dbl> <labe> <dbl>  <dbl> <lab> <fct>  <fct> <fct> <fct>  <fct>   <fct>
##  1  2016     1 1         47      3 2     Bache… White Male  New E… $17000… None
##  2  2016     2 2         61      0 3     High … White Male  New E… $50000… None
##  3  2016     3 3         72      2 3     Bache… White Male  New E… $75000… Cath…
##  4  2016     4 1         43      4 3     High … White Fema… New E… $17000… Cath…
##  5  2016     5 3         55      2 2     Gradu… White Fema… New E… $17000… None
##  6  2016     6 2         53      2 2     Junio… White Fema… New E… $60000… None
##  7  2016     7 1         50      2 2     High … White Male  New E… $17000… None
##  8  2016     8 3         23      3 6     High … Other Fema… Middl… $30000… Cath…
##  9  2016     9 1         45      3 5     High … Black Male  Middl… $60000… Prot…
## 10  2016    10 3         71      4 1     Junio… White Male  Middl… $60000… None
## # … with 2,857 more rows, 20 more variables: marital <fct>, padeg <fct>,
## #   madeg <fct>, partyid <fct>, polviews <fct>, happy <fct>, partners <fct>,
## #   grass <fct>, zodiac <fct>, pres12 <labelled>, wtssall <dbl>,
## #   income_rc <fct>, agegrp <fct>, ageq <fct>, siblings <fct>, kids <fct>,
## #   religion <fct>, bigregion <fct>, partners_rc <fct>, obama <dbl>, and
## #   abbreviated variable name ¹income16
```

Shuffle columns around

```r
gss_sm |>
  select(region, bigregion, year,
         id:region,
         starts_with("p"),
         contains("income"))
```

```
## # A tibble: 2,867 × 19
##    region bigre…¹  year    id ballot   age childs sibs  degree race  sex   padeg
##    <fct>  <fct>   <dbl> <dbl> <labe> <dbl>  <dbl> <lab> <fct>  <fct> <fct> <fct>
##  1 New E… Northe…  2016     1 1         47      3 2     Bache… White Male  Grad…
##  2 New E… Northe…  2016     2 2         61      0 3     High … White Male  Lt H…
##  3 New E… Northe…  2016     3 3         72      2 3     Bache… White Male  High…
##  4 New E… Northe…  2016     4 1         43      4 3     High … White Fema… <NA>
##  5 New E… Northe…  2016     5 3         55      2 2     Gradu… White Fema… Bach…
##  6 New E… Northe…  2016     6 2         53      2 2     Junio… White Fema… <NA>
##  7 New E… Northe…  2016     7 1         50      2 2     High … White Male  High…
##  8 Middl… Northe…  2016     8 3         23      3 6     High … Other Fema… Lt H…
##  9 Middl… Northe…  2016     9 1         45      3 5     High … Black Male  Lt H…
## 10 Middl… Northe…  2016    10 3         71      4 1     Junio… White Male  High…
## # … with 2,857 more rows, 7 more variables: partyid <fct>, polviews <fct>,
## #   partners <fct>, pres12 <labelled>, partners_rc <fct>, income16 <fct>,
## #   income_rc <fct>, and abbreviated variable name ¹bigregion
```

Shuffle columns around

```
gss_sm |>
  select(region, bigregion, year,
         id:region,
         starts_with("p"),
         contains("income")) |>
  rename(children = childs,
         siblings = sibs)
```

```
## # A tibble: 2,867 × 19
##    region     bigre…¹  year    id ballot    age child…² sibli…³ degree race  sex
##    <fct>      <fct>   <dbl> <dbl> <labe> <dbl>   <dbl> <label> <fct>  <fct> <fct>
##  1 New Engl… Northe…  2016     1 1         47       3 2       Bache… White Male
##  2 New Engl… Northe…  2016     2 2         61       0 3       High … White Male
##  3 New Engl… Northe…  2016     3 3         72       2 3       Bache… White Male
##  4 New Engl… Northe…  2016     4 1         43       4 3       High … White Fema…
##  5 New Engl… Northe…  2016     5 3         55       2 2       Gradu… White Fema…
##  6 New Engl… Northe…  2016     6 2         53       2 2       Junio… White Fema…
##  7 New Engl… Northe…  2016     7 1         50       2 2       High … White Male
##  8 Middle A… Northe…  2016     8 3         23       3 6       High … Other Fema…
##  9 Middle A… Northe…  2016     9 1         45       3 5       High … Black Male
## 10 Middle A… Northe…  2016    10 3         71       4 1       Junio… White Male
## # … with 2,857 more rows, 8 more variables: padeg <fct>, partyid <fct>,
## #   polviews <fct>, partners <fct>, pres12 <labelled>, partners_rc <fct>,
## #   income16 <fct>, income_rc <fct>, and abbreviated variable names ¹bigregion,
## #   ²children, ³siblings
```

Shuffle columns around

```r
gss_sm |>
  select(region, bigregion, year,
         id:region,
         starts_with("p"),
         contains("income")) |>
  rename(children = childs,
         siblings = sibs) |>
  relocate(id)
```

```
## # A tibble: 2,867 × 19
##       id region     bigre…¹  year ballot   age child…² sibli…³ degree race  sex
##    <dbl> <fct>      <fct>   <dbl> <labe> <dbl>   <dbl> <label> <fct>  <fct> <fct>
##  1     1 New Engl… Northe…  2016 1         47       3 2       Bache… White Male
##  2     2 New Engl… Northe…  2016 2         61       0 3       High … White Male
##  3     3 New Engl… Northe…  2016 3         72       2 3       Bache… White Male
##  4     4 New Engl… Northe…  2016 1         43       4 3       High … White Fema…
##  5     5 New Engl… Northe…  2016 3         55       2 2       Gradu… White Fema…
##  6     6 New Engl… Northe…  2016 2         53       2 2       Junio… White Fema…
##  7     7 New Engl… Northe…  2016 1         50       2 2       High … White Male
##  8     8 Middle A… Northe…  2016 3         23       3 6       High … Other Fema…
##  9     9 Middle A… Northe…  2016 1         45       3 5       High … Black Male
## 10    10 Middle A… Northe…  2016 3         71       4 1       Junio… White Male
## # … with 2,857 more rows, 8 more variables: padeg <fct>, partyid <fct>,
## #   polviews <fct>, partners <fct>, pres12 <labelled>, partners_rc <fct>,
## #   income16 <fct>, income_rc <fct>, and abbreviated variable names ¹bigregion,
## #   ²children, ³siblings
```

Shuffle columns around

```r
gss_sm |>
  select(region, bigregion, year,
         id:region,
         starts_with("p"),
         contains("income")) |>
  rename(children = childs,
         siblings = sibs) |>
  relocate(id) |>
  select(-ballot)
```

```
## # A tibble: 2,867 × 18
##       id region     bigre…¹  year   age child…² sibli…³ degree race  sex   padeg
##    <dbl> <fct>      <fct>   <dbl> <dbl>   <dbl> <label> <fct>  <fct> <fct> <fct>
##  1     1 New Engla… Northe…  2016    47       3 2       Bache… White Male  Grad…
##  2     2 New Engla… Northe…  2016    61       0 3       High … White Male  Lt H…
##  3     3 New Engla… Northe…  2016    72       2 3       Bache… White Male  High…
##  4     4 New Engla… Northe…  2016    43       4 3       High … White Fema… <NA>
##  5     5 New Engla… Northe…  2016    55       2 2       Gradu… White Fema… Bach…
##  6     6 New Engla… Northe…  2016    53       2 2       Junio… White Fema… <NA>
##  7     7 New Engla… Northe…  2016    50       2 2       High … White Male  High…
##  8     8 Middle At… Northe…  2016    23       3 6       High … Other Fema… Lt H…
##  9     9 Middle At… Northe…  2016    45       3 5       High … Black Male  Lt H…
## 10    10 Middle At… Northe…  2016    71       4 1       Junio… White Male  High…
## # … with 2,857 more rows, 7 more variables: partyid <fct>, polviews <fct>,
## #   partners <fct>, pres12 <labelled>, partners_rc <fct>, income16 <fct>,
## #   income_rc <fct>, and abbreviated variable names ¹bigregion, ²children,
## #   ³siblings
```

Shuffle columns around

```r
gss_sm |>
  select(region, bigregion, year,
         id:region,
         starts_with("p"),
         contains("income")) |>
  rename(children = childs,
         siblings = sibs) |>
  relocate(id) |>
  select(-ballot) |>
  relocate(where(is.numeric),
           .before = where(is.factor))
```

```
## # A tibble: 2,867 × 18
##       id  year   age children siblings  pres12 region bigre…¹ degree race  sex
##    <dbl> <dbl> <dbl>    <dbl> <labelle> <labe> <fct>  <fct>   <fct>  <fct> <fct>
##  1     1  2016    47        3 2          3      New E… Northe… Bache… White Male
##  2     2  2016    61        0 3          1      New E… Northe… High … White Male
##  3     3  2016    72        2 3          2      New E… Northe… Bache… White Male
##  4     4  2016    43        4 3          2      New E… Northe… High … White Fema…
##  5     5  2016    55        2 2          1      New E… Northe… Gradu… White Fema…
##  6     6  2016    53        2 2          1      New E… Northe… Junio… White Fema…
##  7     7  2016    50        2 2         NA      New E… Northe… High … White Male
##  8     8  2016    23        3 6         NA      Middl… Northe… High … Other Fema…
##  9     9  2016    45        3 5         NA      Middl… Northe… High … Black Male
## 10    10  2016    71        4 1          2      Middl… Northe… Junio… White Male
## # … with 2,857 more rows, 7 more variables: padeg <fct>, partyid <fct>,
## #   polviews <fct>, partners <fct>, partners_rc <fct>, income16 <fct>,
## #   income_rc <fct>, and abbreviated variable name ¹bigregion
```

Shuffle columns around

```r
gss_sm |>
  select(region, bigregion, year,
         id:region,
         starts_with("p"),
         contains("income")) |>
  rename(children = childs,
         siblings = sibs) |>
  relocate(id) |>
  select(-ballot) |>
  relocate(where(is.numeric),
           .before = where(is.factor)) |>
  relocate(contains("region"),
           .after = year)
```

```
## # A tibble: 2,867 × 18
##       id  year region     bigre…¹   age child…² sibli…³ pres12 degree race  sex
##    <dbl> <dbl> <fct>      <fct>   <dbl>   <dbl> <label> <labe> <fct>  <fct> <fct>
##  1     1  2016 New Engl… Northe…    47       3 2            3 Bache… White Male
##  2     2  2016 New Engl… Northe…    61       0 3            1 High … White Male
##  3     3  2016 New Engl… Northe…    72       2 3            2 Bache… White Male
##  4     4  2016 New Engl… Northe…    43       4 3            2 High … White Fema…
##  5     5  2016 New Engl… Northe…    55       2 2            1 Gradu… White Fema…
##  6     6  2016 New Engl… Northe…    53       2 2            1 Junio… White Fema…
##  7     7  2016 New Engl… Northe…    50       2 2           NA High … White Male
##  8     8  2016 Middle A… Northe…    23       3 6           NA High … Other Fema…
##  9     9  2016 Middle A… Northe…    45       3 5           NA High … Black Male
## 10    10  2016 Middle A… Northe…    71       4 1            2 Junio… White Male
## # … with 2,857 more rows, 7 more variables: padeg <fct>, partyid <fct>,
## #   polviews <fct>, partners <fct>, partners_rc <fct>, income16 <fct>,
## #   income_rc <fct>, and abbreviated variable names ¹bigregion, ²children,
## #   ³siblings
```

Recapping the Office Hour

```r
library(ukelection2019)

ukvote2019
```

```
## # A tibble: 3,320 × 13
##    cid       const…¹ elect…² party…³ candi…⁴ votes vote_…⁵ vote_…⁶ total…⁷ vrank
##    <chr>     <chr>     <int> <chr>   <chr>   <int>   <dbl>   <dbl>   <int> <int>
##  1 W07000049 Aberav…   50747 Labour  Stephe… 17008    53.8   -14.3   31598     1
##  2 W07000049 Aberav…   50747 Conser… Charlo…  6518    20.6     2.9   31598     2
##  3 W07000049 Aberav…   50747 The Br… Glenda…  3108     9.8     9.8   31598     3
##  4 W07000049 Aberav…   50747 Plaid … Nigel …  2711     8.6     0.3   31598     4
##  5 W07000049 Aberav…   50747 Libera… Sheila…  1072     3.4     1.6   31598     5
##  6 W07000049 Aberav…   50747 Indepe… Captai…   731     2.3     2.3   31598     6
##  7 W07000049 Aberav…   50747 Green   Giorgi…   450     1.4     1.4   31598     7
##  8 W07000058 Aberco…   44699 Conser… Robin … 14687    46.1     1.5   31865     1
##  9 W07000058 Aberco…   44699 Labour  Emily … 12653    39.7    -2.9   31865     2
## 10 W07000058 Aberco…   44699 Plaid … Lisa G…  2704     8.5    -1.4   31865     3
## # … with 3,310 more rows, 3 more variables: turnout <dbl>, fname <chr>,
## #   lname <chr>, and abbreviated variable names ¹constituency, ²electorate,
## #   ³party_name, ⁴candidate, ⁵vote_share_percent, ⁶vote_share_change,
## #   ⁷total_votes_cast
```

Recapping the Office Hour

Use `sample_n()` to sample n rows of your tibble.

```r
library(ukelection2019)

ukvote2019 |>
  sample_n(10)
```

```
## # A tibble: 10 × 13
##    cid       const…¹ elect…² party…³ candi…⁴ votes vote_…⁵ vote_…⁶ total…⁷ vrank
##    <chr>     <chr>     <int> <chr>   <chr>   <int>   <dbl>   <dbl>   <int> <int>
##  1 E14000780 Leeds …   67741 Conser… Stewar… 13222    26.8     7.2   49283     2
##  2 S14000056 Ruther…   80918 Scotti… Margar… 23775    44.2     7.2   53794     1
##  3 N06000016 Strang…   66928 Sinn F… Ryan C…   555     1.5    -1.3   37485     7
##  4 E14000896 Richmo…   82696 Labour  Sandra…  3407     5.2    -3.9   65067     3
##  5 E14000794 Liverp…   62628 Conser… Alex P…  4018     9.9     1.3   40786     2
##  6 E14000728 Harbor…   80480 Libera… Zuffar…  9103    15.9     3.2   57319     3
##  7 E14000744 Hertfo…   82407 Indepe… Brian …   308     0.5     0.5   60094     6
##  8 E14000800 Luton …   68185 The Br… Sudhir…  1215     2.9     2.9   42589     4
##  9 W07000066 Carmar…   58629 Labour  Marc T… 14438    34.3    -5.2   42114     2
## 10 E14000907 Runnym…   77196 Conser… Ben Sp… 29262    54.9    -6     53289     1
## # … with 3 more variables: turnout <dbl>, fname <chr>, lname <chr>, and
## #   abbreviated variable names ¹constituency, ²electorate, ³party_name,
## #   ⁴candidate, ⁵vote_share_percent, ⁶vote_share_change, ⁷total_votes_cast
```

Recapping the Office Hour

A vector of unique constituency names

```r
ukvote2019 |>
  distinct(constituency)
```

```
## # A tibble: 650 × 1
##    constituency
##    <chr>
##  1 Aberavon
##  2 Aberconwy
##  3 Aberdeen North
##  4 Aberdeen South
##  5 Aberdeenshire West & Kincardine
##  6 Airdrie & Shotts
##  7 Aldershot
##  8 Aldridge-Brownhills
##  9 Altrincham & Sale West
## 10 Alyn & Deeside
## # … with 640 more rows
```

Recapping the Office Hour

Tally them up

```
ukvote2019 |>
  distinct(constituency) |>
  tally()
```

```
## # A tibble: 1 × 1
##       n
##   <int>
## 1   650
```

```
# Base R / non-pipeline version

length(unique(ukvote2019$constituency))
```

```
## [1] 650
```

Recapping the Office Hour

```
ukvote2019 |>
  count(party_name) |>
  arrange(desc(n))
```

```
## # A tibble: 69 × 2
##    party_name                       n
##    <chr>                        <int>
##  1 Conservative                   636
##  2 Labour                         631
##  3 Liberal Democrat               611
##  4 Green                          497
##  5 The Brexit Party               275
##  6 Independent                    224
##  7 Scottish National Party         59
##  8 UKIP                            44
##  9 Plaid Cymru                     36
## 10 Christian Peoples Alliance      29
## # … with 59 more rows
```

Recapping the Office Hour

Top 5

```
ukvote2019 |>
  count(party_name) |>
  slice_max(order_by = n, n = 5)
```

```
## # A tibble: 5 × 2
##   party_name           n
##   <chr>            <int>
## 1 Conservative       636
## 2 Labour             631
## 3 Liberal Democrat   611
## 4 Green              497
## 5 The Brexit Party   275
```

Recapping the Office Hour

Top 5

```
ukvote2019 |>
  count(party_name) |>
  slice_max(order_by = n, n = 5)
```

```
## # A tibble: 5 × 2
##   party_name           n
##   <chr>            <int>
## 1 Conservative       636
## 2 Labour             631
## 3 Liberal Democrat   611
## 4 Green              497
## 5 The Brexit Party   275
```

Bottom 5

```
ukvote2019 |>
  count(party_name) |>
  slice_min(order_by = n, n = 5)
```

```
## # A tibble: 25 × 2
##    party_name                                n
##    <chr>                                 <int>
##  1 Ashfield Independents                     1
##  2 Best for Luton                            1
##  3 Birkenhead Social Justice Party           1
##  4 British National Party                    1
##  5 Burnley & Padiham Independent Party       1
##  6 Church of the Militant Elvis Party        1
##  7 Citizens Movement Party UK                1
##  8 CumbriaFirst                              1
##  9 Heavy Woollen District Independents       1
## 10 Independent Network                       1
## # … with 15 more rows
```

Recapping the Office Hour

```r
ukvote2019 |>
  count(constituency)
```

```
## # A tibble: 650 × 2
##    constituency                          n
##    <chr>                             <int>
##  1 Aberavon                              7
##  2 Aberconwy                             4
##  3 Aberdeen North                        6
##  4 Aberdeen South                        4
##  5 Aberdeenshire West & Kincardine       4
##  6 Airdrie & Shotts                      5
##  7 Aldershot                             4
##  8 Aldridge-Brownhills                   5
##  9 Altrincham & Sale West                6
## 10 Alyn & Deeside                        5
## # … with 640 more rows
```

Counting Twice Over

```r
ukvote2019 |>
  count(constituency) |>
  count(n)
```

```
## # A tibble: 8 × 2
##       n    nn
##   <int> <int>
## 1     3    21
## 2     4   194
## 3     5   226
## 4     6   139
## 5     7    49
## 6     8    18
## 7     9     2
## 8    12     1
```

Counting Twice Over

```r
ukvote2019
```

```
## # A tibble: 3,320 × 13
##    cid       const…¹ elect…² party…³ candi…⁴ votes vote_…⁵ vote_…⁶ total…⁷ vrank
##    <chr>     <chr>     <int> <chr>   <chr>   <int>   <dbl>   <dbl>   <int> <int>
##  1 W07000049 Aberav…   50747 Labour  Stephe… 17008    53.8   -14.3   31598     1
##  2 W07000049 Aberav…   50747 Conser… Charlo…  6518    20.6     2.9   31598     2
##  3 W07000049 Aberav…   50747 The Br… Glenda…  3108     9.8     9.8   31598     3
##  4 W07000049 Aberav…   50747 Plaid … Nigel …  2711     8.6     0.3   31598     4
##  5 W07000049 Aberav…   50747 Libera… Sheila…  1072     3.4     1.6   31598     5
##  6 W07000049 Aberav…   50747 Indepe… Captai…   731     2.3     2.3   31598     6
##  7 W07000049 Aberav…   50747 Green   Giorgi…   450     1.4     1.4   31598     7
##  8 W07000058 Aberco…   44699 Conser… Robin … 14687    46.1     1.5   31865     1
##  9 W07000058 Aberco…   44699 Labour  Emily … 12653    39.7    -2.9   31865     2
## 10 W07000058 Aberco…   44699 Plaid … Lisa G…  2704     8.5    -1.4   31865     3
## # … with 3,310 more rows, 3 more variables: turnout <dbl>, fname <chr>,
## #   lname <chr>, and abbreviated variable names ¹constituency, ²electorate,
## #   ³party_name, ⁴candidate, ⁵vote_share_percent, ⁶vote_share_change,
## #   ⁷total_votes_cast
```

Counting Twice Over

```r
ukvote2019 |>
  count(constituency, name = "n_cands")
```

```
## # A tibble: 650 × 2
##    constituency                      n_cands
##    <chr>                               <int>
##  1 Aberavon                                7
##  2 Aberconwy                               4
##  3 Aberdeen North                          6
##  4 Aberdeen South                          4
##  5 Aberdeenshire West & Kincardine         4
##  6 Airdrie & Shotts                        5
##  7 Aldershot                               4
##  8 Aldridge-Brownhills                     5
##  9 Altrincham & Sale West                  6
## 10 Alyn & Deeside                          5
## # … with 640 more rows
```

Counting Twice Over

```r
ukvote2019 |>
  count(constituency, name = "n_cands") |>
  count(n_cands, name = "n_const")
```

```
## # A tibble: 8 × 2
##   n_cands n_const
##     <int>   <int>
## 1       3      21
## 2       4     194
## 3       5     226
## 4       6     139
## 5       7      49
## 6       8      18
## 7       9       2
## 8      12       1
```

Two dplyr gotchas

Comparisons filtering on proportions

Let's say you are working with proportions

```
df
```

```
## # A tibble: 4 × 3
##   id    prop1 prop2
##   <chr> <dbl> <dbl>
## 1 A      0.1   0.2 
## 2 B      0.1   0.21
## 3 C      0.11  0.2 
## 4 D      0.1   0.1 
```

Comparisons filtering on proportions

And you want to focus on cases where `prop1` *plus* `prop2` is greater than 0.3:

Comparisons filtering on proportions

And you want to focus on cases where `prop1` *plus* `prop2` is greater than 0.3:

```
df |>
  filter(prop1 + prop2 > 0.3)
```

```
## # A tibble: 3 × 3
##   id    prop1 prop2
##   <chr> <dbl> <dbl>
## 1 A      0.1   0.2
## 2 B      0.1   0.21
## 3 C      0.11  0.2
```

The row with `id` **`A`** shouldn't have been included there.

Comparisons filtering on proportions

And you want to focus on cases where `prop1` *plus* `prop2` is greater than 0.3:

```
df |>
  filter(prop1 + prop2 > 0.3)
```

```
## # A tibble: 3 × 3
##   id    prop1 prop2
##   <chr> <dbl> <dbl>
## 1 A      0.1   0.2
## 2 B      0.1   0.21
## 3 C      0.11  0.2
```

The row with `id` `A` shouldn't have been included there.

This is not dlpyr's fault. It's our floating point friend again.

Comparisons filtering on proportions

```r
df |>
  filter(prop1 + prop2 == 0.3)
```

```
## # A tibble: 0 × 3
## # … with 3 variables: id <chr>, prop1 <dbl>, prop2 <dbl>
```

The row with `id` `A` *should* have been included here!

Comparisons filtering on proportions

This won't give the right behavior either:

```r
df |>
  mutate(prop3 = prop1 + prop2) |>
  filter(prop3 == 0.3)
```

```
## # A tibble: 0 × 4
## # … with 4 variables: id <chr>, prop1 <dbl>, prop2 <dbl>, prop3 <dbl>
```

Comparisons filtering on proportions

So, beware.

```
df |>
  filter(prop1*100 + prop2*100 == 0.3*100)
```

```
## # A tibble: 1 × 3
##   id    prop1 prop2
##   <chr> <dbl> <dbl>
## 1 A       0.1   0.2
```

Better:

```
df |>
  filter(near(prop1 + prop2, 0.3))
```

```
## # A tibble: 1 × 3
##   id    prop1 prop2
##   <chr> <dbl> <dbl>
## 1 A       0.1   0.2
```

Zero Counts in dplyr

```r
df <- read_csv(here("data", "first_terms.csv"))

df
```

```
## # A tibble: 280 × 4
##      pid start_year party      sex
##    <dbl> <date>     <chr>      <chr>
##  1  3160 2013-01-03 Republican M
##  2  3161 2013-01-03 Democrat   F
##  3  3162 2013-01-03 Democrat   M
##  4  3163 2013-01-03 Republican M
##  5  3164 2013-01-03 Democrat   M
##  6  3165 2013-01-03 Republican M
##  7  3166 2013-01-03 Republican M
##  8  3167 2013-01-03 Democrat   F
##  9  3168 2013-01-03 Republican M
## 10  3169 2013-01-03 Democrat   M
## # … with 270 more rows
```

Zero Counts in dplyr

```r
df |>
    group_by(start_year, party, sex) |>
    summarize(N = n()) |>
    mutate(freq = N / sum(N))
```

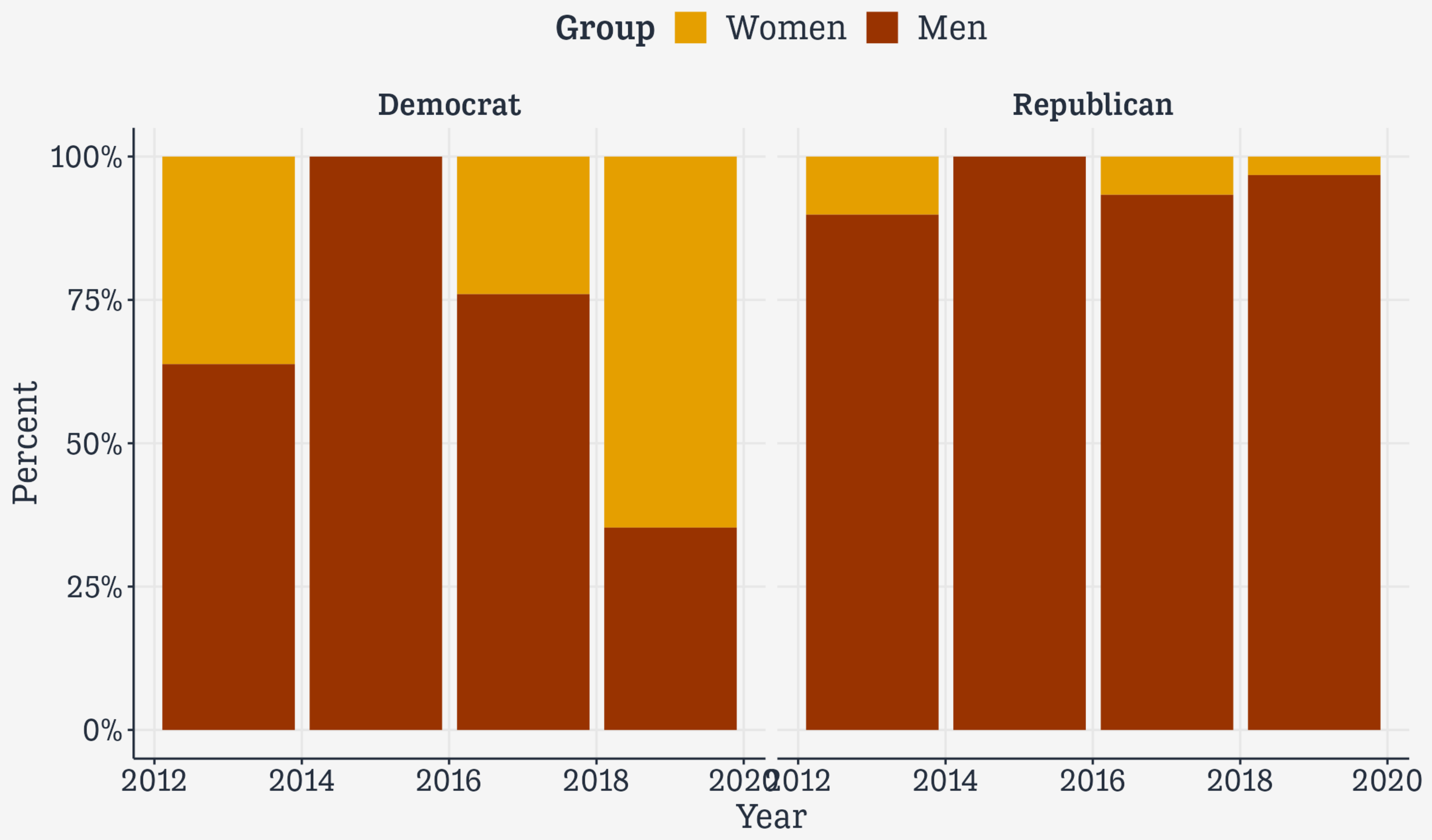
```
## # A tibble: 14 × 5
## # Groups:   start_year, party [8]
##    start_year party      sex       N   freq
##    <date>     <chr>      <chr> <int>  <dbl>
##  1 2013-01-03 Democrat   F        21 0.362
##  2 2013-01-03 Democrat   M        37 0.638
##  3 2013-01-03 Republican F         8 0.101
##  4 2013-01-03 Republican M        71 0.899
##  5 2015-01-03 Democrat   M         1 1
##  6 2015-01-03 Republican M         5 1
##  7 2017-01-03 Democrat   F         6 0.24
##  8 2017-01-03 Democrat   M        19 0.76
##  9 2017-01-03 Republican F         2 0.0667
## 10 2017-01-03 Republican M        28 0.933
## 11 2019-01-03 Democrat   F        33 0.647
## 12 2019-01-03 Democrat   M        18 0.353
## 13 2019-01-03 Republican F         1 0.0323
## 14 2019-01-03 Republican M        30 0.968
```

Zero Counts in dplyr

```r
p_col <- df |>
    group_by(start_year, party, sex) |>
    summarize(N = n()) |>
    mutate(freq = N / sum(N)) |>
    ggplot(aes(x = start_year,
               y = freq,
               fill = sex)) +
    geom_col() +
    scale_y_continuous(labels = scales::percent) +
    scale_fill_manual(values = sex_colors, labels = c("Women", "Men")) +
    labs(x = "Year", y = "Percent", fill = "Group") +
    facet_wrap(~ party)
```

Zero Counts in dplyr

```
p_col
```

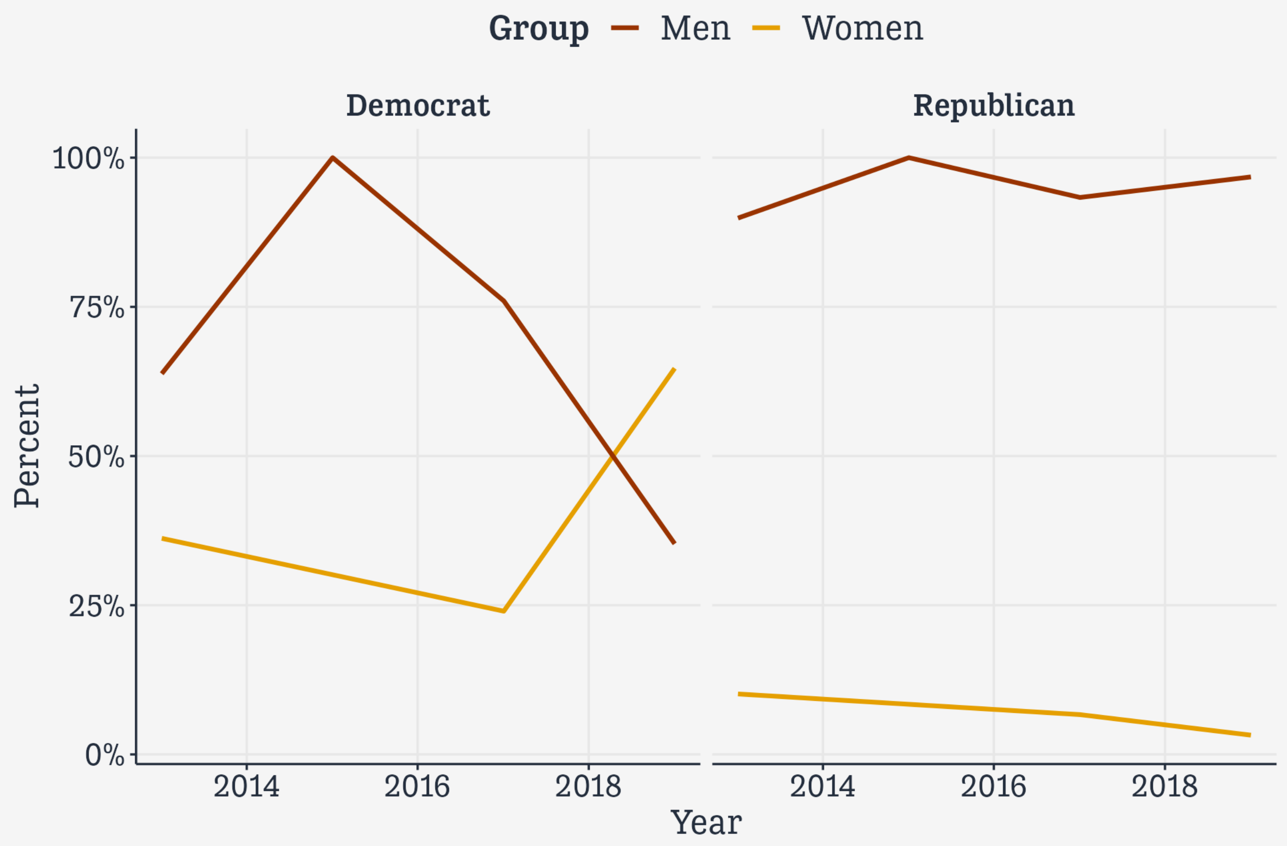


Zero Counts in dplyr

```r
p_line <- df |>
    group_by(start_year, party, sex) |>
    summarize(N = n()) |>
    mutate(freq = N / sum(N)) |>
    ggplot(aes(x = start_year,
               y = freq,
               color = sex)) +
    geom_line(size = 1.1) +
    scale_y_continuous(labels = scales::percent) +
    scale_color_manual(values = sex_colors, labels = c("Women", "Men")) +
    guides(color = guide_legend(reverse = TRUE)) +
    labs(x = "Year", y = "Percent", color = "Group") +
    facet_wrap(~ party)
```

Zero Counts in dplyr

```
p_line
```



Option 1: factors and `.drop`

Factors are for categorical variables and are stored differently from characters.

This can matter when modeling, and also now.

```r
df_f <- df |>
  mutate(party_f = factor(party))

df_f
```

```
## # A tibble: 280 × 5
##      pid start_year party      sex   party_f
##    <dbl> <date>     <chr>      <chr> <fct>
##  1  3160 2013-01-03 Republican M     Republican
##  2  3161 2013-01-03 Democrat   F     Democrat
##  3  3162 2013-01-03 Democrat   M     Democrat
##  4  3163 2013-01-03 Republican M     Republican
##  5  3164 2013-01-03 Democrat   M     Democrat
##  6  3165 2013-01-03 Republican M     Republican
##  7  3166 2013-01-03 Republican M     Republican
##  8  3167 2013-01-03 Democrat   F     Democrat
##  9  3168 2013-01-03 Republican M     Republican
## 10  3169 2013-01-03 Democrat   M     Democrat
## # … with 270 more rows
```

Option 1: **factors** and `.drop`

```r
df_f |>
  group_by(party_f) |>
  tally()
```

```
## # A tibble: 2 × 2
##   party_f        n
##   <fct>      <int>
## 1 Democrat     135
## 2 Republican   145
```

Factors are integer values with named labels, or *levels*:

```r
typeof(df_f$party_f)
```

```
## [1] "integer"
```

```r
levels(df_f$party_f)
```

```
## [1] "Democrat"   "Republican"
```

Option 1: factors and .drop

By default, unused levels won't display:

```
df_f <- df |>
  mutate(party_f = factor(party,
                          levels = c("Democrat",
                                     "Republican",
                                     "Libertarian")))

df_f |>
  group_by(party_f) |>
  tally()
```

```
## # A tibble: 2 × 2
##   party_f        n
##   <fct>      <int>
## 1 Democrat     135
## 2 Republican   145
```

```
levels(df_f$party_f)
```

```
## [1] "Democrat"    "Republican"  "Libertarian"
```

Option 1: factors and `.drop`

By default, unused levels won't display:

```r
df |>
  mutate(across(where(is.character), as_factor)) |>
  group_by(start_year, party, sex) |>
  summarize(N = n()) |>
  mutate(freq = N / sum(N))
```

```
## # A tibble: 14 × 5
## # Groups:   start_year, party [8]
##    start_year party      sex       N   freq
##    <date>     <fct>      <fct> <int>  <dbl>
##  1 2013-01-03 Republican M        71 0.899
##  2 2013-01-03 Republican F         8 0.101
##  3 2013-01-03 Democrat   M        37 0.638
##  4 2013-01-03 Democrat   F        21 0.362
##  5 2015-01-03 Republican M         5 1
##  6 2015-01-03 Democrat   M         1 1
##  7 2017-01-03 Republican M        28 0.933
##  8 2017-01-03 Republican F         2 0.0667
##  9 2017-01-03 Democrat   M        19 0.76
## 10 2017-01-03 Democrat   F         6 0.24
## 11 2019-01-03 Republican M        30 0.968
## 12 2019-01-03 Republican F         1 0.0323
## 13 2019-01-03 Democrat   M        18 0.353
## 14 2019-01-03 Democrat   F        33 0.647
```

Option 1: factors and `.drop`

You can make `dplyr` keep empty factor levels though:

```
df |>
  mutate(across(where(is.character), as_factor)) |>
  group_by(start_year, party, sex, .drop = FALSE) |>
  summarize(N = n()) |>
  mutate(freq = N / sum(N))
```

```
## # A tibble: 16 × 5
## # Groups:   start_year, party [8]
##    start_year party      sex       N   freq
##    <date>     <fct>      <fct> <int>  <dbl>
##  1 2013-01-03 Republican M        71 0.899
##  2 2013-01-03 Republican F         8 0.101
##  3 2013-01-03 Democrat   M        37 0.638
##  4 2013-01-03 Democrat   F        21 0.362
##  5 2015-01-03 Republican M         5 1
##  6 2015-01-03 Republican F         0 0
##  7 2015-01-03 Democrat   M         1 1
##  8 2015-01-03 Democrat   F         0 0
##  9 2017-01-03 Republican M        28 0.933
## 10 2017-01-03 Republican F         2 0.0667
## 11 2017-01-03 Democrat   M        19 0.76
## 12 2017-01-03 Democrat   F         6 0.24
## 13 2019-01-03 Republican M        30 0.968
## 14 2019-01-03 Republican F         1 0.0323
## 15 2019-01-03 Democrat   M        18 0.353
## 16 2019-01-03 Democrat   F        33 0.647
```

Option 2: ungroup() and complete()

Maybe you don't want to deal with factors.

```r
df_c <- df |>
    group_by(start_year, party, sex) |>
    summarize(N = n()) |>
    mutate(freq = N / sum(N)) |>
    ungroup() |>
    complete(start_year, party, sex,
             fill = list(N = 0, freq = 0))
```

Option 2: ungroup() and complete()

```
df_c
```

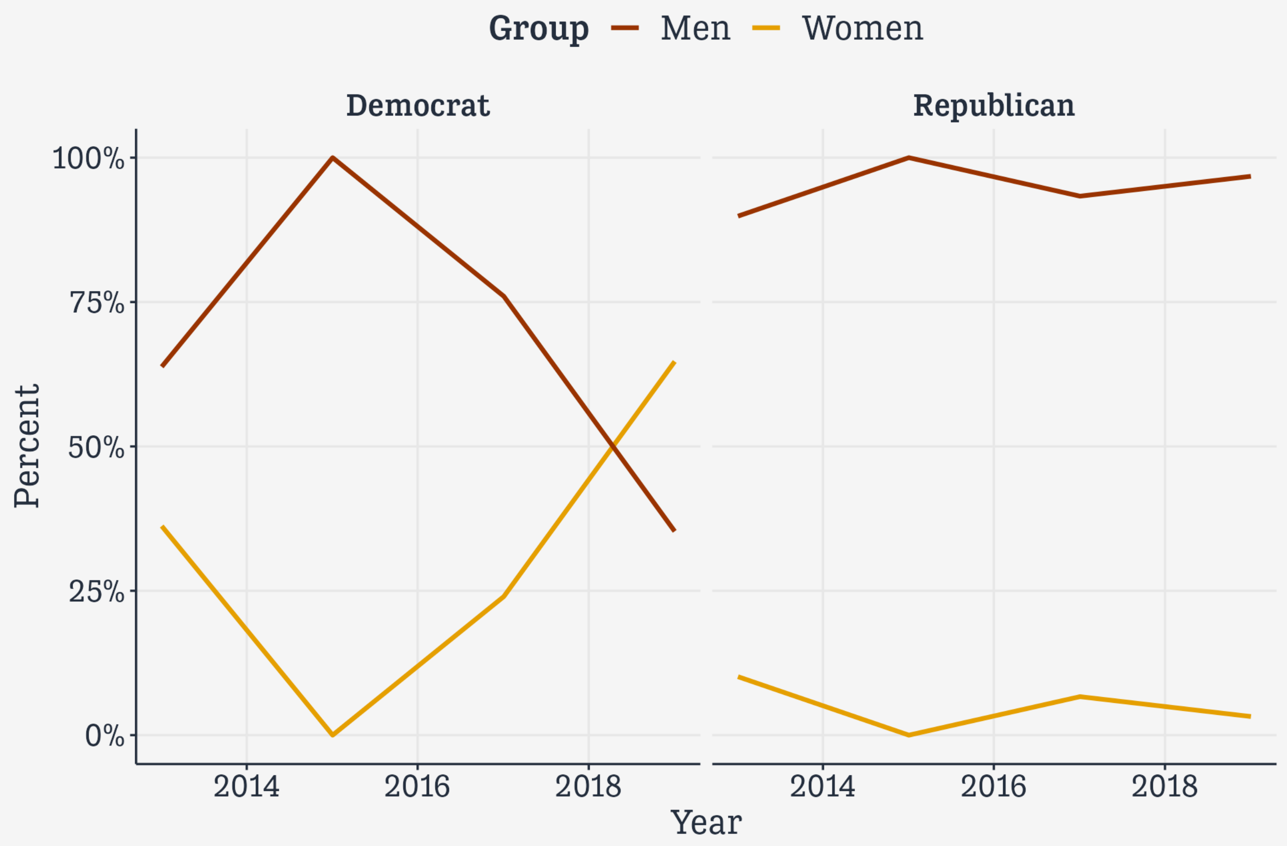
```
## # A tibble: 16 × 5
##    start_year party      sex       N   freq
##    <date>     <chr>      <chr> <int>  <dbl>
##  1 2013-01-03 Democrat   F        21 0.362
##  2 2013-01-03 Democrat   M        37 0.638
##  3 2013-01-03 Republican F         8 0.101
##  4 2013-01-03 Republican M        71 0.899
##  5 2015-01-03 Democrat   F         0 0
##  6 2015-01-03 Democrat   M         1 1
##  7 2015-01-03 Republican F         0 0
##  8 2015-01-03 Republican M         5 1
##  9 2017-01-03 Democrat   F         6 0.24
## 10 2017-01-03 Democrat   M        19 0.76
## 11 2017-01-03 Republican F         2 0.0667
## 12 2017-01-03 Republican M        28 0.933
## 13 2019-01-03 Democrat   F        33 0.647
## 14 2019-01-03 Democrat   M        18 0.353
## 15 2019-01-03 Republican F         1 0.0323
## 16 2019-01-03 Republican M        30 0.968
```

Option 2: ungroup() and complete()

```r
p_out <- df_c |>
  ggplot(aes(x = start_year,
               y = freq,
               color = sex)) +
    geom_line(size = 1.1) +
    scale_y_continuous(labels = scales::percent) +
    scale_color_manual(values = sex_colors, labels = c("Women", "Men")) +
    guides(color = guide_legend(reverse = TRUE)) +
    labs(x = "Year", y = "Percent", color = "Group") +
    facet_wrap(~ party)
```

Option 2: ungroup() and complete()

```
p_out
```


Group
Men
Women
Democrat
Republican
Percent
Year