Safely iterating with purrr and map

Data Wrangling: Session 7b

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Statistical Horizons, April 2022

Load the packages, as always

```
library(here)      # manage file paths
```

```
## here() starts at /Users/kjhealy/Documents/courses/data_wrangling
```

```
library(socviz)    # data and some useful functions
```

```
##
## Attaching package: 'socviz'
```

```
## The following object is masked from 'package:kjhutils':
##
##     %nin%
```

```
library(tidyverse) # your friend and mine
```

```
## ── Attaching packages ─────────────────────────────────────── tidyverse 1.3.1 ──
```

```
## ✓ ggplot2 3.3.5     ✓ purrr   0.3.4
## ✓ tibble  3.1.6     ✓ dplyr   1.0.8
## ✓ tidyr   1.2.0     ✓ stringr 1.4.0
## ✓ readr   2.1.2     ✓ forcats 0.5.1
```

```
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## x readr::edition_get()   masks testthat::edition_get()
## x dplyr::filter()        masks stats::filter()
## x purrr::is_null()       masks testthat::is_null()
## x dplyr::lag()           masks stats::lag()
## x readr::local_edition() masks testthat::local_edition()
## x dplyr::matches()       masks tidyr::matches(), testthat::matches()
```

Additional libraries

```
library(survey)
library(srvyr)
library(broom)
library(gssr) # https://kjhealy.github.io/gssr
```

The complete GSS

```
data(gss_all)

gss_all
```

```
## # A tibble: 68,846 × 6,311
##     year    id    wrkstat  hrs1  hrs2      evwork   occ prestige  wrkslf wrkgovt
##    <dbl> <dbl>  <dbl+lbl> <dbl> <dbl>   <dbl+lbl> <dbl>    <dbl> <dbl+l> <dbl+l>
##  1  1972     1 1 [workin… NA(i) NA(i) NA(i)          205       50 2 [som…   NA(i)
##  2  1972     2 5 [retire… NA(i) NA(i)     1 [yes]   441       45 2 [som…   NA(i)
##  3  1972     3 2 [workin… NA(i) NA(i) NA(i)          270       44 2 [som…   NA(i)
##  4  1972     4 1 [workin… NA(i) NA(i) NA(i)            1       57 2 [som…   NA(i)
##  5  1972     5 7 [keepin… NA(i) NA(i)     1 [yes]   385       40 2 [som…   NA(i)
##  6  1972     6 1 [workin… NA(i) NA(i) NA(i)          281       49 2 [som…   NA(i)
##  7  1972     7 1 [workin… NA(i) NA(i) NA(i)          522       41 2 [som…   NA(i)
##  8  1972     8 1 [workin… NA(i) NA(i) NA(i)          314       36 2 [som…   NA(i)
##  9  1972     9 2 [workin… NA(i) NA(i) NA(i)          912       26 2 [som…   NA(i)
## 10  1972    10 1 [workin… NA(i) NA(i) NA(i)          984       18 2 [som…   NA(i)
## # … with 68,836 more rows, and 6,301 more variables: commute <dbl>,
## #   industry <dbl>, occ80 <dbl>, prestg80 <dbl>, indus80 <dbl+lbl>,
## #   indus07 <dbl>, occonet <dbl>, found <dbl>, occ10 <dbl+lbl>, occindv <dbl>,
## #   occstatus <dbl>, occtag <dbl>, prestg10 <dbl>, prestg105plus <dbl>,
## #   indus10 <dbl+lbl>, indstatus <dbl>, indtag <dbl>, marital <dbl+lbl>,
## #   martype <dbl+lbl>, agewed <dbl>, divorce <dbl+lbl>, widowed <dbl+lbl>,
## #   spwrksta <dbl+lbl>, sphrs1 <dbl+lbl>, sphrs2 <dbl+lbl>, …
```

Set up our analysis

```
cont_vars <- c("year", "id", "ballot", "age")
cat_vars <- c("race", "sex", "fefam")
wt_vars <- c("vpsu",
             "vstrat",
             "oversamp",
             "formwt",              # weight to deal with experimental randomization
             "wtssall",             # main weight variable
             "sampcode",            # sampling error code
             "sample")              # sampling frame and method
my_vars <- c(cont_vars, cat_vars, wt_vars)
```

Clean the labeled variables

```
gss_df <- gss_all %>%
  filter(year > 1974 & year < 2021) %>%
  select(all_of(my_vars)) %>%
  mutate(across(everything(), haven::zap_missing), # Convert labeled missing to regular NA
         across(all_of(wt_vars), as.numeric),
         across(all_of(cat_vars), as_factor),
         across(all_of(cat_vars), fct_relabel, tolower),
         across(all_of(cat_vars), fct_relabel, tools::toTitleCase),
         compwt = oversamp * formwt * wtssall)
```

Working dataset

```
gss_df
```

```
## # A tibble: 60,213 × 15
##     year    id    ballot      age race  sex   fefam  vpsu vstrat oversamp formwt
##    <dbl> <dbl> <dbl+lbl> <dbl+lb> <fct> <fct> <fct> <dbl>  <dbl>    <dbl>  <dbl>
##  1  1975     1        NA       38 White Male  <NA>      1   7001        1      1
##  2  1975     2        NA       20 White Fema… <NA>      1   7001        1      1
##  3  1975     3        NA       61 White Fema… <NA>      1   7001        1      1
##  4  1975     4        NA       19 White Male  <NA>      1   7001        1      1
##  5  1975     5        NA       28 White Male  <NA>      1   7001        1      1
##  6  1975     6        NA       28 White Fema… <NA>      1   7002        1      1
##  7  1975     7        NA       35 White Fema… <NA>      1   7002        1      1
##  8  1975     8        NA       64 White Fema… <NA>      1   7002        1      1
##  9  1975     9        NA       53 White Male  <NA>      1   7002        1      1
## 10  1975    10        NA       34 White Fema… <NA>      1   7002        1      1
## # … with 60,203 more rows, and 4 more variables: wtssall <dbl>, sampcode <dbl>,
## #   sample <dbl>, compwt <dbl>
```

The `fefam` question

```
gss_df %>%
  count(fefam)
```

```
## # A tibble: 5 × 2
##   fefam                n
##   <fct>            <int>
## 1 Strongly Agree    2543
## 2 Agree             8992
## 3 Disagree         13061
## 4 Strongly Disagree  5479
## 5 <NA>              30138
```

Recoding

```
gss_df <- gss_df %>%
  mutate(fefam_d = forcats::fct_recode(fefam,
                                       Agree = "Strongly Agree",
                                       Disagree = "Strongly Disagree"),
    fefam_n = recode(fefam_d, "Agree" = 1, "Disagree" = 0))

# factor version
gss_df %>%
  count(fefam_d)
```

```
## # A tibble: 3 × 2
##   fefam_d      n
##   <fct>    <int>
## 1 Agree    11535
## 2 Disagree 18540
## 3 <NA>     30138
```

```
# numeric version, 1 is "Agree"
gss_df %>%
  count(fefam_n)
```

```
## # A tibble: 3 × 2
##   fefam_n     n
##     <dbl> <int>
## 1       0 18540
## 2       1 11535
## 3      NA 30138
```

Unweighted model

```r
out_all <- glm(fefam_n ~ age + sex + race,
               data = gss_df,
               family="binomial",
               na.action = na.omit)

summary(out_all)
```

```
##
## Call:
## glm(formula = fefam_n ~ age + sex + race, family = "binomial",
##     data = gss_df, na.action = na.omit)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.6809  -0.9516  -0.7550   1.1813   1.8716
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept) -1.9185878  0.0399581 -48.015  < 2e-16 ***
## age          0.0323648  0.0007275  44.486  < 2e-16 ***
## sexFemale   -0.2247518  0.0248741  -9.036  < 2e-16 ***
## raceBlack    0.0668275  0.0363201   1.840   0.0658 .
## raceOther    0.3659411  0.0493673   7.413 1.24e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 39921  on 29980  degrees of freedom
## Residual deviance: 37746  on 29976  degrees of freedom
```

Tidied output

```
tidy(out_all)
```

```
## # A tibble: 5 × 5
##   term        estimate std.error statistic  p.value
##   <chr>          <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)  -1.92    0.0400      -48.0  0
## 2 age           0.0324  0.000728     44.5  0
## 3 sexFemale    -0.225   0.0249       -9.04 1.63e-19
## 4 raceBlack     0.0668  0.0363        1.84 6.58e- 2
## 5 raceOther     0.366   0.0494        7.41 1.24e-13
```

group_map() and possibly()

Model each year

```
out_yr <- gss_df %>%
  group_by(year) %>%
  group_map_dfr(possibly(~ tidy(glm(fefam_n ~ age + sex + race,
                       data = .x,
                       family = "binomial",
                       na.action = na.omit),
                       conf.int = TRUE),
                      otherwise = NULL))

out_yr
```

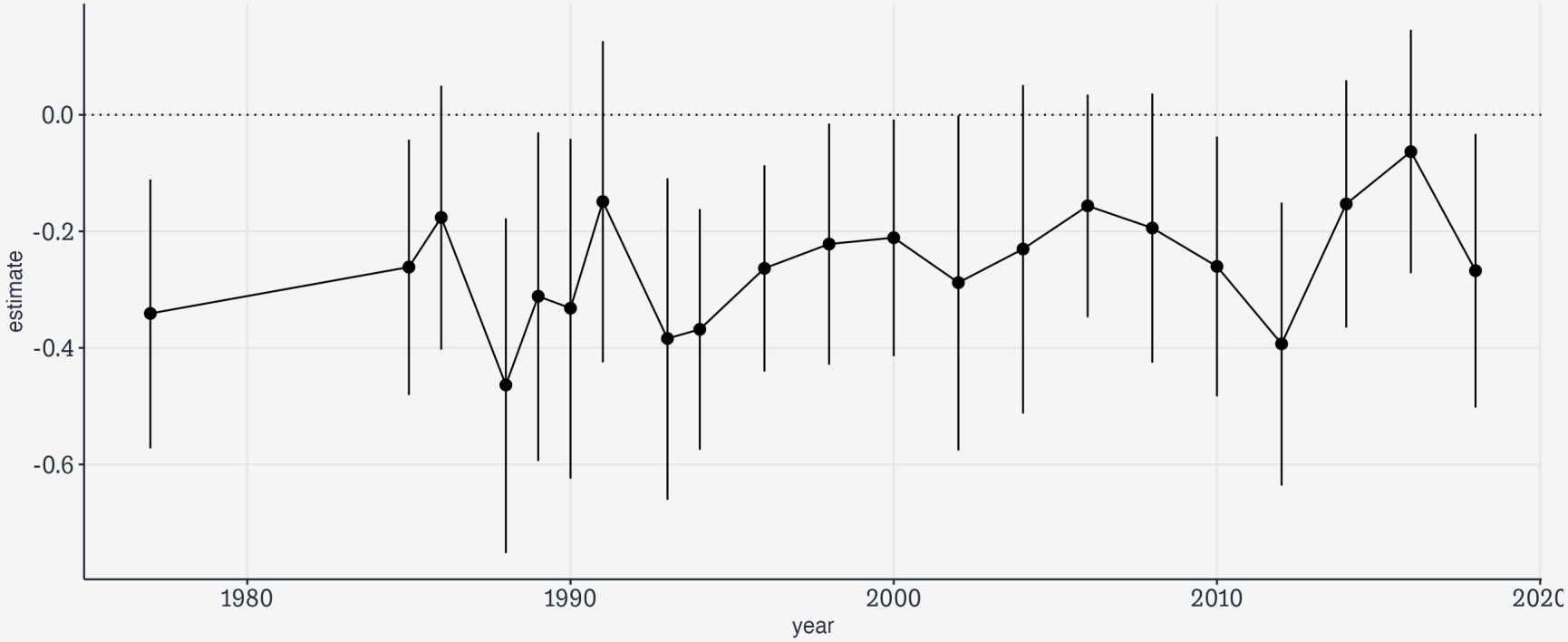
```
## # A tibble: 105 × 8
##     year term        estimate std.error statistic  p.value conf.low conf.high
##    <dbl> <chr>          <dbl>     <dbl>     <dbl>    <dbl>    <dbl>     <dbl>
##  1  1977 (Intercept)  -1.20     0.178      -6.75  1.47e-11  -1.55     -0.854
##  2  1977 age           0.0483   0.00388    12.4   1.56e-35   0.0408    0.0561
##  3  1977 sexFemale    -0.341    0.118      -2.90  3.77e- 3  -0.572    -0.111
##  4  1977 raceBlack    -0.0613   0.180      -0.340 7.34e- 1  -0.412     0.295
##  5  1977 raceOther     0.188    0.576       0.326 7.44e- 1  -0.912     1.40
##  6  1985 (Intercept)  -1.89     0.168     -11.2   2.89e-29  -2.23     -1.56
##  7  1985 age           0.0432   0.00332    13.0   1.03e-38   0.0368    0.0498
##  8  1985 sexFemale    -0.261    0.112      -2.34  1.94e- 2  -0.481    -0.0426
##  9  1985 raceBlack     0.148    0.189       0.782 4.34e- 1  -0.223     0.519
## 10  1985 raceOther    -0.319    0.338      -0.944 3.45e- 1  -1.00      0.329
## # … with 95 more rows
```

group_map() and possibly()

```
possibly(~ tidy(glm(...)), otherwise = NULL)
```

group_map() and possibly()

```
out_yr %>%
  filter(term == "sexFemale") %>%
  ggplot(mapping = aes(x = year, y = estimate,
                       ymin = conf.low, ymax = conf.high)) +
  geom_hline(yintercept = 0, linetype = "dotted") +
  geom_line() +
  geom_pointrange()
```



Survey-weighted estimates

```
options(survey.lonely.psu = "adjust")
options(na.action="na.pass")

gss_svy <- gss_df %>%
  filter(year > 1974) %>%
  mutate(stratvar = interaction(year, vstrat)) %>%
  as_survey_design(id = vpsu,
                   strata = stratvar,
                   weights = compwt,
                   nest = TRUE)
gss_svy
```

```
## Stratified 1 - level Cluster Sampling design (with replacement)
## With (4555) clusters.
## Called via srvyr
## Sampling variables:
##  - ids: vpsu
##  - strata: stratvar
##  - weights: compwt
## Data variables: year (dbl), id (dbl), ballot (dbl+lbl), age (dbl+lbl), race
##   (fct), sex (fct), fefam (fct), vpsu (dbl), vstrat (dbl), oversamp (dbl),
##   formwt (dbl), wtssall (dbl), sampcode (dbl), sample (dbl), compwt (dbl),
##   fefam_d (fct), fefam_n (dbl), stratvar (fct)
```

Survey-weighted estimates

```
gss_svy %>%
  drop_na(fefam_d) %>%
  group_by(year, sex, race, fefam_d) %>%
  summarize(prop = survey_mean(na.rm = TRUE,
                               vartype = "ci"))
```

```
## # A tibble: 252 × 7
## # Groups:   year, sex, race [126]
##     year sex    race  fefam_d   prop prop_low prop_upp
##    <dbl> <fct>  <fct> <fct>    <dbl>    <dbl>    <dbl>
##  1  1977 Male   White Agree    0.694   0.655     0.732
##  2  1977 Male   White Disagree 0.306   0.268     0.345
##  3  1977 Male   Black Agree    0.686   0.564     0.807
##  4  1977 Male   Black Disagree 0.314   0.193     0.436
##  5  1977 Male   Other Agree    0.632   0.357     0.906
##  6  1977 Male   Other Disagree 0.368   0.0936    0.643
##  7  1977 Female White Agree    0.640   0.601     0.680
##  8  1977 Female White Disagree 0.360   0.320     0.399
##  9  1977 Female Black Agree    0.553   0.472     0.634
## 10  1977 Female Black Disagree 0.447   0.366     0.528
## # … with 242 more rows
```

Survey-weighted estimates

```
out_svy_all <- svyglm(fefam_n ~ age + sex + race,
                      design = gss_svy,
                      family = quasibinomial(),
                      na.action = na.omit)

tidy(out_svy_all)
```

```
## # A tibble: 5 × 5
##   term        estimate std.error statistic   p.value
##   <chr>          <dbl>     <dbl>     <dbl>     <dbl>
## 1 (Intercept)  -1.83    0.0480     -38.1   3.04e-232
## 2 age           0.0311  0.000853    36.4   5.29e-217
## 3 sexFemale    -0.240   0.0279      -8.63  1.40e- 17
## 4 raceBlack     0.0285  0.0436       0.653 5.14e-  1
## 5 raceOther     0.385   0.0589       6.52  8.87e- 11
```

Survey-weighted estimates

```
out_svy_yrs <- gss_svy %>%
  group_by(year) %>%
  group_map_dfr(possibly(~ tidy(svyglm(fefam_n ~ age + sex + race,
                       design = .x,
                       family = quasibinomial(),
                       na.action = na.omit),
                       conf.int = TRUE),
                      otherwise = NULL))

out_svy_yrs
```

```
## # A tibble: 105 × 8
##     year term        estimate std.error statistic  p.value conf.low conf.high
##    <dbl> <chr>          <dbl>     <dbl>     <dbl>    <dbl>    <dbl>     <dbl>
##  1  1977 (Intercept)  -1.09     0.184      -5.93  3.74e- 7  -1.46    -0.720
##  2  1977 age           0.0469   0.00403    11.6   2.63e-15   0.0388   0.0550
##  3  1977 sexFemale    -0.344    0.126      -2.73  9.05e- 3  -0.599   -0.0901
##  4  1977 raceBlack    -0.144    0.215      -0.669 5.07e- 1  -0.576    0.288
##  5  1977 raceOther     0.276    0.552       0.500 6.19e- 1  -0.835    1.39
##  6  1985 (Intercept)  -1.90     0.205      -9.29  1.79e-12  -2.31    -1.49
##  7  1985 age           0.0447   0.00377    11.9   3.86e-16   0.0371   0.0523
##  8  1985 sexFemale    -0.268    0.135      -1.99  5.20e- 2  -0.538    0.00243
##  9  1985 raceBlack     0.119    0.293       0.405 6.88e- 1  -0.470    0.707
## 10  1985 raceOther    -0.486    0.279      -1.75  8.69e- 2  -1.05     0.0731
## # … with 95 more rows
```

Survey-weighted estimates

```
out_svy_yrs %>%
  filter(term == "sexFemale") %>%
  ggplot(mapping = aes(x = year,
                       y = estimate,
                       ymin = conf.low,
                       ymax = conf.high)) +
  geom_hline(yintercept = 0, linetype = "dotted") +
  geom_line() +
  geom_pointrange()
```