Iterating Safely

Data Wrangling, Session 7b

Kieran Healy

Code Horizons

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Safely iterating with purrr and map

Load the packages, as always

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

Additional libraries

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

The complete GSS

```r
data(gss_all)

gss_all
```

```
# A tibble: 72,390 × 6,694
   year         id wrkstat    hrs1        hrs2        evwork      occ   prestige
   <dbl+lbl> <dbl> <dbl+lbl>  <dbl+lbl>   <dbl+lbl>   <dbl+lbl>   <dbl> <dbl+lb>
 1 1972          1 1 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 205   50
 2 1972          2 5 [retire… NA(i) [iap] NA(i) [iap]     1 [yes] 441   45
 3 1972          3 2 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 270   44
 4 1972          4 1 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap]   1   57
 5 1972          5 7 [keepin… NA(i) [iap] NA(i) [iap]     1 [yes] 385   40
 6 1972          6 1 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 281   49
 7 1972          7 1 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 522   41
 8 1972          8 1 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 314   36
 9 1972          9 2 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 912   26
10 1972         10 1 [workin… NA(i) [iap] NA(i) [iap] NA(i) [iap] 984   18
# ℹ 72,380 more rows
# ℹ 6,686 more variables: wrkslf <dbl+lbl>, wrkgovt <dbl+lbl>,
#   commute <dbl+lbl>, industry <dbl+lbl>, occ80 <dbl+lbl>, prestg80 <dbl+lbl>,
#   indus80 <dbl+lbl>, indus07 <dbl+lbl>, occonet <dbl+lbl>, found <dbl+lbl>,
#   occ10 <dbl+lbl>, occindv <dbl+lbl>, occstatus <dbl+lbl>, occtag <dbl+lbl>,
#   prestg10 <dbl+lbl>, prestg105plus <dbl+lbl>, indus10 <dbl+lbl>,
```

Set up our analysis

```r
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

```r
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+lbl> <dbl> <dbl+lb> <dbl> <fct> <fct> <fct> <dbl>  <dbl>    <dbl>  <dbl>
 1 1975           1 NA       38    White Male  <NA>      1   7001        1     NA
 2 1975           2 NA       20    White Fema… <NA>      1   7001        1     NA
 3 1975           3 NA       61    White Fema… <NA>      1   7001        1     NA
 4 1975           4 NA       19    White Male  <NA>      1   7001        1     NA
 5 1975           5 NA       28    White Male  <NA>      1   7001        1     NA
 6 1975           6 NA       28    White Fema… <NA>      1   7002        1     NA
 7 1975           7 NA       35    White Fema… <NA>      1   7002        1     NA
 8 1975           8 NA       64    White Fema… <NA>      1   7002        1     NA
 9 1975           9 NA       53    White Male  <NA>      1   7002        1     NA
10 1975          10 NA       34    White Fema… <NA>      1   7002        1     NA
# ℹ 60,203 more rows
# ℹ 4 more variables: wtssall <dbl>, sampcode <dbl>, sample <dbl>, compwt <dbl>
```

The fefam question

```r
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

```r
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
```

```r
# 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)

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
```

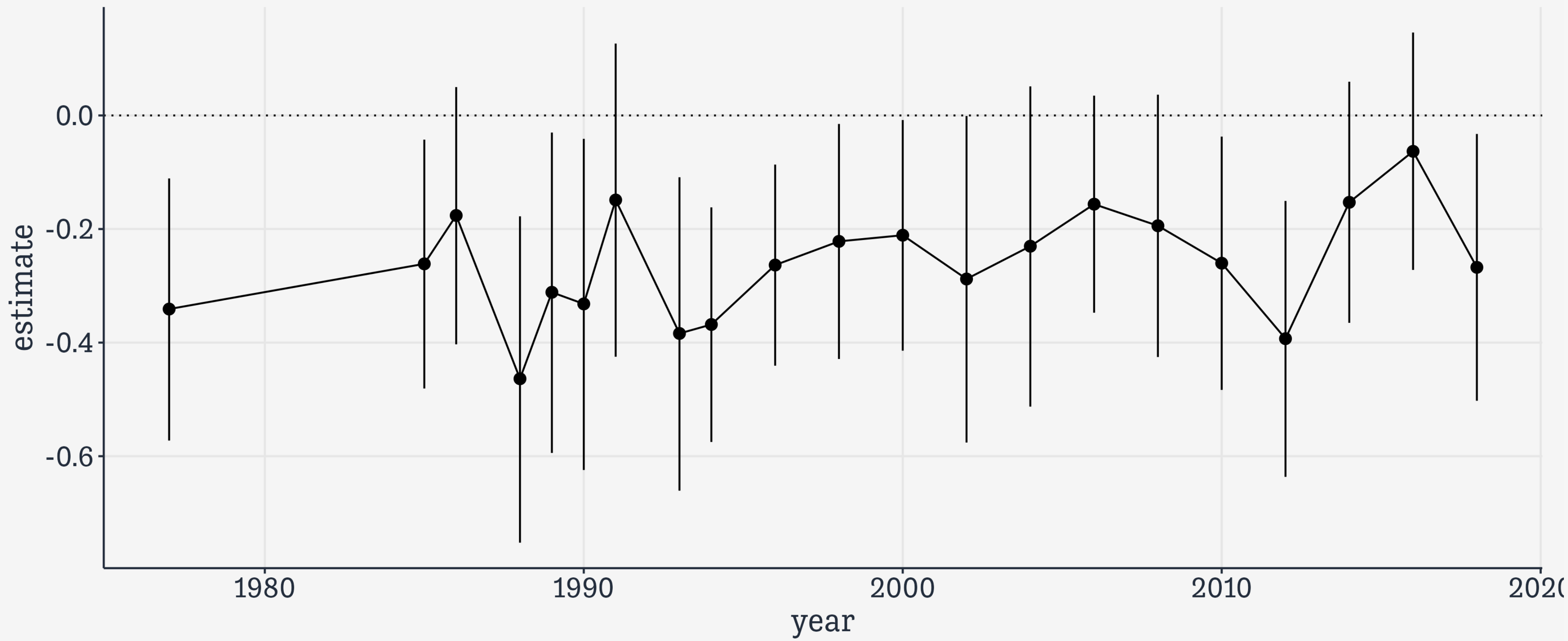
```
# A tibble: 105 × 8
   year      term        estimate std.error statistic  p.value conf.low conf.high
   <dbl+lbl> <chr>          <dbl>     <dbl>     <dbl>    <dbl>    <dbl>     <dbl>
 1 1977      (Intercep…  -1.20     0.178       -6.75  1.47e-11  -1.55     -0.854
 2 1977      age          0.0483   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      (Intercep…  -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
# ℹ 95 more rows
```

group_map() and possibly()

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

group_map() and possibly()

```r
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

```r
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 = wtssall,
                   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: wtssall
Data variables: year (dbl+lbl), 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

```r
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+lbl> <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
# ℹ 242 more rows
```

Survey-weighted estimates

```r
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    0.0478     -38.3   6.34e-234
2 age           0.0310  0.000852    36.4   9.99e-217
3 sexFemale    -0.235   0.0277      -8.48  4.55e- 17
4 raceBlack     0.0282  0.0432       0.653 5.14e-  1
5 raceOther     0.382   0.0588       6.50  1.06e- 10
```

Survey-weighted estimates

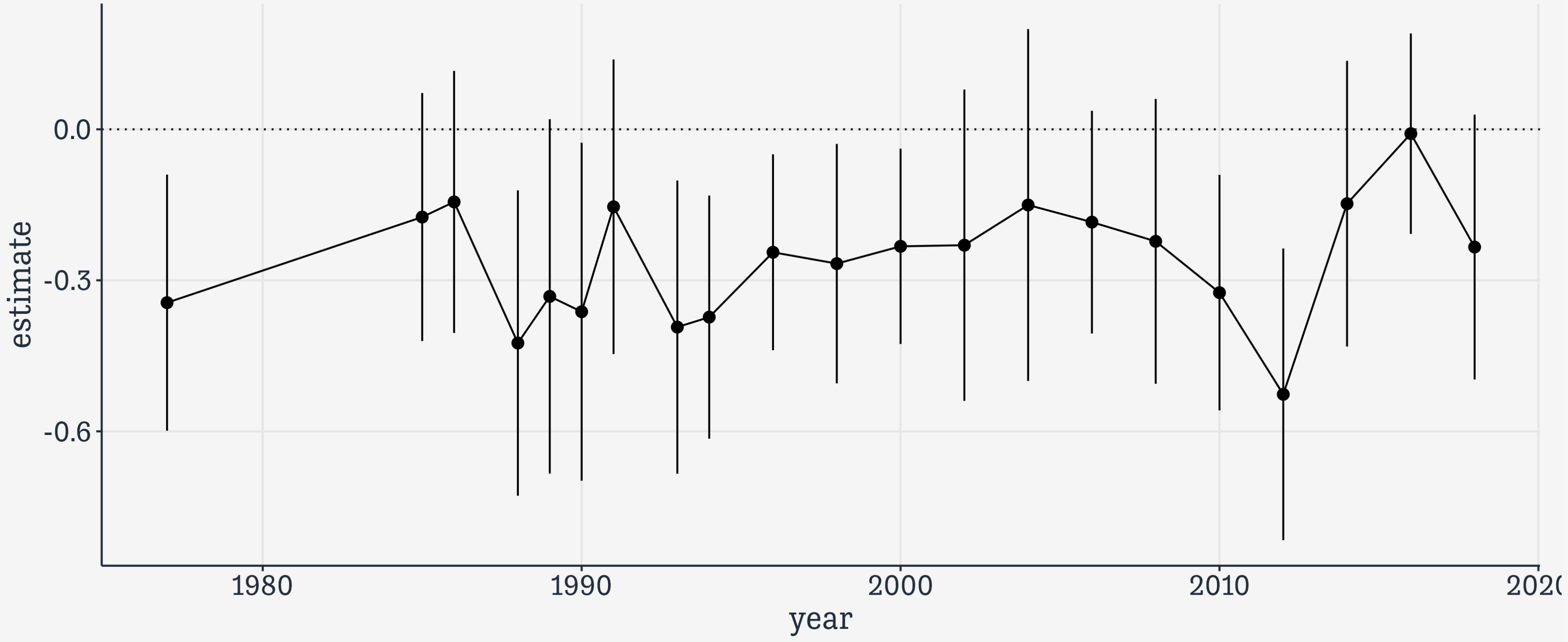
```r
out_svy_yrs <- gss_svy |>
  group_by(year) |>
  group_map_dfr(possibly(~ tidy(svyglm(fefam_n ~ age + sex + race,
                       design = .x,
                       family = quasibinomial(),
                       na.action = na.omit),
                       conf.int = TRUE),
           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

out_svy_yrs
```

```
# A tibble: 105 × 8
   year      term       estimate std.error statistic  p.value conf.low conf.high
   <dbl+lbl> <chr>         <dbl>     <dbl>     <dbl>    <dbl>    <dbl>     <dbl>
 1 1977      (Intercep…  -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      (Intercep…  -1.89     0.199      -9.49  9.05e-13  -2.29    -1.49
 7 1985      age          0.0431   0.00369    11.7   6.47e-16   0.0357   0.0505
 8 1985      sexFemale   -0.174    0.123      -1.42  1.61e- 1  -0.421    0.0720
 9 1985      raceBlack    0.157    0.228       0.688 4.95e- 1  -0.301    0.614
10 1985      raceOther   -0.533    0.268      -1.99  5.24e- 2  -1.07     0.00573
# ℹ 95 more rows
```

Survey-weighted estimates

```r
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()
```


estimate
202(
year