

Iterating Safely

Data Wrangling, Session 7b

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Code Horizons

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Safely iterating with purrr and map

Load the packages, as always

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

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: 75,699 × 6,904
  year      id wrkstat    hrs1      hrs2    evwork    occ prestige
  <dbl+lbl> <dbl> <dbl+lbl> <dbl+lbl> <dbl+lbl> <dbl+lbl> <dbl> <dbl+lbl>
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 75,689 more rows
# i 6,896 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

```
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+lbl> <dbl> <dbl+lb> <dbl> <fct> <fct> <fct> <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

```
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

```
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

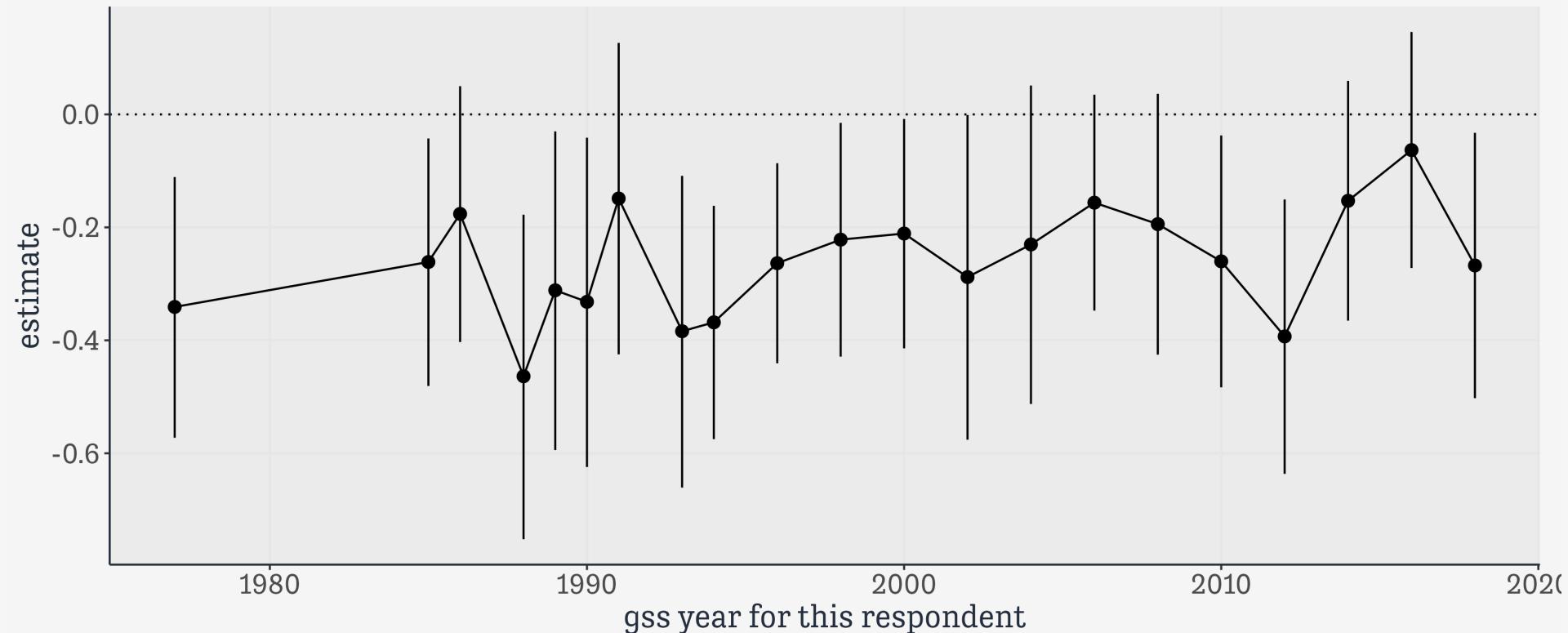
```
out_yr ← gss_df ▷  
  group_by(year) ▷  
  group_map_dfr(possibly(~ tidy(glm(fefam_n ~ age + sex + race,  
    data = .x,  
    family = "binomial",  
    na.action = na.omit),  
    conf.int = TRUE),  
    otherwise = NULL))  
  
out_yr  
  
# A tibble: 105 × 8  
  year     term      estimate std.error 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()

```
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 = wtssall,
                   nest = TRUE)

gss_svy
```

Stratified 1 - level Cluster Sampling design (with replacement)
With (4555) clusters.
Called via svydesign
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

```
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
# i 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     0.0478    -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

```
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

```
out_svys >
  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()
```

