

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> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
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>, wrkgovt <dbl>,
# commute <dbl>, industry <dbl>, occ80 <dbl>, prestg80 <dbl>,
# indus80 <dbl>, indus07 <dbl>, occonet <dbl>, found <dbl>,
# occ10 <dbl>, occindv <dbl>, occstatus <dbl>, occtag <dbl>,
# prestg10 <dbl>, prestg105plus <dbl>, indus10 <dbl>,
```

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>	<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 <chr>	estimate <dbl>	std.error <dbl>	statistic <dbl>	p.value <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	(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

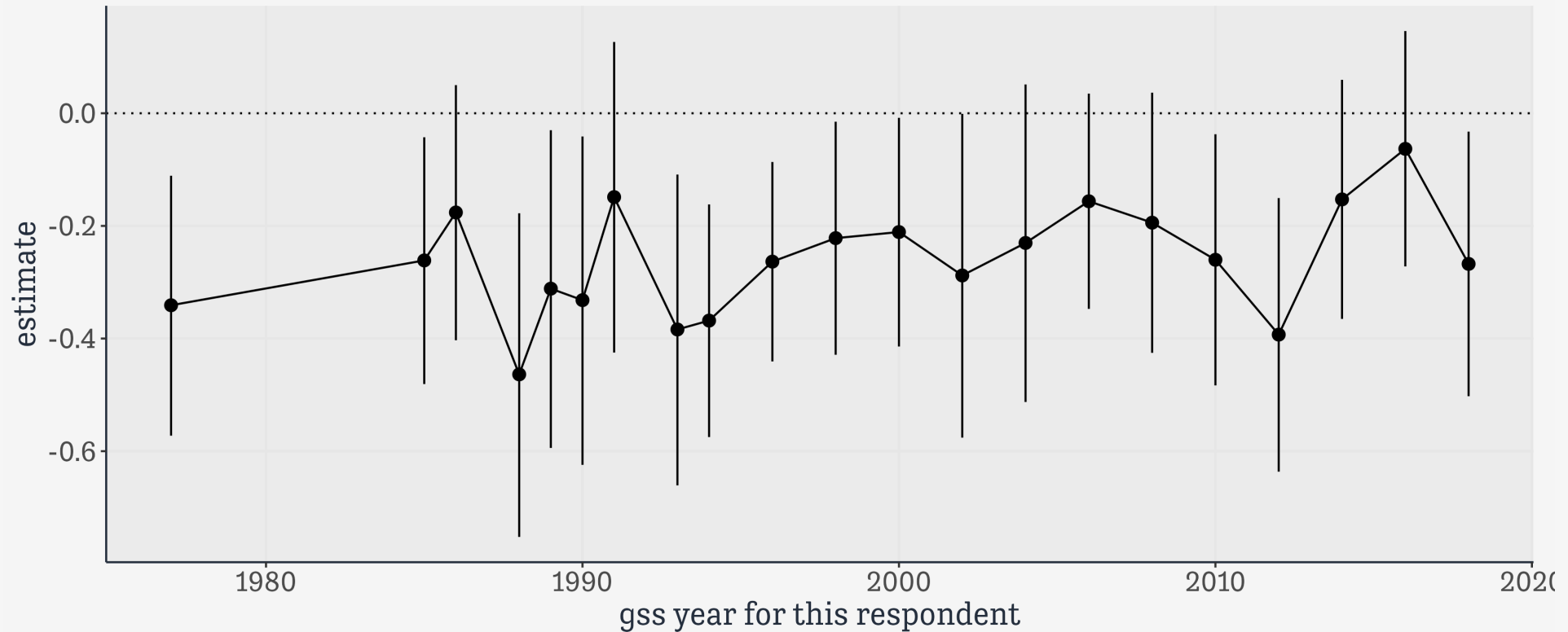
i 95 more rows

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 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

```
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> <lbl> <lbl>    <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 <chr>	estimate <dbl>	std.error <dbl>	statistic <dbl>	p.value <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>	<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_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()
```

