Exploring the BRFSS data

Setup

Load packages

```
library(ggplot2)
library(dplyr)
library(statsr)
library(tidyr)
```

Load data

Make sure your data and R Markdown files are in the same directory. When loaded your data file will be called `brfss2013`. Delete this note when before you submit your work.

```
load("brfss2013.RData")
```

Part 1: Data

Insights on data collection

Generalizability and Causality

- The method in which this data was collected (observational study) appears to make it generalizable to the non-institutionalized Adult population (over 18 years of age.)
- The conclusions arrived at cannot be determined as causal, as random assignment was not utilized.

Sampling Method and Potential Biases

- The observational study itself appears to follow a Stratified sampling method.
    - Each state can be considered a strata, and within that strata, random samples are taken.
- In the data collection phase, there could be a few issues.
    - Bias could exist within the sampling method; more interviews may be taken in specific neighborhoods that are of higher or lower income, skewing the overall results. A multi-stage sampling method would likely return more consistent results.
    - There are a substantial more female interviees in the dataset than males.
    - Up until 2001, the data collected would not be reliable, as many states were not taking part in the surveys at that time. It took until 2011 before data from all states were being collected.

Part 2: Research questions

Research question 1

Which states are the healthiest on average?

- This surface-level question is aimed at identifying which states are the healthiest, based on the genhlth and X_state variables. The sex variable is added to help identify if there is a gap that exists between males and females.

Research question 2

Is there a relationship between general health, income, education level and sex?

- This question, working in conjunction with the first, is to try and answer if there is a relationship between an individuals income, education and overall health. This would tie in with which states are on average, the healthiest.

Research question 3

What is the completion rate of interviews by type and sex?

- This question aims to answer which interview type had the highest completion rate. The sex variable is also included to help differentiate between whether males or females were more likely to finish the interview or not.

Part 3: Exploratory data analysis

NOTE: Insert code chunks as needed by clicking on the “Insert a new code chunk” button (green button with orange arrow) above. Make sure that your code is visible in the project you submit. Delete this note when before you submit your work.

Preliminary Data Analysis

```
#head(brfss2013)
#tail(brfss2013)
#names(brfss2013)
#str(brfss2013)
```

```
# Keep only relevant columns for analysis
trimmed_brfss2013 <- brfss2013 %>%
  select(c(X_state, genhlth, qstver, dispcode, sex, educa, income2))

#colnames(trimmed_brfss2013)
#View(trimmed_brfss2013)
#glimpse(trimmed_brfss2013)

# Check N/A's
#sapply(trimmed_brfss2013, function(x) sum(is.na(x)))

# Remove rows with N/A's
trimmed_brfss2013 <- na.omit(trimmed_brfss2013)

trimmed_brfss2013 <- rename(trimmed_brfss2013,
  state = X_state,
  gen_hlth = genhlth,
  int_type = qstver,
  compl_type = dispcode,
  sex = sex,
  education = educa,
  income = income2)
```

```
# Check for biases
table(trimmed_brfss2013$sex)
```

```
##
##   Male Female
## 177290 241113
```

```
# Compare sex and state
table(trimmed_brfss2013$sex,
trimmed_brfss2013$state)
```

```
##
##             0 Alabama Alaska Arizona Arkansas California Colorado Connecticut
##   Male      0    1842   1957    1557     1720       4624     5327        2803
##   Female    0    3289   2199    2066     2634       5779     6617        3756
##
##         Delaware District of Columbia Florida Georgia Hawaii Idaho Illinois
##   Male      1810                1719   11466    2832   3316  2159     2211
##   Female    2567                2538   16914    4368   3775  2770     3082
##
##         Indiana  Iowa Kansas Kentucky Louisiana Maine Maryland Massachusetts
##   Male     3728  2961   8644     2787      1531  3094     4333          5246
##   Female   4892  4126  11475     4685      2773  4203     6565          7418
##
##         Michigan Minnesota Mississippi Missouri Montana Nebraska Nevada
##   Male      4830      5544        2282     2385    3946     6381   1925
##   Female    6146      6980        3928     3477    4705     8741   2431
##
##         New Hampshire New Jersey New Mexico New York North Carolina
##   Male           2229       5023       3586     3226           2860
##   Female         2955       6462       4644     4352           4235
##
##         North Dakota  Ohio Oklahoma Oregon Pennsylvania Rhode Island
##   Male          3180  4250     2909   2287         4200         2258
##   Female        3560  6015     4298   2871         5487         3245
##
##         South Carolina South Dakota Tennessee Texas  Utah Vermont Virginia
##   Male            3832         2667      1549  3763  5117    2388     3098
##   Female          5246         3091      2531  5143  6028    3174     4220
##
##         Washington West Virginia Wisconsin Wyoming  Guam Puerto Rico    80
##   Male        4276          2131      2619    2278   724        1880     0
##   Female      5421          2814      3205    3186   898        3133     0
```

```
# Compare interview type and completion state
table(trimmed_brfss2013$int_type,
trimmed_brfss2013$compl_type)
```

```
##
##                          Completed interview Partially completed interview
##   Only Version Landline               151509                         12736
##   Version 1 Landline                   60554                          5037
##   Version 2 Landline                   54964                          4708
##   Version 3 Landline                   11502                          1263
##   Only Version Cell Phone              52414                         15445
##   Version 1 Cell Phone                 20254                          3153
##   Version 2 Cell Phone                 17995                          2754
##   Version 3 Cell Phone                  3492                           623
```

```
# Compare education level and income
table(trimmed_brfss2013$education,
trimmed_brfss2013$income)
```

```
##
##                                                          Less than $10,000
##   Never attended school or only kindergarten                           117
##   Grades 1 through 8 (Elementary)                                     2565
##   Grades 9 though 11 (Some high school)                               4232
##   Grade 12 or GED (High school graduate)                              9357
##   College 1 year to 3 years (Some college or technical school)        6070
##   College 4 years or more (College graduate)                          2853
##
##                                                          Less than $15,000
##   Never attended school or only kindergarten                            69
##   Grades 1 through 8 (Elementary)                                     1968
##   Grades 9 though 11 (Some high school)                               3686
##   Grade 12 or GED (High school graduate)                             10785
##   College 1 year to 3 years (Some college or technical school)        7048
##   College 4 years or more (College graduate)                          3025
##
##                                                          Less than $20,000
##   Never attended school or only kindergarten                            76
##   Grades 1 through 8 (Elementary)                                     1999
##   Grades 9 though 11 (Some high school)                               4097
##   Grade 12 or GED (High school graduate)                             14448
##   College 1 year to 3 years (Some college or technical school)        9570
##   College 4 years or more (College graduate)                          4438
##
##                                                          Less than $25,000
##   Never attended school or only kindergarten                            50
##   Grades 1 through 8 (Elementary)                                     1410
##   Grades 9 though 11 (Some high school)                               3488
##   Grade 12 or GED (High school graduate)                             16933
##   College 1 year to 3 years (Some college or technical school)       12476
##   College 4 years or more (College graduate)                          7133
##
##                                                          Less than $35,000
##   Never attended school or only kindergarten                            49
##   Grades 1 through 8 (Elementary)                                     1121
##   Grades 9 though 11 (Some high school)                               2857
##   Grade 12 or GED (High school graduate)                             18084
##   College 1 year to 3 years (Some college or technical school)       15346
##   College 4 years or more (College graduate)                         11160
##
##                                                          Less than $50,000
##   Never attended school or only kindergarten                            31
##   Grades 1 through 8 (Elementary)                                      561
##   Grades 9 though 11 (Some high school)                               1947
##   Grade 12 or GED (High school graduate)                             18800
##   College 1 year to 3 years (Some college or technical school)       19740
##   College 4 years or more (College graduate)                         20187
##
##                                                          Less than $75,000
##   Never attended school or only kindergarten                            23
```

```
##   Grades 1 through 8 (Elementary)                                    242
##   Grades 9 though 11 (Some high school)                             1057
##   Grade 12 or GED (High school graduate)                           14812
##   College 1 year to 3 years (Some college or technical school)     19825
##   College 4 years or more (College graduate)                       29098
##
##                                                              $75,000 or more
##   Never attended school or only kindergarten                              28
##   Grades 1 through 8 (Elementary)                                        286
##   Grades 9 though 11 (Some high school)                                  995
##   Grade 12 or GED (High school graduate)                               15006
##   College 1 year to 3 years (Some college or technical school)         25593
##   College 4 years or more (College graduate)                           73662
```

```
# Compare income and state
table(trimmed_brfss2013$income,
trimmed_brfss2013$state)
```

```
##
##                        0 Alabama Alaska Arizona Arkansas California Colorado
##   Less than $10,000    0     410    188     255      348       1075      457
##   Less than $15,000    0     495    210     257      405        898      523
##   Less than $20,000    0     543    246     315      495        758      798
##   Less than $25,000    0     596    289     395      528        727     1051
##   Less than $35,000    0     604    369     469      536        995     1247
##   Less than $50,000    0     679    525     587      647       1202     1709
##   Less than $75,000    0     746    757     529      574       1404     1993
##   $75,000 or more      0    1058   1572     816      821       3344     4166
##
##                      Connecticut Delaware District of Columbia Florida Georgia
##   Less than $10,000          295      208                  272    1937     509
##   Less than $15,000          297      218                  190    2167     493
##   Less than $20,000          418      301                  285    2875     658
##   Less than $25,000          505      435                  257    3348     726
##   Less than $35,000          577      494                  312    3717     906
##   Less than $50,000          795      687                  381    4294    1020
##   Less than $75,000         1048      685                  500    4064    1063
##   $75,000 or more           2624     1349                 2060    5978    1825
##
##                      Hawaii Idaho Illinois Indiana Iowa Kansas Kentucky
##   Less than $10,000    449   277      228     504  247    852      696
##   Less than $15,000    374   330      245     562  380   1030      666
##   Less than $20,000    557   412      383     807  530   1567      537
##   Less than $25,000    567   541      482     925  723   2049      567
##   Less than $35,000    834   711      583    1113  903   2518      869
##   Less than $50,000   1080   841      805    1331 1149   3245     1146
##   Less than $75,000   1136   813      881    1337 1213   3343     1253
##   $75,000 or more     2094  1004     1686    2041 1942   5515     1738
##
##                      Louisiana Maine Maryland Massachusetts Michigan Minnesota
##   Less than $10,000        308   376      340           673      597       444
##   Less than $15,000        362   507      415           742      614       507
##   Less than $20,000        420   608      646          1016      809       735
##   Less than $25,000        440   751      874          1155     1129      1083
##   Less than $35,000        511   897     1015          1246     1425      1366
##   Less than $50,000        622  1217     1322          1518     1685      1916
##   Less than $75,000        567  1250     1624          1828     1842      2255
##   $75,000 or more         1074  1691     4662          4486     2875      4218
##
##                      Mississippi Missouri Montana Nebraska Nevada New Hampshire
##   Less than $10,000          691      425     524      666    196           175
##   Less than $15,000          664      439     587      844    261           279
##   Less than $20,000          737      566     779     1144    345           343
##   Less than $25,000          665      685    1011     1669    466           478
##   Less than $35,000          776      778    1095     1974    490           506
##   Less than $50,000          798      887    1486     2673    608           809
##   Less than $75,000          773      871    1413     2500    751           862
##   $75,000 or more           1106     1211    1756     3652   1239          1732
##
```

```
##                     New Jersey New Mexico New York North Carolina North Dakota
##   Less than $10,000        528        656      498            476          217
##   Less than $15,000        496        647      500            610          279
##   Less than $20,000        797        922      618            766          387
##   Less than $25,000       1050        931      708            795          538
##   Less than $35,000       1007       1042      776            860          711
##   Less than $50,000       1350       1165      994           1036         1040
##   Less than $75,000       1760       1178     1011            928         1253
##   $75,000 or more         4497       1689     2473           1624         2315
##
##                     Ohio Oklahoma Oregon Pennsylvania Rhode Island
##   Less than $10,000  599      533    278          536          296
##   Less than $15,000  631      571    283          651          338
##   Less than $20,000  934      673    362          915          412
##   Less than $25,000 1194      806    496         1054          478
##   Less than $35,000 1272      884    615         1165          613
##   Less than $50,000 1570     1122    810         1407          776
##   Less than $75,000 1606     1067    881         1468          879
##   $75,000 or more   2459     1551   1433         2491         1711
##
##                     South Carolina South Dakota Tennessee Texas Utah Vermont
##   Less than $10,000            671          290       310   661  379     227
##   Less than $15,000            653          296       411   659  470     304
##   Less than $20,000            920          401       462   820  641     414
##   Less than $25,000            949          507       490   907  942     511
##   Less than $35,000           1163          730       540   954 1168     674
##   Less than $50,000           1281         1007       592  1192 1719     899
##   Less than $75,000           1327         1040       548  1188 2204    1041
##   $75,000 or more             2114         1487       727  2525 3622    1492
##
##                     Virginia Washington West Virginia Wisconsin Wyoming Guam
##   Less than $10,000      368        449           374       261     205  179
##   Less than $15,000      377        472           417       344     296   99
##   Less than $20,000      562        607           498       533     427  194
##   Less than $25,000      649        867           551       624     534  164
##   Less than $35,000      797       1043           643       789     590  261
##   Less than $50,000     1020       1481           699       958     837  269
##   Less than $75,000     1098       1595           739       987     982  205
##   $75,000 or more       2447       3183          1024      1328    1593  251
##
##                     Puerto Rico   80
##   Less than $10,000        1581    0
##   Less than $15,000         816    0
##   Less than $20,000         730    0
##   Less than $25,000         628    0
##   Less than $35,000         484    0
##   Less than $50,000         378    0
##   Less than $75,000         197    0
##   $75,000 or more           199    0
```

```
# Compare general health and state
table(trimmed_brfss2013$state,
trimmed_brfss2013$gen_hlth)
```

```
##
##                       Excellent Very good Good Fair Poor
##   0                           0         0    0    0    0
##   Alabama                   699      1347 1673  963  449
##   Alaska                    792      1440 1284  449  191
##   Arizona                   630      1146 1111  493  243
##   Arkansas                  558      1211 1417  754  414
##   California               2187      3287 2946 1453  530
##   Colorado                 2519      4495 3314 1210  406
##   Connecticut              1444      2400 1779  688  248
##   Delaware                  781      1454 1341  579  222
##   District of Columbia     1083      1450 1130  428  166
##   Florida                  4674      8403 8744 4345 2214
##   Georgia                  1189      2255 2222 1088  446
##   Hawaii                   1404      2136 2487  791  273
##   Idaho                     939      1641 1509  596  244
##   Illinois                  908      1773 1660  705  247
##   Indiana                  1224      2832 2773 1214  577
##   Iowa                     1202      2524 2245  829  287
##   Kansas                   3325      7119 6363 2420  892
##   Kentucky                  868      2302 2332 1286  684
##   Louisiana                 602      1162 1355  810  375
##   Maine                    1308      2717 2131  809  332
##   Maryland                 2142      3848 3197 1279  432
##   Massachusetts            2725      4219 3587 1561  572
##   Michigan                 1746      3986 3331 1367  546
##   Minnesota                2575      4760 3553 1203  433
##   Mississippi               826      1677 1955 1128  624
##   Missouri                  845      1886 1833  907  391
##   Montana                  1622      2893 2610 1041  485
##   Nebraska                 2649      5269 4795 1769  640
##   Nevada                    799      1485 1303  538  231
##   New Hampshire            1063      1961 1409  533  218
##   New Jersey               2303      3821 3441 1397  523
##   New Mexico               1411      2352 2666 1267  534
##   New York                 1469      2509 2267  980  353
##   North Carolina           1194      2156 2166 1055  524
##   North Dakota             1039      2524 2170  747  260
##   Ohio                     1693      3222 3267 1510  573
##   Oklahoma                 1082      2116 2338 1068  603
##   Oregon                    966      1907 1448  564  273
##   Pennsylvania             1592      3296 2966 1300  533
##   Rhode Island             1004      1896 1674  667  262
##   South Carolina           1528      2811 2796 1346  597
##   South Dakota             1099      2126 1670  625  238
##   Tennessee                 534      1220 1242  622  462
##   Texas                    1497      2497 2990 1348  574
##   Utah                     2470      4032 3140 1069  434
##   Vermont                  1222      2152 1458  516  214
##   Virginia                 1407      2466 2151  941  353
##   Washington               1777      3480 2910 1087  443
```

```
##   West Virginia              615      1424 1594  877  435
##   Wisconsin                  899      2105 1855  706  259
##   Wyoming                    975      1925 1638  635  291
##   Guam                       310       385  617  237   73
##   Puerto Rico                762       625 1678 1713  235
##   80                           0         0    0    0    0
```

Research question 1

```
# Comparing State and General Health and Sex
#table(trimmed_brfss2013$state,
#trimmed_brfss2013$gen_hlth)

trimmed_brfss2013 %>%
  group_by(gen_hlth) %>%
  summarise(count = n()) %>%
  arrange(desc(count))
```

```
## # A tibble: 5 × 2
##   gen_hlth   count
##   <fct>      <int>
## 1 Very good 138125
## 2 Good      127531
## 3 Excellent  74176
## 4 Fair       55513
## 5 Poor       23058
```

```
gen_hlth_prop_all <- with(trimmed_brfss2013, table(trimmed_brfss2013$gen_hlth)) %>%
prop.table()
gen_hlth_prop_all
```

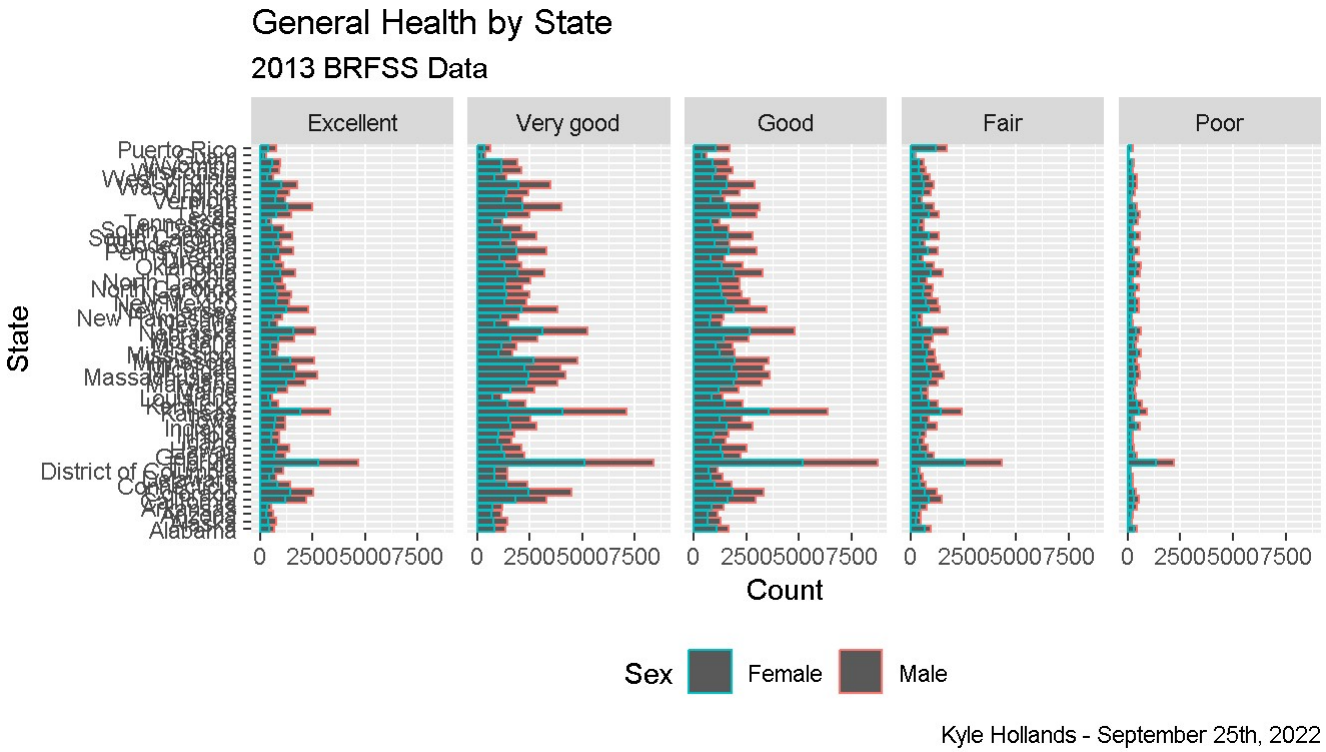
```
##
##  Excellent  Very good       Good       Fair       Poor
## 0.17728362 0.33012431 0.30480422 0.13267830 0.05510955
```

```
gen_hlth_prop_sep <- with(trimmed_brfss2013, table(state, gen_hlth)) %>%
prop.table(margin = 1)
gen_hlth_prop_sep
```

```
##                       gen_hlth
## state                   Excellent  Very good       Good       Fair       Poor
##   0
##   Alabama              0.13623075 0.26252193 0.32605730 0.18768271 0.08750731
##   Alaska               0.19056785 0.34648701 0.30895091 0.10803657 0.04595765
##   Arizona              0.17388904 0.31631245 0.30665195 0.13607508 0.06707149
##   Arkansas             0.12815802 0.27813505 0.32544786 0.17317409 0.09508498
##   California           0.21022782 0.31596655 0.28318754 0.13967125 0.05094684
##   Colorado             0.21090087 0.37633958 0.27746149 0.10130610 0.03399196
##   Connecticut          0.22015551 0.36590944 0.27123037 0.10489404 0.03781064
##   Delaware             0.17843272 0.33219100 0.30637423 0.13228239 0.05071967
##   District of Columbia 0.25440451 0.34061546 0.26544515 0.10054029 0.03899460
##   Florida              0.16469345 0.29608879 0.30810430 0.15310078 0.07801268
##   Georgia              0.16513889 0.31319444 0.30861111 0.15111111 0.06194444
##   Hawaii               0.19799746 0.30122691 0.35072627 0.11154985 0.03849951
##   Idaho                0.19050517 0.33292757 0.30614729 0.12091702 0.04950294
##   Illinois             0.17154733 0.33497072 0.31362176 0.13319479 0.04666541
##   Indiana              0.14199536 0.32853828 0.32169374 0.14083527 0.06693735
##   Iowa                 0.16960632 0.35614505 0.31677720 0.11697474 0.04049668
##   Kansas               0.16526666 0.35384462 0.31626820 0.12028431 0.04433620
##   Kentucky             0.11616702 0.30808351 0.31209850 0.17210921 0.09154176
##   Louisiana            0.13986989 0.26998141 0.31482342 0.18819703 0.08712825
##   Maine                0.17925175 0.37234480 0.29203782 0.11086748 0.04549815
##   Maryland             0.19654983 0.35309231 0.29335658 0.11736098 0.03964030
##   Massachusetts        0.21517688 0.33314908 0.28324384 0.12326279 0.04516740
##   Michigan             0.15907434 0.36315598 0.30348032 0.12454446 0.04974490
##   Minnesota            0.20560524 0.38007027 0.28369531 0.09605557 0.03457362
##   Mississippi          0.13301127 0.27004831 0.31481481 0.18164251 0.10048309
##   Missouri             0.14414875 0.32173320 0.31269191 0.15472535 0.06670078
##   Montana              0.18749278 0.33441221 0.30169923 0.12033291 0.05606288
##   Nebraska             0.17517524 0.34843275 0.31708769 0.11698188 0.04232244
##   Nevada               0.18342516 0.34090909 0.29912764 0.12350781 0.05303030
##   New Hampshire        0.20505401 0.37827932 0.27179784 0.10281636 0.04205247
##   New Jersey           0.20052242 0.33269482 0.29960818 0.12163692 0.04553766
##   New Mexico           0.17144593 0.28578372 0.32393682 0.15394897 0.06488457
##   New York             0.19385062 0.33109000 0.29915545 0.12932172 0.04658221
##   North Carolina       0.16828753 0.30387597 0.30528541 0.14869626 0.07385483
##   North Dakota         0.15415430 0.37448071 0.32195846 0.11083086 0.03857567
##   Ohio                 0.16492937 0.31388212 0.31826595 0.14710180 0.05582075
##   Oklahoma             0.15013182 0.29360344 0.32440683 0.14818926 0.08366866
##   Oregon               0.18728189 0.36971694 0.28072896 0.10934471 0.05292749
##   Pennsylvania         0.16434397 0.34024982 0.30618354 0.13420047 0.05502219
##   Rhode Island         0.18244594 0.34453934 0.30419771 0.12120661 0.04761039
##   South Carolina       0.16831901 0.30964970 0.30799736 0.14827054 0.06576338
##   South Dakota         0.19086488 0.36922543 0.29003126 0.10854463 0.04133380
##   Tennessee            0.13088235 0.29901961 0.30441176 0.15245098 0.11323529
##   Texas                0.16808893 0.28037278 0.33572872 0.15135863 0.06445093
##   Utah                 0.22162405 0.36177658 0.28174069 0.09591745 0.03894123
##   Vermont              0.21970514 0.38691118 0.26213592 0.09277238 0.03847537
##   Virginia             0.19226565 0.33697732 0.29393277 0.12858705 0.04823722
##   Washington           0.18325255 0.35887388 0.30009281 0.11209652 0.04568423
```

```
##   West Virginia        0.12436805 0.28796764 0.32234580 0.17735086 0.08796764
##   Wisconsin            0.15436126 0.36143544 0.31850962 0.12122253 0.04447115
##   Wyoming              0.17844070 0.35230600 0.29978038 0.11621523 0.05325769
##   Guam                 0.19112207 0.23736128 0.38039457 0.14611591 0.04500617
##   Puerto Rico          0.15200479 0.12467584 0.33472970 0.34171155 0.04687812
##   80
```

```
# Plot
ggplot(data = trimmed_brfss2013, aes(y = state)) +
  guides(col = guide_legend(reverse = TRUE)) +
  geom_bar(data = trimmed_brfss2013, aes(color = sex)) +
  facet_grid(. ~ gen_hlth) +
  theme(legend.position = "bottom") +
  labs(
    x = "Count", y = "State",
    title = "General Health by State",
    subtitle = "2013 BRFSS Data",
    caption = "Kyle Hollands - September 25th, 2022",
    color='Sex'
  )
```



```
  ggsave(
  'General Health by State.png',
  plot = last_plot(),
  scale = 1,
  width = 8,
  height = 8,
  dpi = 500,
  limitsize = TRUE,
  bg = NULL
  )
```

Research question 2

```
# Comparing General Health, Income, Education.
#table(trimmed_brfss2013$income,
#trimmed_brfss2013$gen_hlth,
#trimmed_brfss2013$education)

trimmed_brfss2013 %>%
  group_by(gen_hlth, income, education) %>%
  summarise(count = n()) %>%
  arrange(desc(income), desc(education), gen_hlth)
```

```
## `summarise()` has grouped output by 'gen_hlth', 'income'. You can override
## using the `.groups` argument.
```

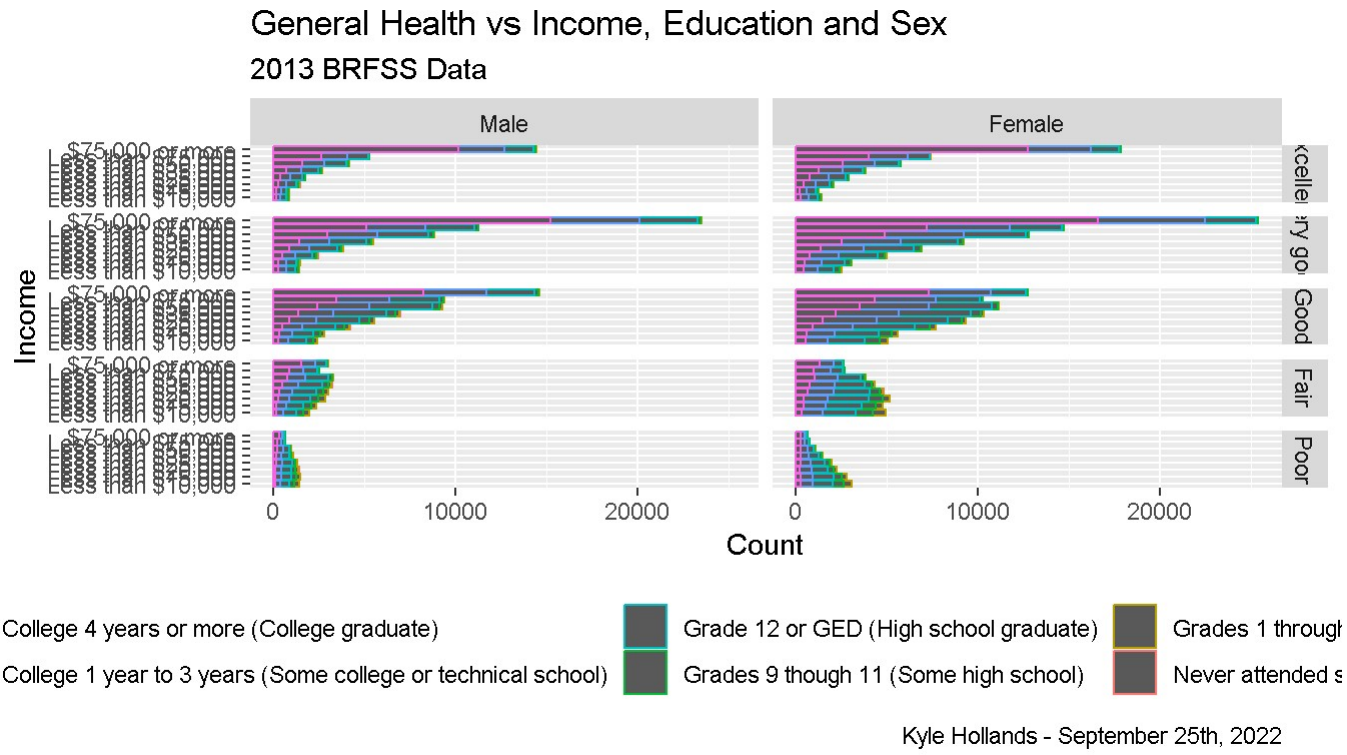
```
## # A tibble: 238 × 4
## # Groups:   gen_hlth, income [40]
##    gen_hlth  income          education                                      count
##    <fct>     <fct>           <fct>                                          <int>
##  1 Excellent $75,000 or more College 4 years or more (College graduate)    22922
##  2 Very good $75,000 or more College 4 years or more (College graduate)    31811
##  3 Good      $75,000 or more College 4 years or more (College graduate)    15502
##  4 Fair      $75,000 or more College 4 years or more (College graduate)     2843
##  5 Poor      $75,000 or more College 4 years or more (College graduate)      584
##  6 Excellent $75,000 or more College 1 year to 3 years (Some college or t…  5970
##  7 Very good $75,000 or more College 1 year to 3 years (Some college or t… 10810
##  8 Good      $75,000 or more College 1 year to 3 years (Some college or t…  6916
##  9 Fair      $75,000 or more College 1 year to 3 years (Some college or t…  1539
## 10 Poor      $75,000 or more College 1 year to 3 years (Some college or t…   358
## # … with 228 more rows
```

```
gen_hlth_vs_income_prop <- with(trimmed_brfss2013, table(income, gen_hlth)) %>%
prop.table(margin = 1)
gen_hlth_vs_income_prop
```

```
##                    gen_hlth
## income               Excellent  Very good       Good       Fair       Poor
##   Less than $10,000 0.09176788 0.15765658 0.29741208 0.27450980 0.17865365
##   Less than $15,000 0.07983146 0.17158873 0.31684286 0.26996727 0.16176969
##   Less than $20,000 0.10246044 0.21546148 0.34425898 0.23200878 0.10581033
##   Less than $25,000 0.11352133 0.25986985 0.35931550 0.18869607 0.07859725
##   Less than $35,000 0.13390378 0.30289816 0.35518440 0.15529547 0.05271818
##   Less than $50,000 0.16255346 0.35340972 0.33380668 0.11668789 0.03354226
##   Less than $75,000 0.19513657 0.40011067 0.30265767 0.08025270 0.02184238
##   $75,000 or more   0.27965735 0.42347495 0.23689539 0.04878429 0.01118802
```

```
#gen_hlth_vs_education_prop <- with(trimmed_brfss2013, table(gen_hlth, education)) %>%
#prop.table(margin = 1)
#gen_hlth_vs_education_prop

# Plot
ggplot(data = trimmed_brfss2013, aes(y = income)) +
  guides(col = guide_legend(reverse = TRUE)) +
  geom_bar(data = trimmed_brfss2013, aes(color = education)) +
  facet_grid(gen_hlth ~ sex) +
  theme(legend.position = "bottom") +
  labs(
    x = "Count", y = "Income",
    title = "General Health vs Income, Education and Sex",
    subtitle = "2013 BRFSS Data",
    caption = "Kyle Hollands - September 25th, 2022",
    color=""
  )
```



```
  ggsave(
  'General Health vs Income and Education.png',
  plot = last_plot(),
  scale = 1,
  width = 11,
  height = 8,
  dpi = 500,
  limitsize = FALSE,
  bg = NULL
  )
```

Research question 3

```
# Comparing state, interview type and completion type

#table(trimmed_brfss2013$int_type,
#trimmed_brfss2013$compl_type)

#trimmed_brfss2013 %>%
#  group_by(compl_type, int_type) %>%
#  summarise(count = n())

compl_perc <- with(trimmed_brfss2013, table(trimmed_brfss2013$compl_type)) %>%
prop.table()
compl_perc
```

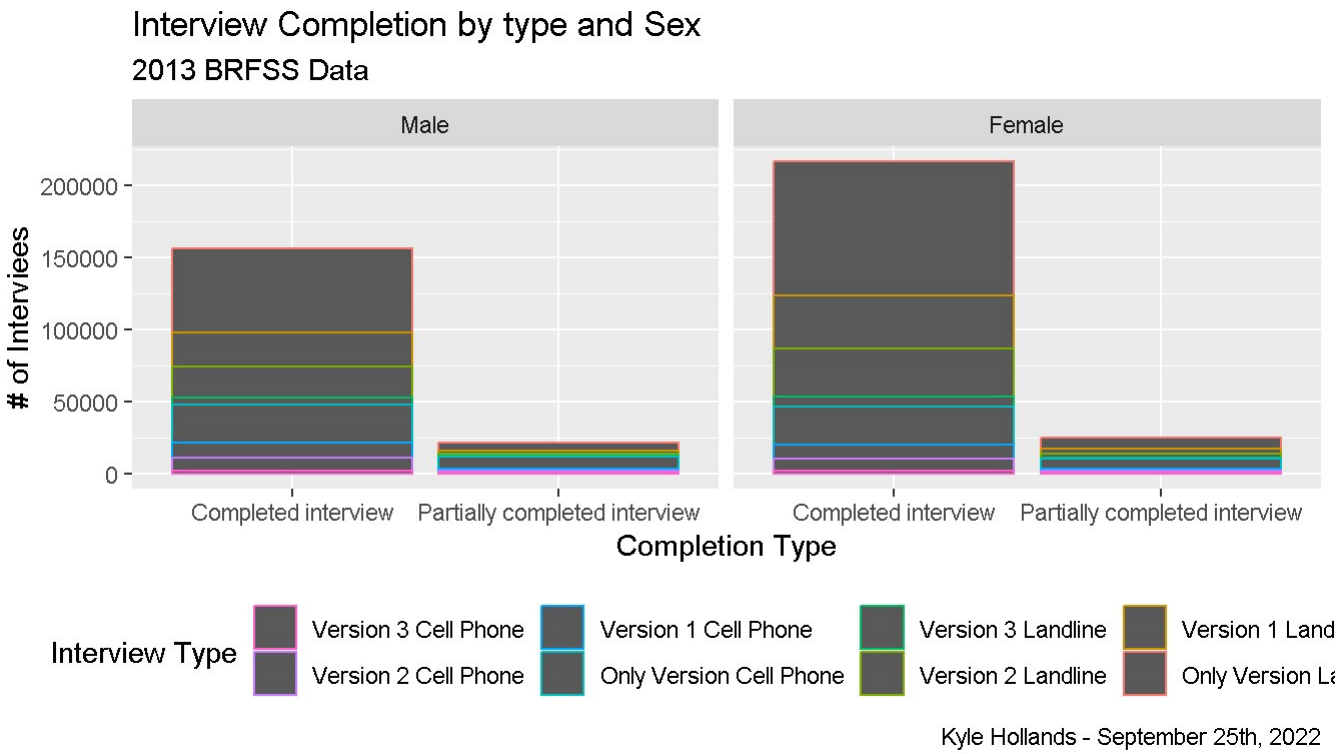
```
##
##           Completed interview Partially completed interview
##                     0.8907298                     0.1092702
```

```
compl_perc_sex <- with(trimmed_brfss2013, table(sex, compl_type)) %>%
prop.table(margin = 2)
compl_perc_sex
```

```
##         compl_type
## sex      Completed interview Partially completed interview
##   Male             0.4187918                     0.4639865
##   Female           0.5812082                     0.5360135
```

```
#compl_perc_state <- with(trimmed_brfss2013, table( state, compl_type)) %>%
#prop.table(margin = 1)
#compl_perc_state

# Plot
ggplot(data = trimmed_brfss2013, aes(x = compl_type)) +
  guides(col = guide_legend(reverse = TRUE)) +
  geom_bar(data = trimmed_brfss2013, aes(color = int_type)) +
  facet_grid(. ~ sex) +
  theme(legend.position = "bottom") +
  labs(
    x = "Completion Type", y = "# of Interviees",
    title = "Interview Completion by type and Sex",
    subtitle = "2013 BRFSS Data",
    caption = "Kyle Hollands - September 25th, 2022",
    color="Interview Type"
  )
```




```
ggsave(
  'Interview Completion by type and Sex.png',
  plot = last_plot(),
  scale = 1,
  width = 8,
  height = 8,
  dpi = 500,
  limitsize = FALSE,
  bg = NULL
  )
```