Project; Introduction to Probability and Data, Week 5

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Setup

Load packages

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.5.3
```

```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 3.5.3
```

```
library(corrplot)
```

```
## Warning: package 'corrplot' was built under R version 3.5.3
```

Load data

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

Part 1: Data

In this dataset, the sampling method was random and stratified sampling have been used to collect the data. Also, this is a observational study from different states in the USA that can be generalize to the whole population of world. However, no causality can be gain by this data. Also, this is very important when and what time these data collected, and it was good or bad day for the respondent.This is easily can effect the results and answers. Also, Number Of Days Physical and mental Health Not Good can be very bias respond because most of people dont remember.In addition, most

of people lie in the questionnaire about Chronic Health Conditions, and they can cause big bias. Finally, although this dataset collected by the random phone numbers, the people are not selected to this experiment. Therfore, no causation can be determined by this dataset and we just can measure the correlation and association between the variables.

Part 2: Research questions

Research quesion 1:

Are there any relationship between “general health, physical and mental health” with gender ‘sex’ and is there any association between sleep time and general health in Female and Male?

Research quesion 2:

In this question, we like to see whether "Employment status and Number Of Children in Household can effect the General health? Also, is there any association between Health Care Coverage and General health?

Research quesion 3:

Is there any relationship between Marital status, Education level and Income with general health?

Part 3: Exploratory data analysis

Research quesion 1

Lets explore the data:

```
dim(brfss2013)
```

```
## [1] 491775    330
```

```
str(brfss2013)
```

```
## 'data.frame':    491775 obs. of  330 variables:
##  $ X_state  : Factor w/ 55 levels "0","Alabama",..: 2 2 2 2 2
2 2 2 2 2 ...
##  $ fmonth   : Factor w/ 12 levels "January","February",..: 1 1
```

```
1 1 2 3 3 3 4 4 ...
##  $ idate    : int  1092013 1192013 1192013 1112013 2062013 327
2013 3222013 3042013 4242013 4242013 ...
##  $ imonth   : Factor w/ 12 levels "January","February",..: 1 1
1 1 2 3 3 3 4 4 ...
##  $ iday     : Factor w/ 31 levels "1","2","3","4",..: 9 19 19
11 6 27 22 4 24 24 ...
##  $ iyear    : Factor w/ 2 levels "2013","2014": 1 1 1 1 1 1 1
1 1 1 ...
##  $ dispcode : Factor w/ 2 levels "Completed interview",..: 1 1
1 1 1 1 1 1 1 1 ...
##  $ seqno    : int  2013000580 2013000593 2013000600 2013000606
2013000608 2013000630 2013000634 2013000644 2013001305 2013001338
...
##  $ X_psu    : int  2013000580 2013000593 2013000600 2013000606
2013000608 2013000630 2013000634 2013000644 2013001305 2013001338
...
##  $ ctelenum : Factor w/ 1 level "Yes": 1 1 1 1 1 1 1 1 1 1 ...
##  $ pvtresd1 : Factor w/ 2 levels "Yes","No": 1 1 1 1 1 1 1 1 1
1 ...
##  $ colghous : Factor w/ 1 level "Yes": NA NA NA NA NA NA NA NA
NA NA ...
##  $ stateres : Factor w/ 1 level "Yes": 1 1 1 1 1 1 1 1 1 1 ...
##  $ cellfon3 : Factor w/ 1 level "Not a cellular phone": 1 1 1
1 1 1 1 1 1 1 ...
##  $ ladult   : Factor w/ 2 levels "Yes, male respondent",..: NA
NA NA NA NA NA NA NA NA NA ...
##  $ numadult : Factor w/ 19 levels "1","2","3","4",..: 2 2 3 2
2 1 2 1 5 2 ...
##  $ nummen   : Factor w/ 14 levels "0","1","2","3",..: 2 2 3 2
2 1 2 1 5 2 ...
##  $ numwomen : Factor w/ 12 levels "0","1","2","3",..: 2 2 2 2
2 2 2 2 2 2 ...
##  $ genhlth  : Factor w/ 5 levels "Excellent","Very good",..: 4
3 3 2 3 2 4 3 1 3 ...
##  $ physhlth : int  30 0 3 2 10 0 1 5 0 0 ...
##  $ menthlth : int  29 0 2 0 2 0 15 0 0 0 ...
##  $ poorhlth : int  30 NA 0 0 0 NA 0 10 NA NA ...
##  $ hlthpln1 : Factor w/ 2 levels "Yes","No": 1 1 1 1 1 1 1 1 1
1 ...
##  $ persdoc2 : Factor w/ 3 levels "Yes, only one",..: 1 1 1 1 1
1 2 1 1 1 ...
##  $ medcost  : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ checkup1 : Factor w/ 5 levels "Within past year",..: 1 1 1
```

```
2 4 1 1 1 1 1 ...
##  $ sleptim1 : int  NA 6 9 8 6 8 7 6 8 8 ...
##  $ bphigh4  : Factor w/ 4 levels "Yes","Yes, but female told o
nly during pregnancy",..: 1 3 3 3 1 1 1 1 3 3 ...
##  $ bpmeds   : Factor w/ 2 levels "Yes","No": 1 NA NA NA 2 1 1
1 NA NA ...
##  $ bloodcho : Factor w/ 2 levels "Yes","No": 1 1 1 1 1 1 1 1 1
1 ...
##  $ cholchk  : Factor w/ 4 levels "Within past year",..: 1 1 4
1 2 1 1 1 1 1 ...
##  $ toldhi2  : Factor w/ 2 levels "Yes","No": 1 2 2 1 2 1 2 1 1
2 ...
##  $ cvdinfr4 : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ cvdcrhd4 : Factor w/ 2 levels "Yes","No": NA 2 2 2 2 2 2 1
2 2 ...
##  $ cvdstrk3 : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ asthma3  : Factor w/ 2 levels "Yes","No": 1 2 2 2 1 2 2 2 2
2 ...
##  $ asthnow  : Factor w/ 2 levels "Yes","No": 1 NA NA NA 2 NA N
A NA NA NA ...
##  $ chcscncr : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ chcocncr : Factor w/ 2 levels "Yes","No": 2 2 2 2 1 2 2 2 2
2 ...
##  $ chccopd1 : Factor w/ 2 levels "Yes","No": 1 2 2 2 2 2 2 2 2
2 ...
##  $ havarth3 : Factor w/ 2 levels "Yes","No": 1 2 1 2 2 2 1 1 1
2 ...
##  $ addepev2 : Factor w/ 2 levels "Yes","No": 1 1 1 2 2 2 2 2 2
2 ...
##  $ chckidny : Factor w/ 2 levels "Yes","No": 1 2 2 2 2 2 2 2 2
2 ...
##  $ diabete3 : Factor w/ 4 levels "Yes","Yes, but female told o
nly during pregnancy",..: 3 3 3 3 3 3 3 3 3 3 ...
##  $ veteran3 : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ marital  : Factor w/ 6 levels "Married","Divorced",..: 2 1
1 1 1 2 1 3 1 1 ...
##  $ children : int  0 2 0 0 0 0 1 0 1 0 ...
##  $ educa    : Factor w/ 6 levels "Never attended school or onl
y kindergarten",..: 6 5 6 4 6 6 4 5 6 4 ...
##  $ employ1  : Factor w/ 8 levels "Employed for wages",..: 7 1
1 7 7 1 1 7 7 5 ...
```

```
##  $ income2  : Factor w/ 8 levels "Less than $10,000",..: 7 8 8
7 6 8 NA 6 8 4 ...
##  $ weight2  : Factor w/ 570 levels "",".b","100",..: 154 30 63
31 169 128 9 1 139 73 ...
##  $ height3  : int  507 510 504 504 600 503 500 505 602 505 ...
##  $ numhhol2 : Factor w/ 2 levels "Yes","No": 1 2 2 2 2 1 2 2 2
2 ...
##  $ numphon2 : Factor w/ 6 levels "1 residential telephone numb
er",..: 2 NA NA NA NA 1 NA NA NA NA ...
##  $ cpdemo1  : Factor w/ 2 levels "Yes","No": 1 1 1 1 1 1 1 1 1
1 ...
##  $ cpdemo4  : int  10 70 70 75 0 70 40 1 60 50 ...
##  $ internet : Factor w/ 2 levels "Yes","No": 1 1 1 1 1 1 1 1 1
1 ...
##  $ renthom1 : Factor w/ 3 levels "Own","Rent","Other arrangeme
nt": 1 1 1 1 1 1 1 2 1 1 ...
##  $ sex      : Factor w/ 2 levels "Male","Female": 2 2 2 2 1 2
2 2 1 2 ...
##  $ pregnant : Factor w/ 2 levels "Yes","No": NA NA NA NA NA NA
2 NA NA NA ...
##  $ qlactlm2 : Factor w/ 2 levels "Yes","No": 1 2 1 2 2 2 1 1 2
2 ...
##  $ useequip : Factor w/ 2 levels "Yes","No": 1 2 2 2 2 2 2 2 2
2 ...
##  $ blind    : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ decide   : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ diffwalk : Factor w/ 2 levels "Yes","No": 1 2 1 2 2 2 2 1 2
2 ...
##  $ diffdres : Factor w/ 2 levels "Yes","No": 2 2 2 2 2 2 2 2 2
2 ...
##  $ diffalon : Factor w/ 2 levels "Yes","No": 1 2 2 2 2 2 2 2 2
2 ...
##  $ smoke100 : Factor w/ 2 levels "Yes","No": 1 2 1 2 1 2 1 1 2
2 ...
##  $ smokday2 : Factor w/ 3 levels "Every day","Some days",..: 3
NA 2 NA 3 NA 3 1 NA NA ...
##  $ stopsmk2 : Factor w/ 2 levels "Yes","No": NA NA 1 NA NA NA
NA 2 NA NA ...
##  $ lastsmk2 : Factor w/ 8 levels "Within the past month",..: 7
NA NA NA 1 NA 5 NA NA NA ...
##  $ usenow3  : Factor w/ 3 levels "Every day","Some days",..: 3
3 3 3 3 3 3 3 1 3 ...
##  $ alcday5  : int  201 0 220 208 210 0 201 202 101 0 ...
```

```
##  $ avedrnk2 : int  2 NA 4 2 2 NA 1 1 1 NA ...
##  $ drnk3ge5 : int  0 NA 20 0 0 NA 0 0 0 NA ...
##  $ maxdrnks : int  2 NA 10 2 3 NA 1 1 2 NA ...
##  $ fruitju1 : int  304 305 301 202 0 205 320 0 0 202 ...
##  $ fruit1   : int  104 301 203 306 302 206 325 320 101 202 ...
##  $ fvbeans  : int  303 310 202 202 101 0 330 360 202 203 ...
##  $ fvgreen  : int  310 203 202 310 310 203 315 315 203 201 ...
##  $ fvorang  : int  303 202 310 305 303 0 310 325 0 201 ...
##  $ vegetab1 : int  NA 203 330 204 101 207 310 308 101 203 ...
##  $ exerany2 : Factor w/ 2 levels "Yes","No": 2 1 2 1 2 1 1 1 1
1 ...
##  $ exract11 : Factor w/ 75 levels "Active Gaming Devices (Wii
Fit, Dance, Dance revolution)",..: NA 64 NA 64 NA 6 64 64 7 64 ..
.
##  $ exeroft1 : int  NA 105 NA 205 NA 102 220 102 102 220 ...
##  $ exerhmm1 : int  NA 20 NA 30 NA 15 100 15 100 30 ...
##  $ exract21 : Factor w/ 76 levels "Active Gaming Devices (Wii
Fit, Dance, Dance revolution)",..: NA 71 NA 75 NA 18 75 75 75 18
...
##  $ exeroft2 : int  NA 101 NA NA NA 102 NA NA NA 101 ...
##  $ exerhmm2 : int  NA 10 NA NA NA 30 NA NA NA 100 ...
##  $ strength : int  0 0 0 0 0 0 205 0 102 0 ...
##  $ lmtjoin3 : Factor w/ 2 levels "Yes","No": 1 NA 1 NA NA NA 2
1 2 NA ...
##  $ arthdis2 : Factor w/ 2 levels "Yes","No": 1 NA 1 NA NA NA 1
2 2 NA ...
##  $ arthsocl : Factor w/ 3 levels "A lot","A little",..: 1 NA 2
NA NA NA 3 1 3 NA ...
##  $ joinpain : int  7 NA 5 NA NA NA 3 8 4 NA ...
##  $ seatbelt : Factor w/ 6 levels "Always","Nearly always",..:
1 1 1 1 1 1 1 1 2 1 ...
##  $ flushot6 : Factor w/ 2 levels "Yes","No": 2 1 1 2 2 1 2 1 1
2 ...
##  $ flshtmy2 : Factor w/ 26 levels "January 2012",..: NA 10 13
NA NA NA NA 10 10 NA ...
##  $ tetanus  : Factor w/ 4 levels "Yes, received Tdap",..: 4 1
1 4 4 4 4 4 1 4 ...
##  $ pneuvac3 : Factor w/ 2 levels "Yes","No": 1 2 2 2 2 1 2 2 2
2 ...
##   [list output truncated]
```

```
names(brfss2013)
```

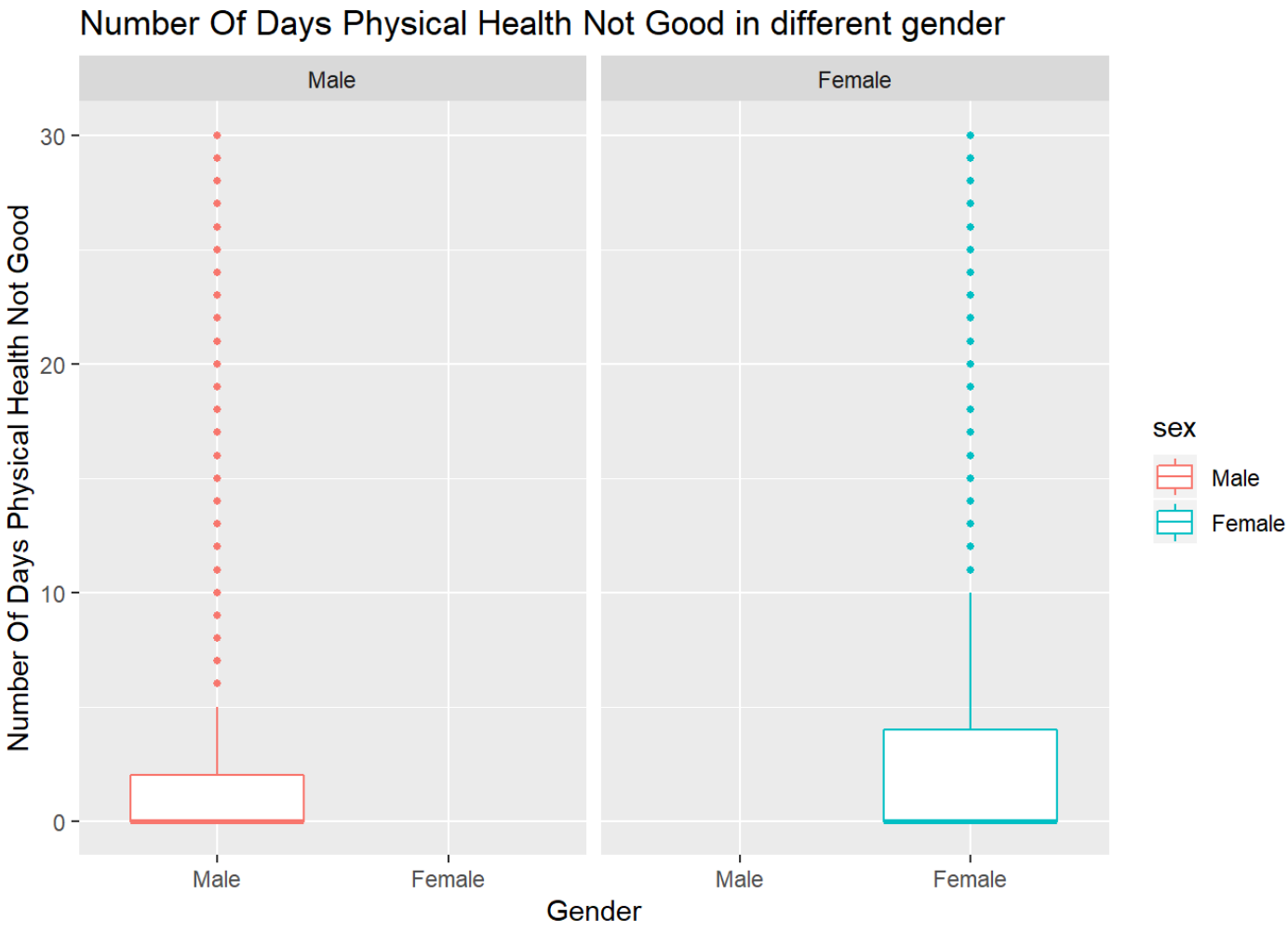
```
##   [1] "X_state"   "fmonth"    "idate"     "imonth"    "iday"
```

```
##   [6] "iyear"     "dispcode"  "seqno"     "X_psu"     "ctelenu
m"
##  [11] "pvtresd1"  "colghous"  "stateres"  "cellfon3"  "ladult"
##  [16] "numadult"  "nummen"    "numwomen"  "genhlth"   "physhlt
h"
##  [21] "menthlth"  "poorhlth"  "hlthpln1"  "persdoc2"  "medcost
"
##  [26] "checkup1"  "sleptim1"  "bphigh4"   "bpmeds"    "bloodch
o"
##  [31] "cholchk"   "toldhi2"   "cvdinfr4"  "cvdcrhd4"  "cvdstrk
3"
##  [36] "asthma3"   "asthnow"   "chcscncr"  "chcocncr"  "chccopd
1"
##  [41] "havarth3"  "addepev2"  "chckidny"  "diabete3"  "veteran
3"
##  [46] "marital"   "children"  "educa"     "employ1"   "income2
"
##  [51] "weight2"   "height3"   "numhhol2"  "numphon2"  "cpdemo1
"
##  [56] "cpdemo4"   "internet"  "renthom1"  "sex"       "pregnan
t"
##  [61] "qlactlm2"  "useequip"  "blind"     "decide"    "diffwal
k"
##  [66] "diffdres"  "diffalon"  "smoke100"  "smokday2"  "stopsmk
2"
##  [71] "lastsmk2"  "usenow3"   "alcday5"   "avedrnk2"  "drnk3ge
5"
##  [76] "maxdrnks"  "fruitju1"  "fruit1"    "fvbeans"   "fvgreen
"
##  [81] "fvorang"   "vegetab1"  "exerany2"  "exract11"  "exeroft
1"
##  [86] "exerhmm1"  "exract21"  "exeroft2"  "exerhmm2"  "strengt
h"
##  [91] "lmtjoin3"  "arthdis2"  "arthsocl"  "joinpain"  "seatbel
t"
##  [96] "flushot6"  "flshtmy2"  "tetanus"   "pneuvac3"  "hivtst6
"
## [101] "hivtstd3"  "whrtst10"  "pdiabtst"  "prediab1"  "diabage
2"
## [106] "insulin"   "bldsugar"  "feetchk2"  "doctdiab"  "chkhemo
3"
## [111] "feetchk"   "eyeexam"   "diabeye"   "diabedu"   "painact
2"
## [116] "qlmentl2"  "qlstres2"  "qlhlth2"   "medicare"  "hlthcvr
g"
```

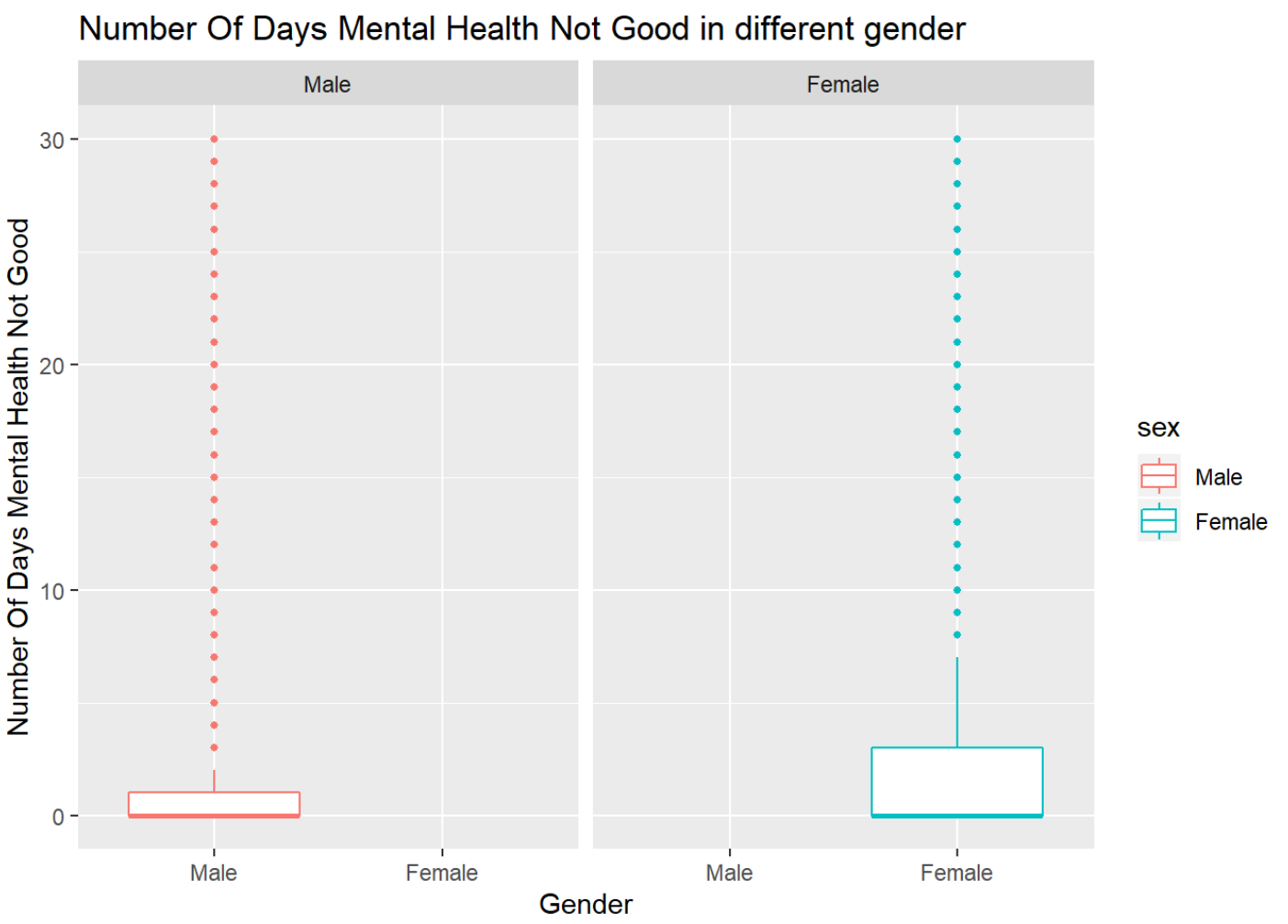
```
## [121] "delaymed"  "dlyother"  "nocov121"  "lstcovrg"  "drvisit
s"
## [126] "medscost"  "carercvd"  "medbills"  "ssbsugar"  "ssbfrut
2"
## [131] "wtchsalt"  "longwtch"  "dradvise"  "asthmage"  "asattac
k"
## [136] "aservist"  "asdrvist"  "asrchkup"  "asactlim"  "asympto
m"
## [141] "asnoslep"  "asthmed3"  "asinhalr"  "harehab1"  "strehab
1"
## [146] "cvdasprn"  "aspunsaf"  "rlivpain"  "rduchart"  "rducstr
k"
## [151] "arttoday"  "arthwgt"   "arthexer"  "arthedu"   "imfvpla
c"
## [156] "hpvadvc2"  "hpvadsht"  "hadmam"    "howlong"   "profexa
m"
## [161] "lengexam"  "hadpap2"   "lastpap2"  "hadhyst2"  "bldstoo
l"
## [166] "lstblds3"  "hadsigm3"  "hadsgco1"  "lastsig3"  "pcpsaad
2"
## [171] "pcpsadi1"  "pcpsare1"  "psatest1"  "psatime"   "pcpsars
1"
## [176] "pcpsade1"  "pcdmdecn"  "rrclass2"  "rrcognt2"  "rratwrk
2"
## [181] "rrhcare3"  "rrphysm2"  "rremtsm2"  "misnervs"  "mishopl
s"
## [186] "misrstls"  "misdeprd"  "miseffrt"  "miswtles"  "misnowr
k"
## [191] "mistmnt"   "mistrhlp"  "misphlpf"  "scntmony"  "scntmea
l"
## [196] "scntpaid"  "scntwrk1"  "scntlpad"  "scntlwk1"  "scntvot
1"
## [201] "rcsgendr"  "rcsrltn2"  "casthdx2"  "casthno2"  "emtsupr
t"
## [206] "lsatisfy"  "ctelnum1"  "cellfon2"  "cadult"    "pvtresd
2"
## [211] "cclghous"  "cstate"    "landline"  "pctcell"   "qstver"
## [216] "qstlang"   "mscode"    "X_ststr"   "X_strwt"   "X_rawra
ke"
## [221] "X_wt2rake" "X_imprace" "X_impnph"  "X_impeduc" "X_impmr
tl"
## [226] "X_imphome" "X_chispnc" "X_crace1"  "X_impcage" "X_impcr
ac"
## [231] "X_impcsex" "X_cllcpwt" "X_dualuse" "X_dualcor" "X_llcpw
t2"
```

```
## [236] "X_llcpwt"  "X_rfhlth"  "X_hcvu651" "X_rfhype5" "X_cholc
hk"
## [241] "X_rfchol"  "X_ltasth1" "X_casthm1" "X_asthms1" "X_drdxa
r1"
## [246] "X_prace1"  "X_mrace1"  "X_hispanc" "X_race"    "X_raceg
21"
## [251] "X_racegr3" "X_race_g1" "X_ageg5yr" "X_age65yr" "X_age_g
"
## [256] "htin4"     "htm4"      "wtkg3"     "X_bmi5"    "X_bmi5c
at"
## [261] "X_rfbmi5"  "X_chldcnt" "X_educag"  "X_incomg"  "X_smoke
r3"
## [266] "X_rfsmok3" "drnkany5"  "drocdy3_"  "X_rfbing5" "X_drnkd
y4"
## [271] "X_drnkmo4" "X_rfdrhv4" "X_rfdrmn4" "X_rfdrwm4" "ftjuda1
_"
## [276] "frutda1_"  "beanday_"  "grenday_"  "orngday_"  "vegeda1
_"
## [281] "X_misfrtn" "X_misvegn" "X_frtresp" "X_vegresp" "X_fruts
um"
## [286] "X_vegesum" "X_frtlt1"  "X_veglt1"  "X_frt16"   "X_veg23
"
## [291] "X_fruitex" "X_vegetex" "X_totinda" "metvl11_"  "metvl21
_"
## [296] "maxvo2_"   "fc60_"     "actin11_"  "actin21_"  "padur1_
"
## [301] "padur2_"   "pafreq1_"  "pafreq2_"  "X_minac11" "X_minac
21"
## [306] "strfreq_"  "pamiss1_"  "pamin11_"  "pamin21_"  "pa1min_
"
## [311] "pavig11_"  "pavig21_"  "pa1vigm_"  "X_pacat1"  "X_paind
x1"
## [316] "X_pa150r2" "X_pa300r2" "X_pa30021" "X_pastrng" "X_parec
1"
## [321] "X_pastae1" "X_lmtact1" "X_lmtwrk1" "X_lmtscl1" "X_rfsea
t2"
## [326] "X_rfseat3" "X_flshot6" "X_pneumo2" "X_aidtst3" "X_age80
"
```

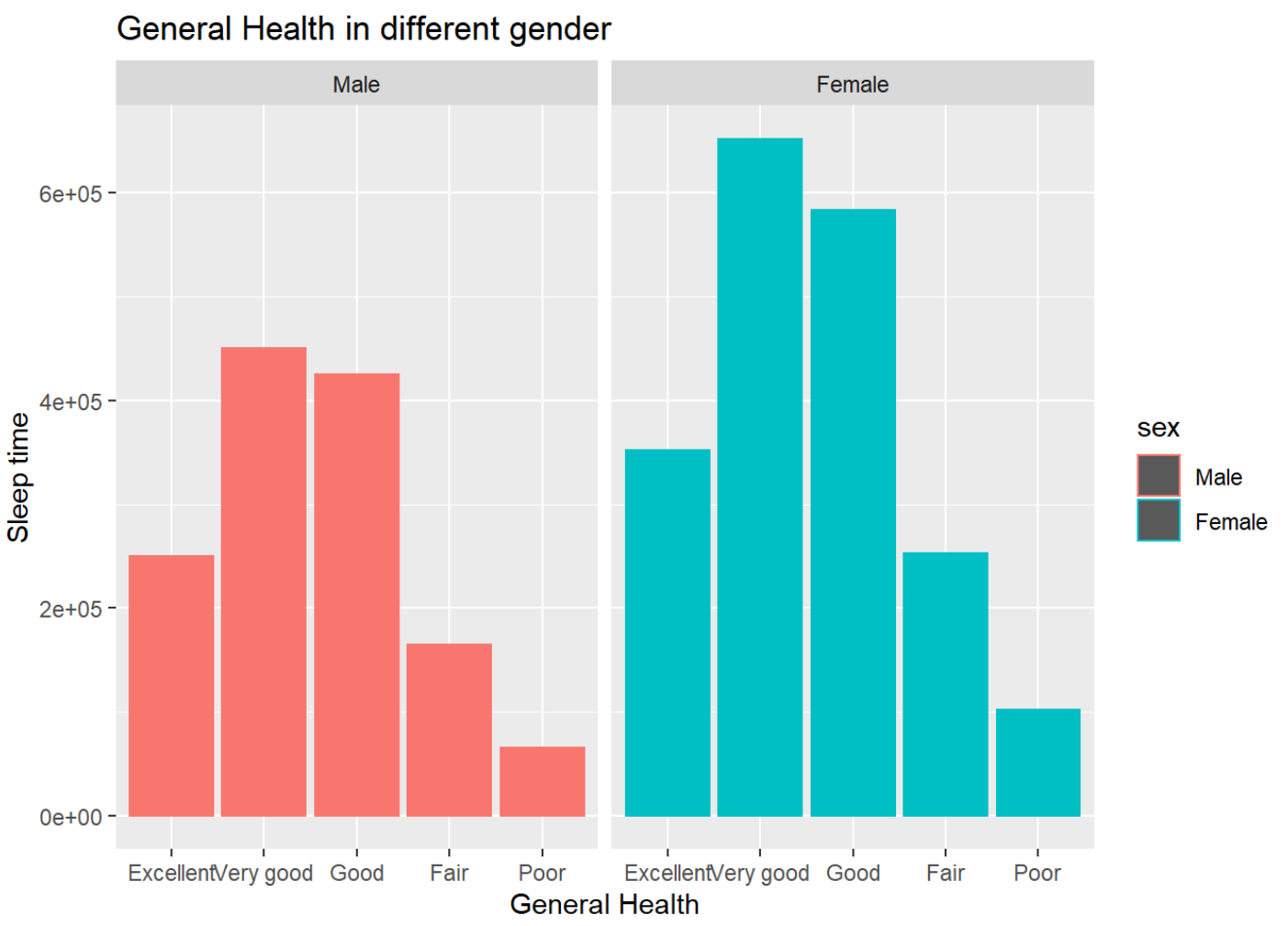
```
brfss <- brfss2013 %>%filter(menthlth != "NA") %>% filter(physhlt
h != "NA")%>% filter(genhlth!= "NA") %>% filter(sleptim1 != "NA")
%>% filter(sex != "NA")

ggplot(brfss , aes(x = sex, y =physhlth, color=sex )) + geom_boxp
lot(outlier.size = 1)+
  ggtitle("Number Of Days Physical Health Not Good in different g
ender")+xlab(" Gender ") +
  ylab("Number Of Days Physical Health Not Good")+facet_wrap(~sex
)
```




```
ggplot(brfss , aes(x = sex, y =menthlth, color=sex )) + geom_boxp
lot(outlier.size = 1)+
  ggtitle("Number Of Days Mental Health Not Good in different gen
der")+xlab(" Gender ") +
  ylab("Number Of Days Mental Health Not Good")+facet_wrap(~sex)
```



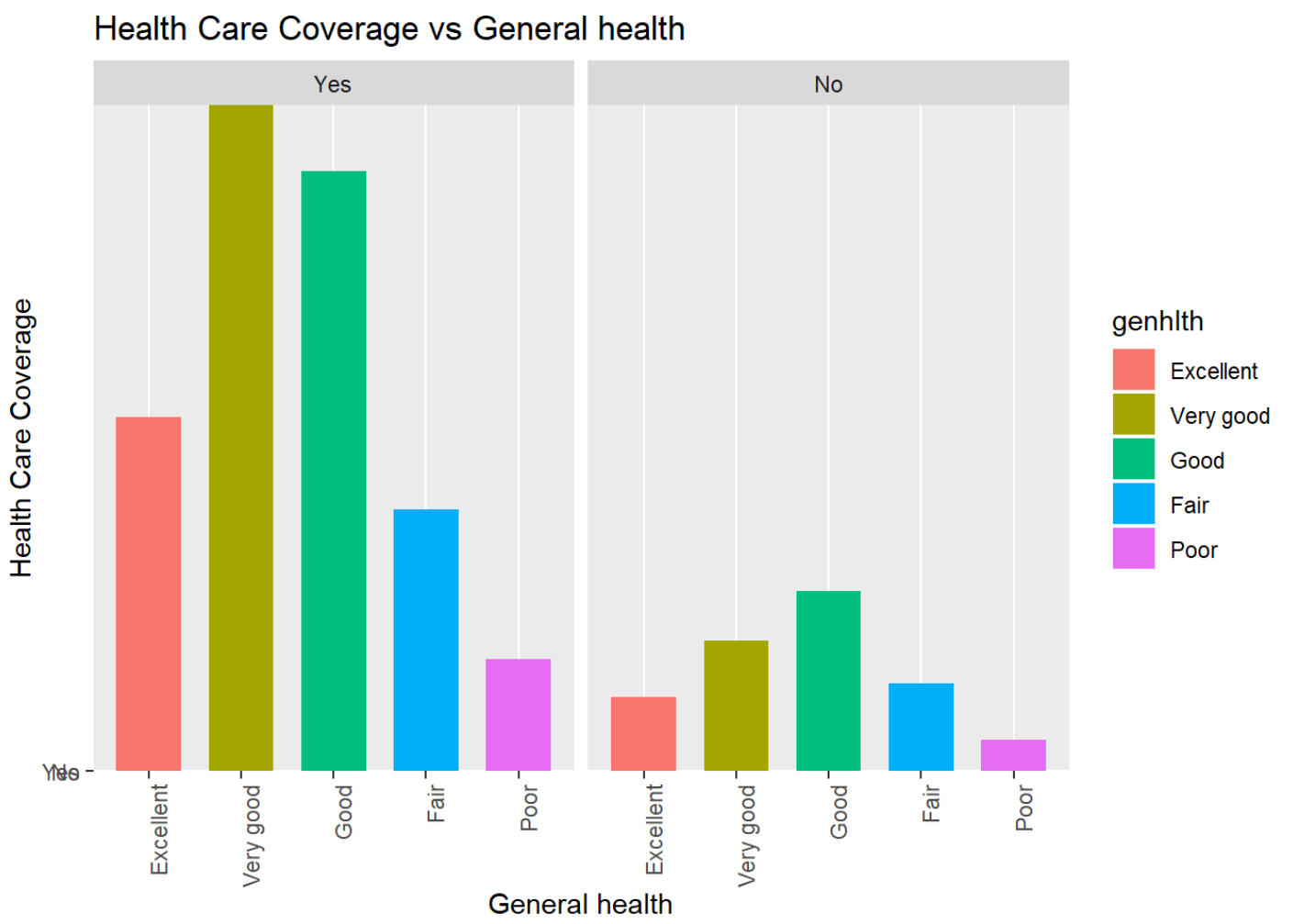

```
ggplot(brfss , aes(x = genhlth, y =sleptim1, color=sex )) + geom_
bar(stat = "identity")+
  ggtitle("General Health in different gender")+xlab("General Hea
lth") +
  ylab("Sleep time")+facet_wrap(~sex)
```



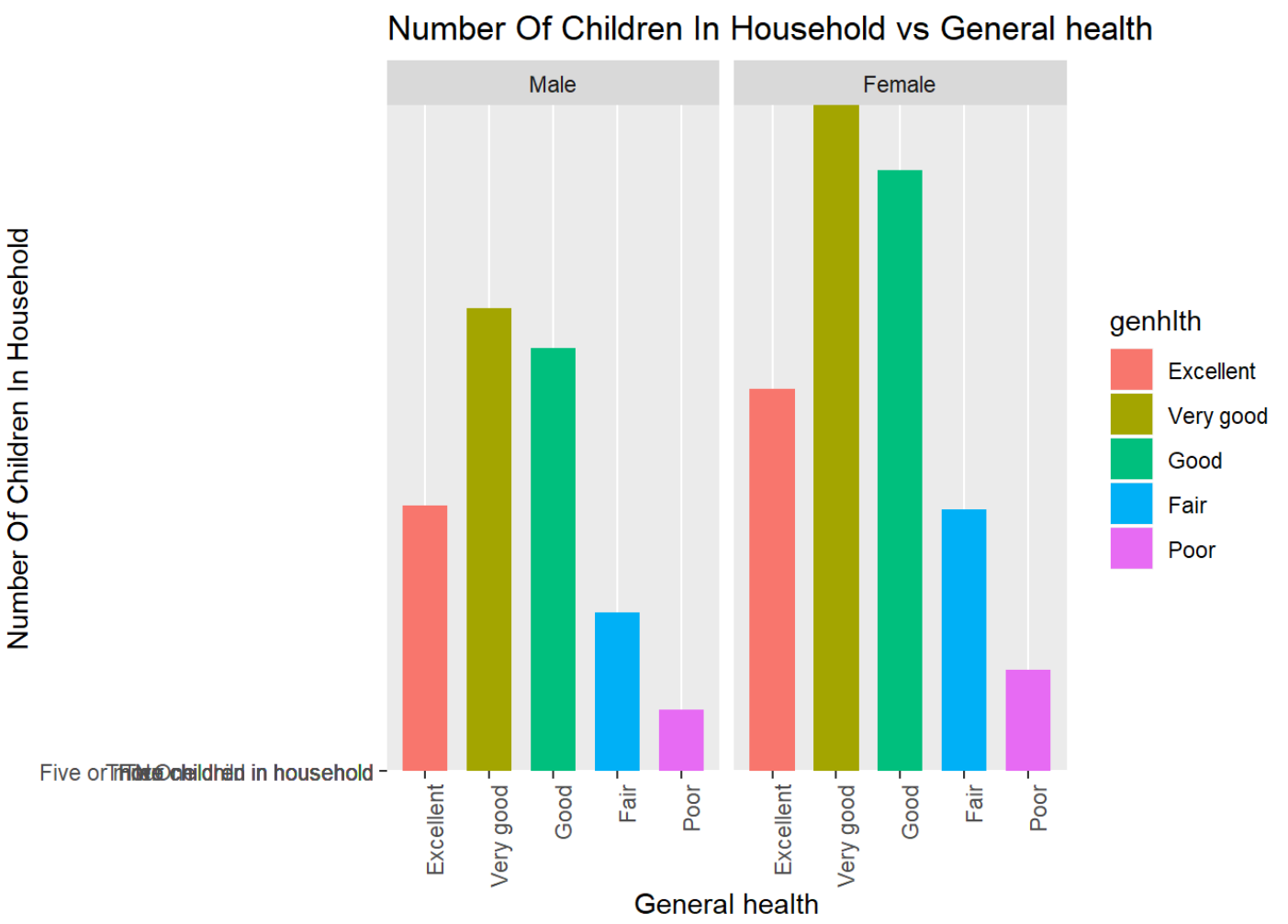
Based on our figures, mental and physical health in females are higher compare to the men. In addition, general health in Females are higher than Male due to higher value of sleep times, and general health are mostly between Fair and Excellent, and number of poor general health is very low in Female.

Research quesion 2

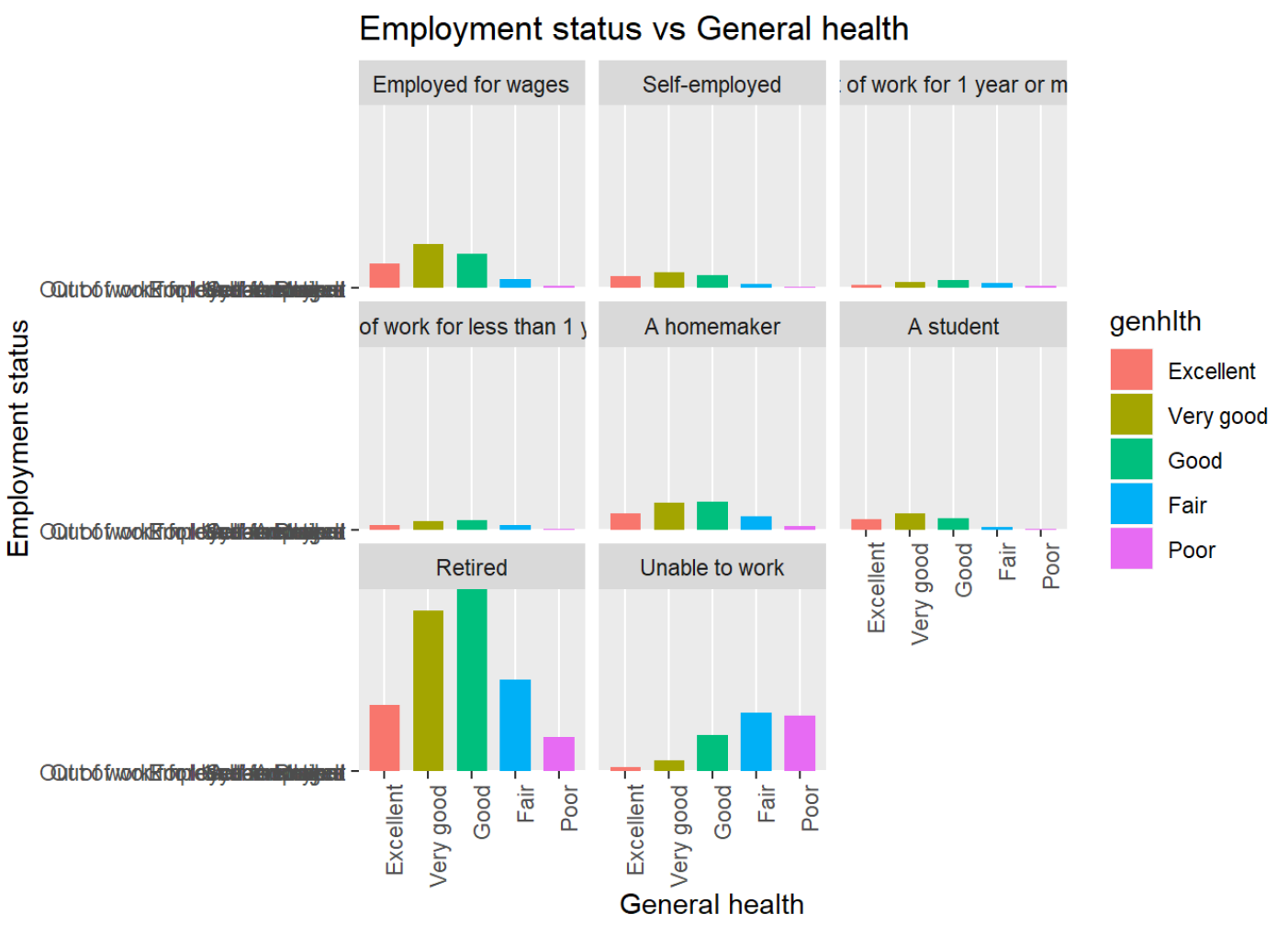
```
brfss2 <- brfss2013 %>%filter(hlthpln1 != "NA") %>% filter(X_chld
cnt != "NA")%>% filter(genhlth!= "NA") %>% filter(employ1 != "NA"
) %>% filter(sex != "NA")

ggplot(brfss2, aes(x = genhlth, y =hlthpln1, fill=genhlth )) + ge
om_bar(stat="identity", width=0.7)+
  ggtitle("Health Care Coverage vs General health")+
  xlab(" General health ") + ylab("Health Care Coverage")+ facet_
wrap(~hlthpln1)+
  theme(axis.text.x = element_text(angle = 90, hjust = 1))
```




```
ggplot(brfss2, aes(x = genhlth, y =X_chldcnt, fill=genhlth )) + g
eom_bar(stat="identity", width=0.7)+
  ggtitle("Number Of Children In Household vs General health")+
  xlab(" General health ") + ylab("Number Of Children In Househol
d")+ facet_wrap(~sex)+
  theme(axis.text.x = element_text(angle = 90, hjust = 1))
```



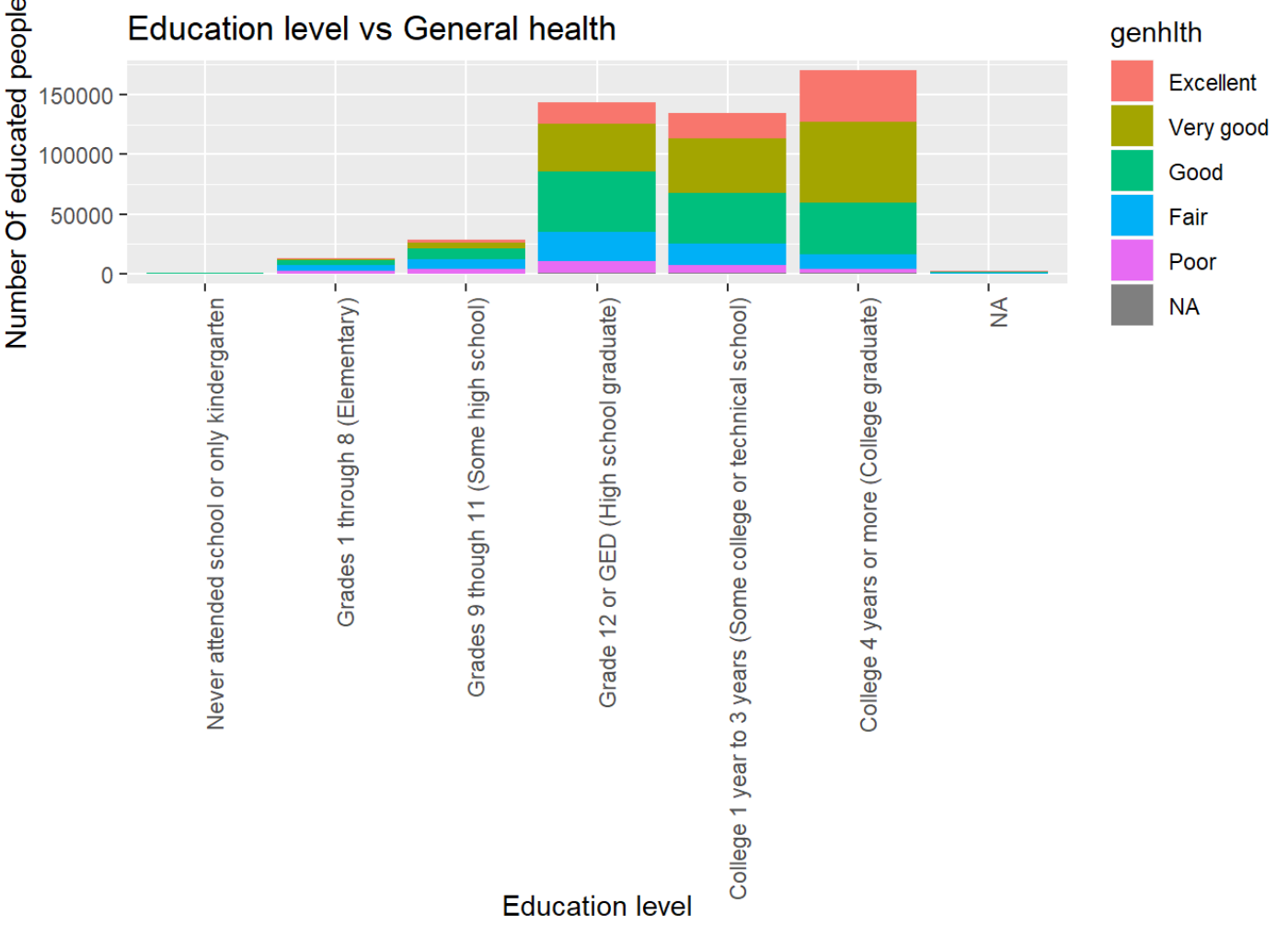

```
ggplot(brfss2, aes(x = genhlth, y =employ1, fill=genhlth )) + geo
m_bar(stat="identity", width=0.7)+
  ggtitle("Employment status vs General health")+
  xlab(" General health ") + ylab("Employment status")+ facet_wra
p(~employ1)+
  theme(axis.text.x = element_text(angle = 90, hjust = 1))
```



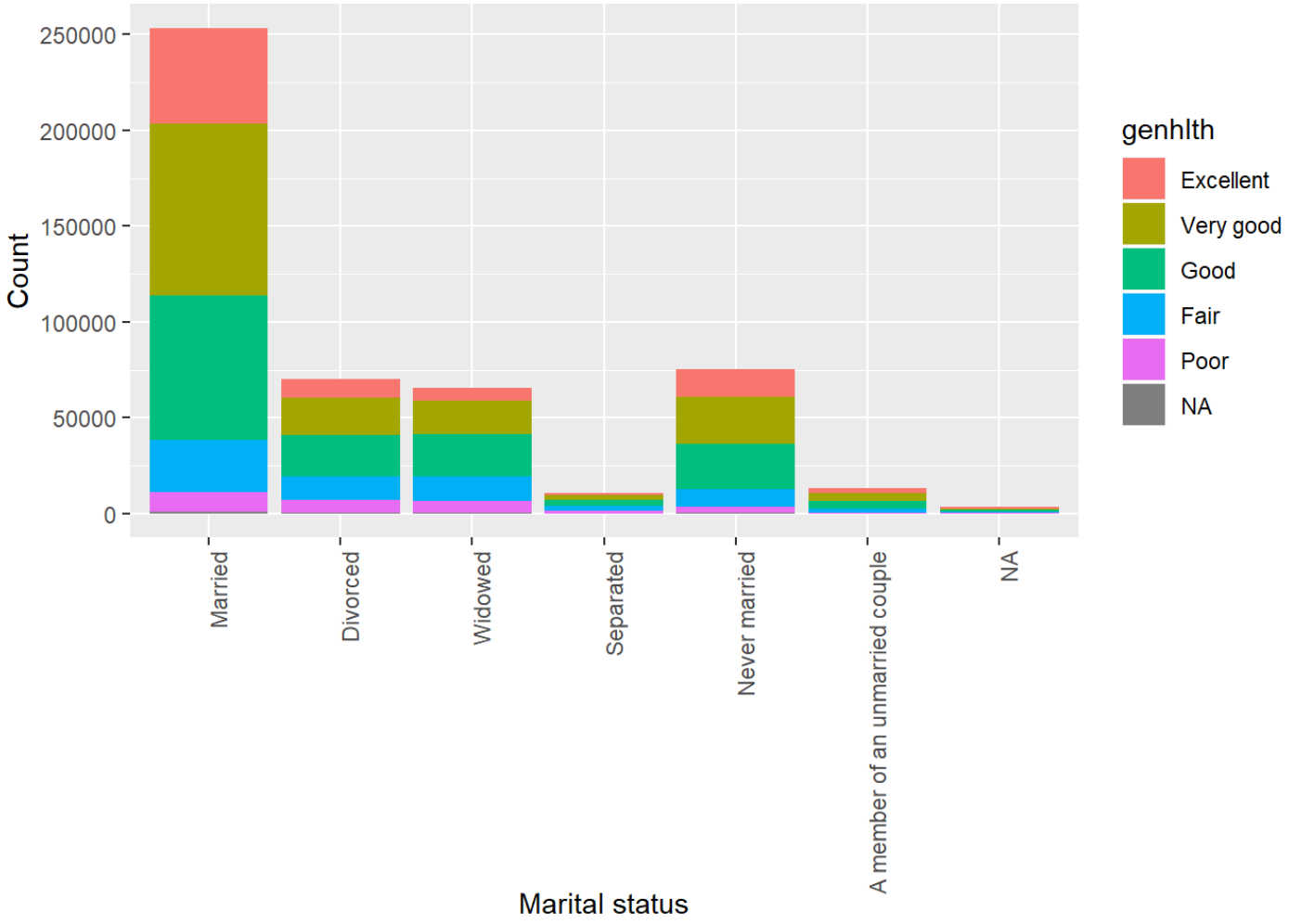
Based on these data, cases with Health Care Coverage are generally healthier (probably go to the doctor more) compare to the people that do not have Health Care Coverage. On the other hand, number of children have different effect on general health between female and male, generally female are healthier compare to man with higher number of childeren. Finally, regarding employment status retired people and employed cases have the better general health and cases that are out of the work have poor general health.

Research quesion 3

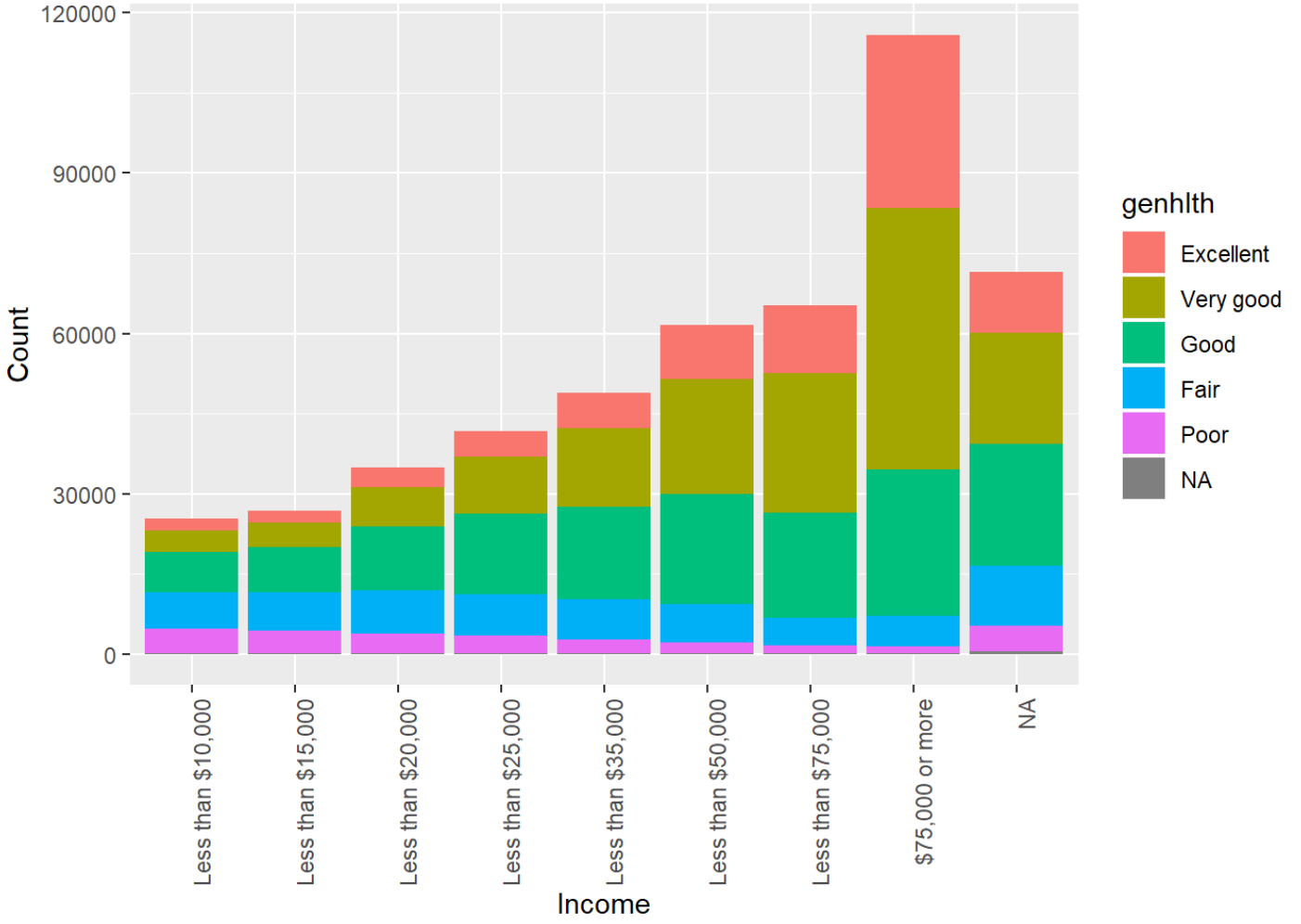
```
ggplot(brfss2013)+geom_bar(aes(x=educa, fill=genhlth))+
  ggtitle("Education level vs General health")+
  xlab("Education level") + ylab("Number Of educated people")+the
me(axis.text.x = element_text(angle = 90, hjust = 1))
```




```
ggplot(brfss2013)+geom_bar(aes(x=marital, fill=genhlth))+
  xlab("Marital status") + ylab("Count")+theme(axis.text.x = elem
ent_text(angle = 90, hjust = 1))
```




```
ggplot(brfss2013)+geom_bar(aes(x=income2, fill=genhlth))+
  xlab("Income") + ylab("Count")+theme(axis.text.x = element_text
(angle = 90, hjust = 1))
```



In case of income, people with higher income generally are healthier, so income is a critical variable. On the other hand, in case of Martial status, married people are healthier (Good, Very good and Excellent) compare to divorced, widowed and seperated people. In case of education, It seems cases with higher education are healthier that is very interesting finding.