Capstone Project - Factors that Affect the Housing Ownership

Instructions

THis document is to show how the data processes and transfromes, also

how to apply the method and then analysis the data for the project

Factors that Affect the Housing Ownership

load required R libraries

```
{ r echo=TRUE} install.packages("knitr") library(knitr) install.packages("rmarkdown") library(rmarkdown) install.packages("sas7bdat") library(s
```

LOAD data from the HADS website

Check for attribute, Correlation using pearson for numeric variable or spearman for character variable

and remove the attributes with more than lots of missing data

check attrible of the dataset and check for missing variable

since control number is primary varible, there is no missing within

```
temp <- tempfile()
download.file("https://www.huduser.gov/portal/datasets/hads/hads2013n_ASCII.zip",temp)
hads2013n <- read.csv(unz(temp, "thads2013n.txt"), header = FALSE, skip = 1)
hads2013n.names <- readLines(unz(temp, "thads2013n.txt"), n = 1)
names(hads2013n) <- unlist(strsplit(hads2013n.names, ","))
str(hads2013n)
```

```
## 'data.frame':    64535 obs. of  99 variables:
##  $ CONTROL            : Factor w/ 64535 levels "'100003130103'",..: 1 2 3 4 5 6 7 8 9 10 ...
##  $ AGE1               : int  82 50 53 67 26 56 50 26 60 26 ...
##  $ METRO3             : Factor w/ 5 levels "'1'","'2'","'3'",..: 3 5 5 5 1 2 1 4 5 4 ...
##  $ REGION             : Factor w/ 4 levels "'1'","'2'","'3'",..: 1 3 3 3 3 3 3 4 4 2 ...
##  $ LMED               : int  73738 55846 55846 55846 60991 62066 60991 52322 50296 63221 ...
##  $ FMR                : int  956 1100 1100 949 737 657 988 773 1125 552 ...
##  $ L30                : int  15738 17165 13750 13750 14801 13170 16646 13489 13115 13338 ...
##  $ L50                : int  26213 28604 22897 22897 24628 21924 27713 22471 21859 22199 ...
##  $ L80                : int  40322 45744 36614 36614 39421 35073 44340 35929 34939 35501 ...
##  $ IPOV               : int  11067 24218 15470 13964 15492 12005 18050 15992 15452 12005 ...
##  $ BEDRMS             : int  2 4 4 3 2 1 3 2 3 1 ...
##  $ BUILT              : int  2006 1980 1985 1985 1980 1985 1985 1980 1985 1985 ...
##  $ STATUS             : Factor w/ 2 levels "'1'","'3'": 1 1 1 1 1 1 1 1 1 1 ...
##  $ TYPE               : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ VALUE              : int  40000 130000 150000 200000 -6 -6 260000 -6 170000 -6 ...
##  $ VACANCY            : int  -6 -6 -6 -6 -6 -6 -6 -6 -6 -6 ...
##  $ TENURE             : Factor w/ 4 levels "'-6'","'1'","'2'",..: 2 2 2 2 3 3 2 3 2 3 ...
##  $ NUNITS             : int  1 1 1 1 100 32 1 8 1 24 ...
##  $ ROOMS              : int  6 6 7 6 4 3 6 5 7 3 ...
##  $ WEIGHT             : num  3117 2151 2214 2365 2315 ...
##  $ PER                : int  1 4 2 2 2 1 3 2 2 1 ...
##  $ ZINC2              : int  18021 122961 27974 32220 96874 14987 69962 32000 118987 47987 ...
##  $ ZADEQ              : Factor w/ 4 levels "'-6'","'1'","'2'",..: 2 2 2 2 2 2 2 3 2 2 ...
##  $ ZSMHC              : int  533 487 1405 279 759 695 1165 976 1156 1100 ...
##  $ STRUCTURETYPE      : int  1 1 1 1 5 4 1 3 1 4 ...
##  $ OWNRENT            : Factor w/ 2 levels "'1'","'2'": 1 1 1 1 2 2 1 2 1 2 ...
##  $ UTILITY            : num  169 245 159 179 146 ...
##  $ OTHERCOST          : num  213.8 58.3 37.5 70.7 12.5 ...
##  $ COST06             : num  649 1168 1193 1579 759 ...
##  $ COST12             : num  803 1670 1773 2351 759 ...
##  $ COST08             : num  697 1325 1375 1820 759 ...
##  $ COSTMED            : num  615 1059 1068 1412 759 ...
##  $ TOTSAL             : int  0 123000 28000 0 96900 15000 70001 20000 107000 48000 ...
##  $ ASSISTED           : int  -9 -9 -9 -9 0 1 -9 0 -9 0 ...
##  $ GLMED              : int  73738 55846 55846 55846 60991 62066 60991 52322 50296 63221 ...
##  $ GL30               : int  15738 17165 13750 13750 14801 13170 16646 13489 13115 13338 ...
##  $ GL50               : int  26213 28604 22897 22897 24628 21924 27713 22471 21859 22199 ...
##  $ GL80               : int  40322 45744 36614 36614 39421 35073 44340 35929 34939 35501 ...
##  $ APLMED             : num  51617 55846 44677 44677 48793 ...
##  $ ABL30              : num  20235 19911 19938 17875 16651 ...
##  $ ABL50              : num  33702 33181 33201 29766 27707 ...
##  $ ABL80              : num  51843 53063 53090 47598 44349 ...
##  $ ABLMED             : num  66364 64781 64781 58080 54892 ...
##  $ BURDEN             : num  0.3549 0.0475 0.6027 0.1039 0.094 ...
##  $ INCRELAMIPCT       : num  34.9 220.2 62.6 72.1 198.5 ...
##  $ INCRELAMICAT       : int  2 7 4 4 7 2 7 4 7 6 ...
##  $ INCRELPOVPCT       : num  163 508 181 231 625 ...
##  $ INCRELPOVCAT       : int  3 4 3 4 4 2 4 4 4 4 ...
##  $ INCRELFMRPCT       : num  47.1 279.5 63.6 84.9 328.6 ...
##  $ INCRELFMRCAT       : int  1 3 2 2 3 2 3 3 3 3 ...
##  $ COST06RELAMIPCT    : num  39.1 72.1 73.7 108.7 55.3 ...
##  $ COST06RELAMICAT    : int  2 4 4 6 3 3 7 4 6 5 ...
##  $ COST06RELPOVPCT    : num  234 193 309 452 196 ...
##  $ COST06RELPOVCAT    : int  4 3 4 4 3 4 4 4 4 4 ...
##  $ COST06RELFMRPCT    : num  67.8 106.1 108.5 166.4 103 ...
##  $ COST06RELFMRCAT    : int  2 3 3 3 3 3 3 3 3 3 ...
##  $ COST08RELAMIPCT    : num  42 81.8 84.9 125.4 55.3 ...
##  $ COST08RELAMICAT    : int  2 4 5 7 3 3 7 4 6 5 ...
##  $ COST08RELPOVPCT    : num  252 219 355 521 196 ...
##  $ COST08RELPOVCAT    : int  4 4 4 4 3 4 4 4 4 4 ...
##  $ COST08RELFMRPCT    : num  72.9 120.4 125 191.8 103 ...
##  $ COST08RELFMRCAT    : int  2 3 3 3 3 3 3 3 3 3 ...
##  $ COST12RELAMIPCT    : num  48.4 103.1 109.5 161.9 55.3 ...
##  $ COST12RELAMICAT    : int  2 6 6 7 3 3 7 4 7 5 ...
##  $ COST12RELPOVPCT    : num  290 276 458 673 196 ...
##  $ COST12RELPOVCAT    : int  4 4 4 4 3 4 4 4 4 4 ...
##  $ COST12RELFMRPCT    : num  84 152 161 248 103 ...
##  $ COST12RELFMRCAT    : int  2 3 3 3 3 3 3 3 3 3 ...
##  $ COSTMedRELAMIPCT   : num  37.1 65.4 65.9 97.2 55.3 ...
##  $ COSTMedRELAMICAT   : int  2 4 4 5 3 3 6 4 5 5 ...
##  $ COSTMedRELPOVPCT   : num  222 175 276 404 196 ...
##  $ COSTMedRELPOVCAT   : int  4 3 4 4 3 4 4 4 4 4 ...
##  $ COSTMedRELFMRPCT   : num  64.3 96.3 97.1 148.8 103 ...
##  $ COSTMedRELFMRCAT   : int  2 2 2 3 3 3 3 3 3 3 ...
##  $ FMTZADEQ           : Factor w/ 4 levels "'-5'","'1 Adequate'",..: 2 2 2 2 2 2 2 3 2 2 ...
##  $ FMTMETRO3          : Factor w/ 2 levels "'-5'","'Central City'": 1 1 1 1 2 1 2 1 1 1 ...
##  $ FMTBUILT           : Factor w/ 7 levels "'-5'","'1940-1959'",..: 6 4 4 4 4 4 4 4 4 4 ...
##  $ FMTSTRUCTURETYPE   : Factor w/ 7 levels "'.'","'1 Single Family'",..: 2 2 2 2 6 5 2 4 2 5 ...
##  $ FMTBEDRMS          : Factor w/ 5 levels "'0 Studio'","'1 1BR'",..: 3 5 5 4 3 2 4 3 4 2 ...
##  $ FMTOWNRENT         : Factor w/ 2 levels "'1 Owner'","'2 Renter'": 1 1 1 1 2 2 1 2 1 2 ...
##  $ FMTCOST06RELPOVCAT : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 4 5 5 4 5 5 5 5 5 ...
##  $ FMTCOST08RELPOVCAT : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 5 5 5 4 5 5 5 5 5 ...
##  $ FMTCOST12RELPOVCAT : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 5 5 5 4 5 5 5 5 5 ...
##  $ FMTCOSTMEDRELPOVCAT: Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 4 5 5 4 5 5 5 5 5 ...
##  $ FMTINCRELPOVCAT    : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 4 5 4 5 5 3 5 5 5 5 ...
```

```
##  $ FMTCOST06RELFMRCAT : Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
##  $ FMTCOST08RELFMRCAT : Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
##  $ FMTCOST12RELFMRCAT : Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
##  $ FMTCOSTMEDRELFMRCAT: Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 2 2 3 3 3 3 3 3 3 ...
##  $ FMTINCRELFMRCAT    : Factor w/ 4 levels "'.'","'1 LTE 50% FMR'",..: 2 4 3 3 4 3 4 4 4 4 ...
##  $ FMTCOST06RELAMICAT : Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 4 6 3 3 7 4 6 5 ...
##  $ FMTCOST08RELAMICAT : Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 5 7 3 3 7 4 6 5 ...
##  $ FMTCOST12RELAMICAT : Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 6 6 7 3 3 7 4 7 5 ...
##  $ FMTCOSTMEDRELAMICAT: Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 4 5 3 3 6 4 5 5 ...
##  $ FMTINCRELAMICAT    : Factor w/ 8 levels "'.'","'1 LTE 30% AMI'",..: 3 8 5 5 8 3 8 5 8 7 ...
##  $ FMTASSISTED        : Factor w/ 3 levels "'.'","'0 Not Assisted'",..: 1 1 1 1 2 3 1 2 1 2 ...
##  $ FMTBURDEN          : Factor w/ 5 levels "'.'","'1 Less than 30%'",..: 3 2 4 2 2 4 2 3 2 2 ...
##  $ FMTREGION          : Factor w/ 2 levels "'-5'","'West'": 1 1 1 1 1 1 1 2 2 1 ...
##  $ FMTSTATUS          : Factor w/ 1 level "'-5'": 1 1 1 1 1 1 1 1 1 1 ...
```

apply change for missing and error records and Duplicated Column

notice by reading data description variable like BEDRMS and FMTBEDRMS are same but in different format

and by comparing the unformated and formated the column, it shows formated columns are more reasonable

to be used.

```
## check FMTOWNRENT and TENURE : 2 option, either Onwer or Renter
str(hads2013n$FMTOWNRENT)
```

```
##  Factor w/ 2 levels "'1 Owner'","'2 Renter'": 1 1 1 1 2 2 1 2 1 2 ...
```

```
str(hads2013n$TENURE)
```

```
##  Factor w/ 4 levels "'-6'","'1'","'2'",..: 2 2 2 2 3 3 2 3 2 3 ...
```

```
table(hads2013n$FMTOWNRENT)
```

```
##
##  '1 Owner' '2 Renter'
##      37146      27389
```

```
table(hads2013n$TENURE)
```

```
##
##  '-6'   '1'   '2'   '3'
##  4438 35852 23358   887
```

```
## Hence TENURE contains some error '-6'/missing rows. we will use FMTOWNRENT and Drop TENURE
hads2013n_c <- subset(hads2013n,select = -c(TENURE))
```

```
## Warning: closing unused connection 5 (C:\Users\THOMAS~1\AppData\Local\Temp
## \RtmpQDUVUZ\file1b7027c973ec:thads2013n.txt)
```

```
## check BEDRMS and FMTBEDRMS
str(hads2013n$BEDRMS)
```

```
##  int [1:64535] 2 4 4 3 2 1 3 2 3 1 ...
```

```
str(hads2013n$FMTBEDRMS)
```

```
##  Factor w/ 5 levels "'0 Studio'","'1 1BR'",..: 3 5 5 4 3 2 4 3 4 2 ...
```

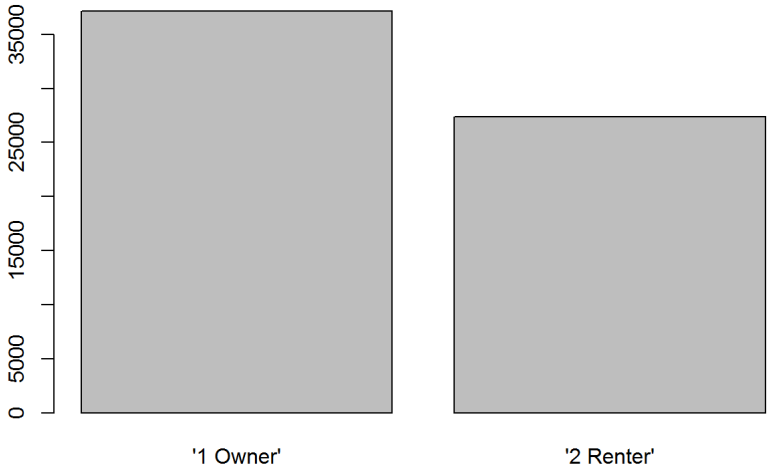
```
table(hads2013n$BEDRMS)
```

```
##
##     0     1     2     3     4     5     6     7
##   622  9821 16401 24850 10189  2209   392    51
```

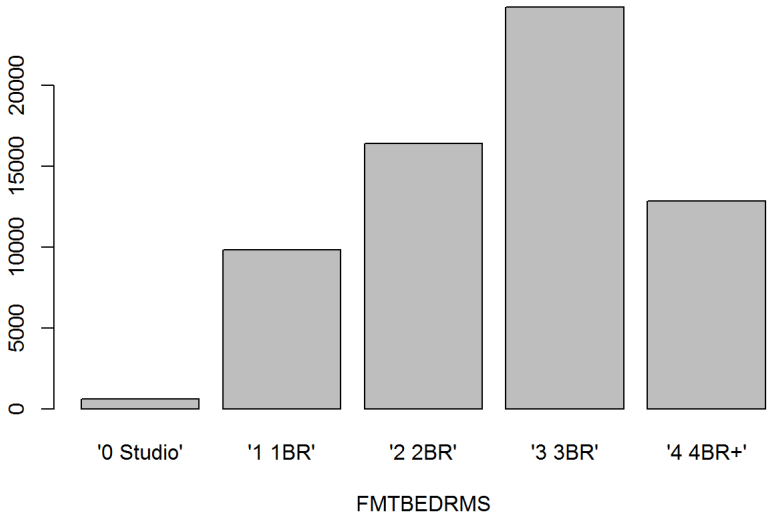
```
table(hads2013n$FMTBEDRMS)
```

```
##
## '0 Studio'    '1 1BR'    '2 2BR'    '3 3BR'   '4 4BR+'
##        622       9821      16401      24850      12841
```

```
plot(hads2013n_c$FMTOWNRENT)
```




```
## FMTBEDRMS is under sorted by group, drop BEDRMS
hads2013n_c <- subset(hads2013n_c,select = -c(BEDRMS))

plot(hads2013n_c$FMTBEDRMS,xlab="FMTBEDRMS")
```




```
## check ASSISTED & FMTASSISTED: 2 options not assisted or assisted.
str(hads2013n$ASSISTED)
```

```
##  int [1:64535] -9 -9 -9 -9 0 1 -9 0 -9 0 ...
```

```
str(hads2013n$FMTASSISTED)
```

```
##  Factor w/ 3 levels "'.'","'0 Not Assisted'",..: 1 1 1 1 2 3 1 2 1 2 ...
```

```
table(hads2013n$ASSISTED)
```

```
##
##    -9     0     1
## 40290 17627  6618
```

```
table(hads2013n$FMTASSISTED)
```

```
##
##              '.' '0 Not Assisted'     '1 Assisted'
##            40290             17627             6618
```

```
## since test try to remove all missing rows from ASSISTED and notice all Owner is removed
## we can say all assist is for renter only. we can remove both column ASSISTED & FMTASSISTED
hads2013n_c2 <- hads2013n[hads2013n$ASSISTED > -1,]
table(hads2013n$FMTASSISTED)
```

```
##
##              '.' '0 Not Assisted'     '1 Assisted'
##            40290             17627             6618
```

```
table(hads2013n_c2$FMTASSISTED)
```

```
##
##              '.' '0 Not Assisted'     '1 Assisted'
##                0             17627             6618
```

```
table(hads2013n_c2$FMTOWNRENT)
```

```
##
##  '1 Owner' '2 Renter'
##          0      24245
```

```
rm(hads2013n_c2)
hads2013n_c <- subset(hads2013n_c,select = -c(ASSISTED, FMTASSISTED))

## REGION & FMTREGION :The four Census regions. Drop FMTREGION
str(hads2013n$REGION)
```

```
##  Factor w/ 4 levels "'1'","'2'","'3'",..: 1 3 3 3 3 3 3 4 4 2 ...
```

```
str(hads2013n$FMTREGION)
```

```
##  Factor w/ 2 levels "'-5'","'West'": 1 1 1 1 1 1 1 2 2 1 ...
```

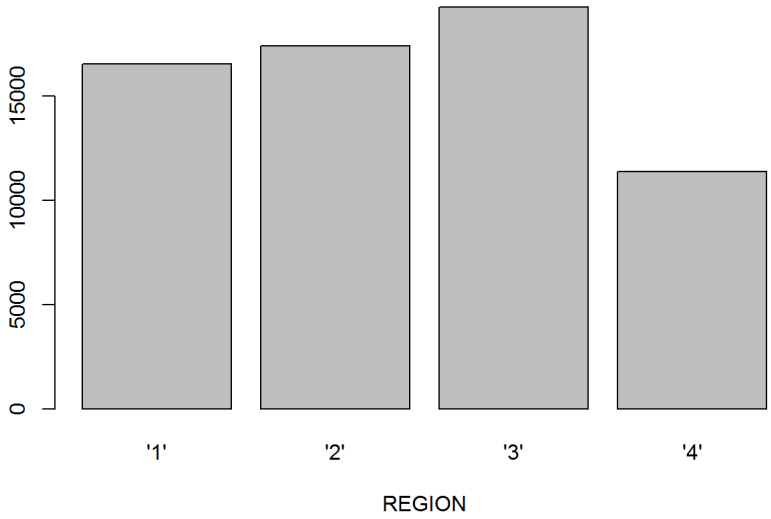
```
table(hads2013n$REGION)
```

```
##
##   '1'   '2'   '3'   '4'
## 16519 17400 19260 11356
```

```
table(hads2013n$FMTREGION)
```

```
##
##   '-5' 'West'
##  53179  11356
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(FMTREGION))
plot(hads2013n_c$REGION,xlab="REGION")
```




```
## METRO3 & FMTMETRO3 :indicate whether a unit is in a central city, suburb, or outside a
## metropolitan area. Drop FMTMETRO3
str(hads2013n$METRO3)
```

```
##  Factor w/ 5 levels "'1'","'2'","'3'",..: 3 5 5 5 1 2 1 4 5 4 ...
```

```
str(hads2013n$FMTMETRO3)
```

```
##  Factor w/ 2 levels "'-5'","'Central City'": 1 1 1 1 2 1 2 1 1 1 ...
```

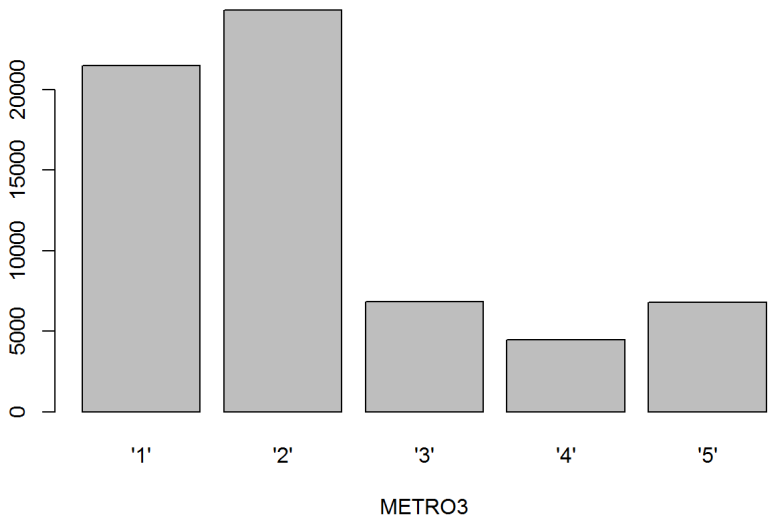
```
table(hads2013n$METRO3)
```

```
##
##   '1'   '2'   '3'   '4'   '5'
## 21493 24936  6851  4462  6793
```

```
table(hads2013n$FMTMETRO3)
```

```
##
##           '-5' 'Central City'
##          43042          21493
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(FMTMETRO3))
plot(hads2013n_c$METRO3,xlab="METRO3")
```



```
##For the Variable below are Mortgage payments at 6, 8, and 12 percent interest rates
##COST12    Housing cost at 12 percent interest
##COST06    Housing cost at 6 percent interest
##COST08    Housing cost at 8 percent interest
##COSTMED   Housing cost at Median interest


##COST06RELFMRCAT, FMTCOST06RELFMRCAT, COST06RELFMRPCT
##Cost06 Relative to FMR (Category), Cost06 Relative to FMR (Category), Cost06 Relative to FMR (Percent)
str(hads2013n$COST06RELFMRCAT)
```

```
##  int [1:64535] 2 3 3 3 3 3 3 3 3 3 ...
```

```
str(hads2013n$FMTCOST06RELFMRCAT)
```

```
##  Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
```

```
str(hads2013n$COST06RELFMRPCT)
```

```
##  num [1:64535] 67.8 106.1 108.5 166.4 103 ...
```

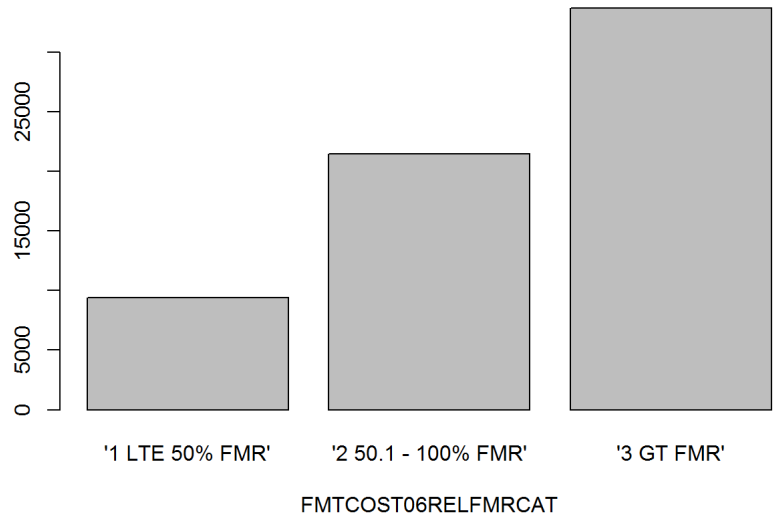
```
table(hads2013n$COST06RELFMRCAT)
```

```
##
##     1     2     3
##  9405 21440 33690
```

```
table(hads2013n$FMTCOST06RELFMRCAT)
```

```
##
##     '1 LTE 50% FMR' '2 50.1 - 100% FMR'          '3 GT FMR'
##                9405               21440               33690
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST06RELFMRCAT))
plot(hads2013n_c$FMTCOST06RELFMRCAT,xlab="FMTCOST06RELFMRCAT")
```




```
##COST06RELAMICAT,FMTCOST06RELAMICAT, COST06RELAMIPCT
##Cost06 Relative to Median Income (Category), Cost06 Relative to Median Income (Category),
##Cost06 Relative to Median Income (Percent)
## Drop COST06RELAMICAT
str(hads2013n$COST06RELAMICAT)
```

```
##  int [1:64535] 2 4 4 6 3 3 7 4 6 5 ...
```

```
str(hads2013n$FMTCOST06RELAMICAT)
```

```
##  Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 4 6 3 3 7 4 6 5 ...
```

```
str(hads2013n$COST06RELAMIPCT)
```

```
##  num [1:64535] 39.1 72.1 73.7 108.7 55.3 ...
```

```
table(hads2013n$COST06RELAMICAT)
```

```
##
##     1     2     3     4     5     6     7
##  8789 11479  7612 11939  7668  5157 11891
```

```
table(hads2013n$FMTCOST06RELAMICAT)
```

```
##
##    '1 LTE 30% AMI'   '2 30 - 50% AMI'   '3 50 - 60% AMI'
##               8789              11479               7612
##   '4 60 - 80% AMI'  '5 80 - 100% AMI' '6 100 - 120% AMI'
##              11939               7668               5157
##     '7 120% AMI +'
##              11891
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST06RELAMICAT))

##COST06RELPOVCAT       Cost06 Relative to Poverty Income (Category)
##FMTCOST06RELPOVCAT        Cost06 Relative to Poverty Income (Category)
##COST06RELPOVPCT       Cost06 Relative to Poverty Income (Percent)
str(hads2013n$COST06RELPOVCAT)
```

```
##  int [1:64535] 4 3 4 4 3 4 4 4 4 4 ...
```

```
str(hads2013n$FMTCOST06RELPOVCAT)
```

```
##  Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 4 5 5 4 5 5 5 5 5 ...
```

```
str(hads2013n$COST06RELPOVPCT)
```

```
##  num [1:64535] 234 193 309 452 196 ...
```

```
table(hads2013n$COST06RELPOVCAT)
```

```
##
##    -9     1     2     3     4
##  4438  6802  6114  7254 39927
```

```
table(hads2013n$FMTCOST06RELPOVCAT)
```

```
##
##                  '.'      '1 LTE Poverty' '2 100-150% Poverty'
##                 4438                6802                6114
## '3 150-200% Poverty'    '4 200%+ Poverty'
##                 7254               39927
```

```
##4438 missing at FMTCOST06RELPOVCAT, 6.88% of the rows to the entire dataset
## check the impact if we Remove the missing row
hads2013n_c2 <- hads2013n[hads2013n$COST06RELPOVCAT > 0,]
table(hads2013n_c2$COST06RELPOVCAT)
```

```
##
##     1     2     3     4
##  6802  6114  7254 39927
```

```
table(hads2013n_c2$FMTOWNRENT)
```

```
##
##  '1 Owner' '2 Renter'
##      35852      24245
```

```
table(hads2013n$FMTOWNRENT)
```

```
##
##  '1 Owner' '2 Renter'
##      37146      27389
```

```
## comparing the result owner drop from 37146 to 35852 and renter drop from 27389 to 24245
## so we dropp the missing rows and remove the testing dataset and the COST06RELPOVCAT column
rm(hads2013n_c2)
hads2013n_c <- hads2013n_c[hads2013n$COST06RELPOVCAT > 0,]
hads2013n_c <- subset(hads2013n_c,select = -c(COST06RELPOVCAT))

##SAME to all the following
#COST08RELFMRCAT    Cost08 Relative to FMR (Category)
#FMTCOST08RELFMRCAT Cost08 Relative to FMR (Category)
#COST08RELFMRPCT    Cost08 Relative to FMR (Percent)
str(hads2013n_c$COST08RELFMRCAT)
```

```
##  int [1:60097] 2 3 3 3 3 3 3 3 3 3 ...
```

```
str(hads2013n_c$FMTCOST08RELFMRCAT)
```

```
##  Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
```

```
str(hads2013n_c$COST08RELFMRPCT)
```

```
##  num [1:60097] 72.9 120.4 125 191.8 103 ...
```

```
table(hads2013n_c$COST08RELFMRCAT)
```

```
##
##     1     2     3
##  8362 17590 34145
```

```
table(hads2013n_c$FMTCOST08RELFMRCAT)
```

```
##
##     '1 LTE 50% FMR' '2 50.1 - 100% FMR'          '3 GT FMR'
##                8362               17590               34145
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST08RELFMRCAT))

##COST08RELAMICAT   Cost08 Relative to Median Income (Category)
##FMTCOST08RELAMICAT    Cost08 Relative to Median Income (Category)
##COST08RELAMIPCT   Cost08 Relative to Median Income (Percent)
str(hads2013n_c$COST08RELAMICAT)
```

```
##  int [1:60097] 2 4 5 7 3 3 7 4 6 5 ...
```

```
str(hads2013n_c$FMTCOST08RELAMICAT)
```

```
##  Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 5 7 3 3 7 4 6 5 ...
```

```
str(hads2013n_c$COST08RELAMIPCT)
```

```
##  num [1:60097] 42 81.8 84.9 125.4 55.3 ...
```

```
table(hads2013n_c$COST08RELAMICAT)
```

```
##
##     1     2     3     4     5     6     7
##  7867  9251  6451 10014  7083  5181 14250
```

```
table(hads2013n_c$FMTCOST08RELAMICAT)
```

```
##
##    '1 LTE 30% AMI'   '2 30 - 50% AMI'   '3 50 - 60% AMI'
##               7867               9251               6451
##   '4 60 - 80% AMI'  '5 80 - 100% AMI' '6 100 - 120% AMI'
##              10014               7083               5181
##     '7 120% AMI +'
##              14250
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST08RELAMICAT))

##COST08RELPOVCAT   Cost08 Relative to Poverty Income (Category)
##FMTCOST08RELPOVCAT    Cost08 Relative to Poverty Income (Category)
##COST08RELPOVPCT   Cost08 Relative to Poverty Income (Percent)
str(hads2013n_c$COST08RELPOVCAT)
```

```
##  int [1:60097] 4 4 4 4 3 4 4 4 4 4 ...
```

```
str(hads2013n_c$FMTCOST08RELPOVCAT)
```

```
##  Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 5 5 5 4 5 5 5 5 5 ...
```

```
str(hads2013n_c$COST08RELPOVPCT)
```

```
##  num [1:60097] 252 219 355 521 196 ...
```

```
table(hads2013n_c$COST08RELPOVCAT)
```

```
##
##     1     2     3     4
##  6547  5557  6657 41336
```

```
table(hads2013n_c$FMTCOST08RELPOVCAT)
```

```
##
##                  '.'      '1 LTE Poverty' '2 100-150% Poverty'
##                    0                 6547                 5557
## '3 150-200% Poverty'    '4 200%+ Poverty'
##                 6657                41336
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST08RELPOVCAT))

##COST12RELFMRCAT   Cost12 Relative to FMR (Category)
##FMTCOST12RELFMRCAT    Cost12 Relative to FMR (Category)
##COST12RELFMRPCT   Cost12 Relative to FMR (Percent)
str(hads2013n_c$COST12RELFMRCAT)
```

```
##  int [1:60097] 2 3 3 3 3 3 3 3 3 3 ...
```

```
str(hads2013n_c$FMTCOST12RELFMRCAT)
```

```
##  Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
```

```
str(hads2013n_c$COST12RELFMRPCT)
```

```
##  num [1:60097] 84 152 161 248 103 ...
```

```
table(hads2013n_c$COST12RELFMRCAT)
```

```
##
##     1     2     3
##  7823 14731 37543
```

```
table(hads2013n_c$FMTCOST12RELFMRCAT)
```

```
##
##     '1 LTE 50% FMR' '2 50.1 - 100% FMR'          '3 GT FMR'
##                7823               14731               37543
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST12RELFMRCAT))

##COST12RELAMICAT   Cost12 Relative to Median Income (Category)
##FMTCOST12RELAMICAT    Cost12 Relative to Median Income (Category)
##COST12RELAMIPCT   Cost12 Relative to Median Income (Percent)
str(hads2013n_c$COST12RELAMICAT)
```

```
##  int [1:60097] 2 6 6 7 3 3 7 4 7 5 ...
```

```
str(hads2013n_c$FMTCOST12RELAMICAT)
```

```
##  Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 6 6 7 3 3 7 4 7 5 ...
```

```
str(hads2013n_c$COST12RELAMIPCT)
```

```
##  num [1:60097] 48.4 103.1 109.5 161.9 55.3 ...
```

```
table(hads2013n_c$COST12RELAMICAT)
```

```
##
##     1     2     3     4     5     6     7
##  7417  7799  5429  8578  5810  5064 20000
```

```
table(hads2013n_c$FMTCOST12RELAMICAT)
```

```
##
##    '1 LTE 30% AMI'   '2 30 - 50% AMI'   '3 50 - 60% AMI'
##               7417               7799               5429
##   '4 60 - 80% AMI'  '5 80 - 100% AMI' '6 100 - 120% AMI'
##               8578               5810               5064
##     '7 120% AMI +'
##              20000
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST12RELAMICAT))


##COST12RELPOVCAT   Cost12 Relative to Poverty Income (Category)
##FMTCOST12RELPOVCAT    Cost12 Relative to Poverty Income (Category)
##COST12RELPOVPCT   Cost12 Relative to Poverty Income (Percent)
str(hads2013n_c$COST12RELPOVCAT)
```

```
##  int [1:60097] 4 4 4 4 3 4 4 4 4 4 ...
```

```
str(hads2013n_c$FMTCOST12RELPOVCAT)
```

```
##  Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 5 5 5 4 5 5 5 5 5 ...
```

```
str(hads2013n_c$COST12RELPOVPCT)
```

```
##  num [1:60097] 290 276 458 673 196 ...
```

```
table(hads2013n_c$COST12RELPOVCAT)
```

```
##
##     1     2     3     4
##  6254  4906  5710 43227
```

```
table(hads2013n_c$FMTCOST12RELPOVCAT)
```

```
##
##                  '.'      '1 LTE Poverty' '2 100-150% Poverty'
##                    0                 6254                4906
## '3 150-200% Poverty'    '4 200%+ Poverty'
##                 5710               43227
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COST12RELPOVCAT))

##COSTMedRELFMRCAT  CostMed Relative to FMR (Category)
##FMTCOSTMEDRELFMRCAT   CostMed Relative to FMR (Category)
##COSTMedRELFMRPCT  CostMed Relative to FMR (Percent)
str(hads2013n_c$COSTMedRELFMRCAT)
```

```
##  int [1:60097] 2 2 2 3 3 3 3 3 3 3 ...
```

```
str(hads2013n_c$FMTCOSTMEDRELFMRCAT)
```

```
##  Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 2 2 3 3 3 3 3 3 3 ...
```

```
str(hads2013n_c$COSTMedRELFMRPCT)
```

```
##  num [1:60097] 64.3 96.3 97.1 148.8 103 ...
```

```
table(hads2013n_c$COSTMedRELFMRCAT)
```

```
##
##     1     2     3
##  9234 21770 29093
```

```
table(hads2013n_c$FMTCOSTMEDRELFMRCAT)
```

```
##
##     '1 LTE 50% FMR' '2 50.1 - 100% FMR'          '3 GT FMR'
##                9234               21770               29093
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COSTMedRELFMRCAT))

##COSTMedRELAMICAT  CostMed Relative to Median Income (Category)
##FMTCOSTMEDRELAMICAT   CostMed Relative to Median Income (Category)
##COSTMedRELAMIPCT  CostMed Relative to Median Income (Percent)
str(hads2013n_c$COSTMedRELAMICAT)
```

```
##  int [1:60097] 2 4 4 5 3 3 6 4 5 5 ...
```

```
str(hads2013n_c$FMTCOSTMEDRELAMICAT)
```

```
##  Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 4 5 3 3 6 4 5 5 ...
```

```
str(hads2013n_c$COSTMedRELAMIPCT)
```

```
##  num [1:60097] 37.1 65.4 65.9 97.2 55.3 ...
```

```
table(hads2013n_c$COSTMedRELAMICAT)
```

```
##
##     1     2     3     4     5     6     7
##  8536 11621  7622 11503  7149  4515  9151
```

```
table(hads2013n_c$FMTCOSTMEDRELAMICAT)
```

```
##
##    '1 LTE 30% AMI'   '2 30 - 50% AMI'   '3 50 - 60% AMI'
##               8536              11621               7622
##   '4 60 - 80% AMI'  '5 80 - 100% AMI' '6 100 - 120% AMI'
##              11503               7149               4515
##     '7 120% AMI +'
##               9151
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COSTMedRELAMICAT))

##COSTMedRELPOVCAT  CostMed Relative to Poverty Income (Category)
##FMTCOSTMEDRELPOVCAT   CostMed Relative to Poverty Income (Category)
##COSTMedRELPOVPCT  CostMed Relative to Poverty Income (Percent)
str(hads2013n_c$COSTMedRELPOVCAT)
```

```
##  int [1:60097] 4 3 4 4 3 4 4 4 4 4 ...
```

```
str(hads2013n_c$FMTCOSTMEDRELPOVCAT)
```

```
##  Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 4 5 5 4 5 5 5 5 5 ...
```

```
str(hads2013n_c$COSTMedRELPOVPCT)
```

```
##  num [1:60097] 222 175 276 404 196 ...
```

```
table(hads2013n_c$COSTMedRELPOVCAT)
```

```
##
##     1     2     3     4
##  7042  6634  7917 38504
```

```
table(hads2013n_c$FMTCOSTMEDRELPOVCAT)
```

```
##
##                  '.'      '1 LTE Poverty' '2 100-150% Poverty'
##                    0                7042                 6634
## '3 150-200% Poverty'    '4 200%+ Poverty'
##                 7917                38504
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(COSTMedRELPOVCAT))

##VALUE Current market value of unit
str(hads2013n_c$VALUE)
```

```
##  int [1:60097] 40000 130000 150000 200000 -6 -6 260000 -6 170000 -6 ...
```

```
table(hads2013n_c$VALUE,useNA = 'always')
```

```
##
##      -6       1   10000   20000   30000   40000   50000   60000   70000
##   24245     434     553     515     609     712     948     853    1041
##   80000   90000  100000  110000  120000  130000  140000  150000  160000
##    1476    1274    1721     659    1141    1341     931    1858     768
##  170000  180000  190000  200000  210000  220000  230000  240000  250000
##     760    1346     579    1777     326     468     767     430    1394
##  260000  270000  280000  290000  300000  310000  320000  330000  340000
##     320     249     618     240    1413     119     272     408     129
##  350000  360000  370000  380000  390000  400000  410000  420000  430000
##     984     126     112     340     127     918      57      80     192
##  440000  450000  460000  470000  480000  490000  500000  510000  520000
##      71     534      63      32     146      39     626       8      30
##  530000  540000  550000  560000  570000  580000  590000  600000  610000
##      77      24     248      27      15      64      15     410       5
##  620000  630000  640000  650000  660000  670000  680000  690000  700000
##      23      41      14     223       8      11      38      15     221
##  710000  720000  730000  740000  750000  760000  770000  780000  790000
##       3      15      17       5     174       6       2      16      10
##  800000  810000  820000  830000  840000  850000  860000  870000  880000
##     204       3       4      16       3     106       1       4      16
##  890000  900000  910000  920000  930000  940000  950000  960000  970000
##       2     125       1       3       1       1      32       1       1
##  980000  990000 1000000 1010000 1020000 1040000 1050000 1080000 1100000
##       6       3     199       1       4       1       7       1      36
## 1130000 1200000 1240000 1250000 1300000 1350000 1400000 2520000    <NA>
##       1      70       1      13      23       4       1     296       0
```

```
##Noticed that there are 24245 and 434 are error with value (-6 or 1),
24679/nrow(hads2013n_c)
```

```
## [1] 0.4106528
```

```
##41% of this column in the dataset is missing.
##Test to drop the affect of dropping the error rows.
hads2013n_c2 <- hads2013n[hads2013n$VALUE > 2,]
table(hads2013n_c2$VALUE,useNA = 'always')
```

```
##
##   10000   20000   30000   40000   50000   60000   70000   80000   90000
##     598     552     645     763     979     908    1089    1524    1317
##  100000  110000  120000  130000  140000  150000  160000  170000  180000
##    1774     696    1178    1381     967    1918     818     798    1381
##  190000  200000  210000  220000  230000  240000  250000  260000  270000
##     603    1817     333     487     785     441    1421     334     257
##  280000  290000  300000  310000  320000  330000  340000  350000  360000
##     636     258    1444     123     280     415     131     991     134
##  370000  380000  390000  400000  410000  420000  430000  440000  450000
##     119     345     132     925      60      81     203      75     541
##  460000  470000  480000  490000  500000  510000  520000  530000  540000
##      66      41     149      41     653       9      33      77      25
##  550000  560000  570000  580000  590000  600000  610000  620000  630000
##     254      32      18      65      16     418       6      24      45
##  640000  650000  660000  670000  680000  690000  700000  710000  720000
##      14     227       9      11      39      15     225       3      15
##  730000  740000  750000  760000  770000  780000  790000  800000  810000
##      18       5     180       6       2      17      11     212       3
##  820000  830000  840000  850000  860000  870000  880000  890000  900000
##       5      16       5     108       1       4      17       6     126
##  910000  920000  930000  940000  950000  960000  970000  980000  990000
##       1       3       1       1      35       1       1       7       3
## 1000000 1010000 1020000 1040000 1050000 1080000 1100000 1130000 1200000
##     204       1       4       1       7       1      36       1      71
## 1230000 1240000 1250000 1300000 1350000 1400000 2520000    <NA>
##       1       1      13      23       4       1     324       0
```

```
table(hads2013n_c2$FMTOWNRENT,useNA = 'always')
```

```
##
##  '1 Owner' '2 Renter'       <NA>
##      36675          0          0
```

```
table(hads2013n_c$FMTOWNRENT,useNA = 'always')
```

```
##
##  '1 Owner' '2 Renter'       <NA>
##      35852      24245          0
```

```
## by comparing two tables, all the Renter got removed from the removing the error rows.
## so we drop the value column
rm(hads2013n_c2)
hads2013n_c <- subset(hads2013n_c,select = -c(VALUE))



## INCRELFMRCAT HH Income Relative to FMR (Category)
## FMTINCRELFMRCAT  HH Income Relative to FMR (Category)
## INCRELFMRPCT HH Income Relative to FMR (Percent)
table(hads2013n_c$INCRELFMRCAT,useNA = 'always')
```

```
##
##     1     2     3  <NA>
## 15960 14007 30130     0
```

```
table(hads2013n_c$FMTINCRELFMRCAT,useNA = 'always')
```

```
##
##                 '.'     '1 LTE 50% FMR' '2 50.1 - 100% FMR'
##                   0               15960               14007
##          '3 GT FMR'                <NA>
##               30130                   0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(INCRELFMRCAT))



##INCRELPOVCAT  HH Income Relative to Poverty Income (Category)
##FMTINCRELPOVCAT   HH Income Relative to Poverty Income (Category)
##INCRELPOVPCT  HH Income Relative to Poverty Income (Percent)
table(hads2013n_c$INCRELPOVCAT,useNA = 'always')
```

```
##
##     1     2     3     4  <NA>
## 11810  6082  5702 36503     0
```

```
table(hads2013n_c$FMTINCRELPOVCAT,useNA = 'always')
```

```
##
##                  '.'      '1 LTE Poverty' '2 100-150% Poverty'
##                    0                11810                6082
## '3 150-200% Poverty'    '4 200%+ Poverty'                <NA>
##                 5702                36503                   0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(INCRELPOVCAT))



##STATUS    Interview status
table(hads2013n_c$STATUS,useNA = 'always')
```

```
##
##   '1'   '3'  <NA>
## 60097     0     0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(STATUS))


## FMTSTATUS    Occupancy Status
table(hads2013n_c$FMTSTATUS,useNA = 'always')
```

```
##
##  '-5'  <NA>
## 60097     0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(FMTSTATUS))



##STRUCTURETYPE Recoded structure type
##TYPE  Structure type
##FMTSTRUCTURETYPE  Structure Type
str(hads2013n_c$STRUCTURETYPE)
```

```
##  int [1:60097] 1 1 1 1 5 4 1 3 1 4 ...
```

```
str(hads2013n_c$TYPE)
```

```
##  int [1:60097] 1 1 1 1 1 1 1 1 1 1 ...
```

```
str(hads2013n_c$FMTSTRUCTURETYPE)
```

```
##  Factor w/ 7 levels "'.'","'1 Single Family'",..: 2 2 2 2 6 5 2 4 2 5 ...
```

```
table(hads2013n_c$STRUCTURETYPE,useNA = 'always')
```

```
##
##    -9     1     2     3     4     5     6  <NA>
##     1 39376  5583  6389  2391  4075  2282     0
```

```
table(hads2013n_c$TYPE,useNA = 'always')
```

```
##
##     1     2     3     4     5     6     7     9  <NA>
## 57655  1928   354     4     7    21    10   118     0
```

```
table(hads2013n_c$FMTSTRUCTURETYPE,useNA = 'always')
```

```
##
##               '.' '1 Single Family'     '2 2-4 units'    '3 5-19 units'
##                 1             39376              5583              6389
##   '4 20-49 units'     '5 50+ units'   '6 Mobile Home'              <NA>
##              2391              4075              2282                 0
```

```
hads2013n_c <- hads2013n_c[hads2013n_c$STRUCTURETYPE > 0,]
hads2013n_c <- subset(hads2013n_c,select = -c(STRUCTURETYPE))



##VACANCY   Vacancy status
## all the of the rows are -6 drop column
str(hads2013n_c$VACANCY)
```

```
##  int [1:60096] -6 -6 -6 -6 -6 -6 -6 -6 -6 -6 ...
```

```
table(hads2013n_c$VACANCY,useNA = 'always')
```

```
##
##    -6  <NA>
## 60096     0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(VACANCY))

##BUILT Year unit was built
##FMTBUILT  YEAR UNIT WAS BUILT
## notice that the group of '-5' in FMTBUILT is the the year before, we name it group 'before 1940'
str(hads2013n_c$BUILT)
```

```
##  int [1:60096] 2006 1980 1985 1985 1980 1985 1985 1980 1985 1985 ...
```

```
str(hads2013n_c$FMTBUILT)
```

```
##  Factor w/ 7 levels "'-5'","'1940-1959'",..: 6 4 4 4 4 4 4 4 4 4 ...
```

```
table(hads2013n_c$BUILT,useNA = 'always')
```

```
##
## 1919 1920 1930 1940 1950 1960 1970 1975 1980 1985 1990 1995 2000 2001 2002
## 3904 2658 2643 3636 6777 7264 5192 5847 3750 3861 2366 4776  872  726  649
## 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 <NA>
##  683  764  798  773  661  474  335  245  189  221   32    0
```

```
table(hads2013n_c$FMTBUILT,useNA = 'always')
```

```
##
##         '-5'  '1940-1959'  '1960-1979'  '1980-1989'  '1990-1999'
##         9205        10413        18303         7611         7142
##  '2000-2009' 'After 2010'         <NA>
##         6735          687            0
```

```
levels(hads2013n_c$FMTBUILT)[match("'-5'",levels(hads2013n_c$FMTBUILT))] <- "'Before 1940'"
table(hads2013n_c$FMTBUILT,useNA = 'always')
```

```
##
## 'Before 1940'   '1940-1959'   '1960-1979'   '1980-1989'   '1990-1999'
##          9205         10413         18303          7611          7142
##   '2000-2009'  'After 2010'          <NA>
##          6735           687             0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(BUILT))

##ZADEQ ADEQUACY OF UNIT
##FMTZADEQ ADEQUACY OF UNIT
str(hads2013n_c$ZADEQ)
```

```
##  Factor w/ 4 levels "'-6'","'1'","'2'",..: 2 2 2 2 2 2 2 3 2 2 ...
```

```
str(hads2013n_c$FMTZADEQ)
```

```
##  Factor w/ 4 levels "'-5'","'1 Adequate'",..: 2 2 2 2 2 2 2 3 2 2 ...
```

```
table(hads2013n_c$ZADEQ,useNA = 'always')
```

```
##
##  '-6'   '1'   '2'   '3'  <NA>
##     0 56787  2148  1161     0
```

```
table(hads2013n_c$FMTZADEQ,useNA = 'always')
```

```
##
##                   '-5'           '1 Adequate' '2 Moderately Inadequ'
##                      0                 56787                   2148
## '3 Severely Indadequa'                  <NA>
##                   1161                     0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(ZADEQ))

##OWNRENT       Tenure (adjusted)
##FMTOWNRENT        Owner/Renter Status (adjusted)
str(hads2013n_c$OWNRENT)
```

```
##  Factor w/ 2 levels "'1'","'2'": 1 1 1 1 2 2 1 2 1 2 ...
```

```
str(hads2013n_c$FMTOWNRENT)
```

```
##  Factor w/ 2 levels "'1 Owner'","'2 Renter'": 1 1 1 1 2 2 1 2 1 2 ...
```

```
table(hads2013n_c$OWNRENT,useNA = 'always')
```

```
##
##   '1'   '2'  <NA>
## 35852 24244     0
```

```
table(hads2013n_c$FMTOWNRENT,useNA = 'always')
```

```
##
##  '1 Owner' '2 Renter'       <NA>
##      35852      24244          0
```

```
hads2013n_c <- subset(hads2013n_c,select = -c(OWNRENT))

## Drop control since it's identical Veriable
hads2013n_c <- subset(hads2013n_c,select = -c(CONTROL))
```

test for the correlation between variables

peason for numeric variable and spearman for category variable

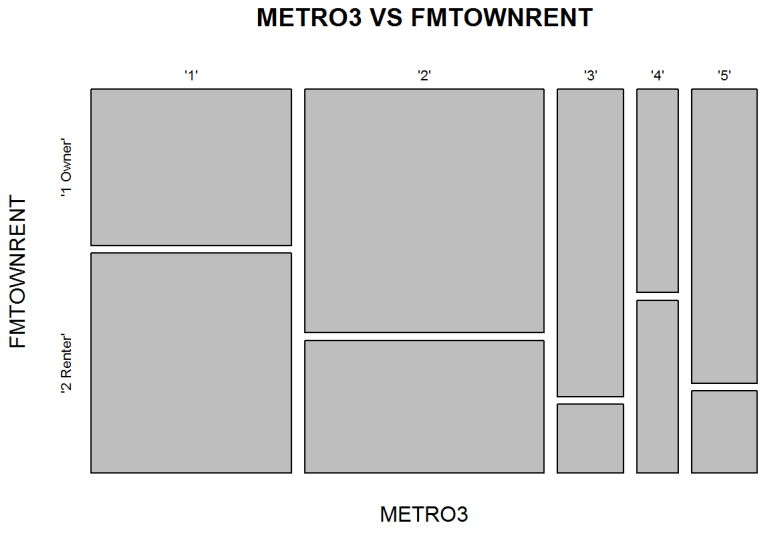
```
##check the variable is either factor or numeric
nums <- sapply(hads2013n_c, is.numeric)
cate<-sapply(hads2013n_c, is.factor)
str(hads2013n_c[,cate])
```

```
## 'data.frame':    60096 obs. of  23 variables:
##  $ METRO3             : Factor w/ 5 levels "'1'","'2'","'3'",..: 3 5 5 5 1 2 1 4 5 4 ...
##  $ REGION             : Factor w/ 4 levels "'1'","'2'","'3'",..: 1 3 3 3 3 3 3 4 4 2 ...
##  $ FMTZADEQ           : Factor w/ 4 levels "'-5'","'1 Adequate'",..: 2 2 2 2 2 2 2 3 2 2 ...
##  $ FMTBUILT           : Factor w/ 7 levels "'Before 1940'",..: 6 4 4 4 4 4 4 4 4 4 ...
##  $ FMTSTRUCTURETYPE   : Factor w/ 7 levels "'.'","'1 Single Family'",..: 2 2 2 2 6 5 2 4 2 5 ...
##  $ FMTBEDRMS          : Factor w/ 5 levels "'0 Studio'","'1 1BR'",..: 3 5 5 4 3 2 4 3 4 2 ...
##  $ FMTOWNRENT         : Factor w/ 2 levels "'1 Owner'","'2 Renter'": 1 1 1 1 2 2 1 2 1 2 ...
##  $ FMTCOST06RELPOVCAT : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 4 5 5 4 5 5 5 5 5 ...
##  $ FMTCOST08RELPOVCAT : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 5 5 5 4 5 5 5 5 5 ...
##  $ FMTCOST12RELPOVCAT : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 5 5 5 4 5 5 5 5 5 ...
##  $ FMTCOSTMEDRELPOVCAT: Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 5 4 5 5 4 5 5 5 5 5 ...
##  $ FMTINCRELPOVCAT    : Factor w/ 5 levels "'.'","'1 LTE Poverty'",..: 4 5 4 5 5 3 5 5 5 5 ...
##  $ FMTCOST06RELFMRCAT : Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
##  $ FMTCOST08RELFMRCAT : Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
##  $ FMTCOST12RELFMRCAT : Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 3 3 3 3 3 3 3 3 3 ...
##  $ FMTCOSTMEDRELFMRCAT: Factor w/ 3 levels "'1 LTE 50% FMR'",..: 2 2 2 3 3 3 3 3 3 3 ...
##  $ FMTINCRELFMRCAT    : Factor w/ 4 levels "'.'","'1 LTE 50% FMR'",..: 2 4 3 3 4 3 4 4 4 4 ...
##  $ FMTCOST06RELAMICAT : Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 4 6 3 3 7 4 6 5 ...
##  $ FMTCOST08RELAMICAT : Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 5 7 3 3 7 4 6 5 ...
##  $ FMTCOST12RELAMICAT : Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 6 6 7 3 3 7 4 7 5 ...
##  $ FMTCOSTMEDRELAMICAT: Factor w/ 7 levels "'1 LTE 30% AMI'",..: 2 4 4 5 3 3 6 4 5 5 ...
##  $ FMTINCRELAMICAT    : Factor w/ 8 levels "'.'","'1 LTE 30% AMI'",..: 3 8 5 5 8 3 8 5 8 7 ...
##  $ FMTBURDEN          : Factor w/ 5 levels "'.'","'1 Less than 30%'",..: 3 2 4 2 2 4 2 3 2 2 ...
```

```
str(hads2013n_c[,nums])
```

```
## 'data.frame':    60096 obs. of  47 variables:
##  $ AGE1            : int  82 50 53 67 26 56 50 26 60 26 ...
##  $ LMED            : int  73738 55846 55846 55846 60991 62066 60991 52322 50296 63221 ...
##  $ FMR             : int  956 1100 1100 949 737 657 988 773 1125 552 ...
##  $ L30             : int  15738 17165 13750 13750 14801 13170 16646 13489 13115 13338 ...
##  $ L50             : int  26213 28604 22897 22897 24628 21924 27713 22471 21859 22199 ...
##  $ L80             : int  40322 45744 36614 36614 39421 35073 44340 35929 34939 35501 ...
##  $ IPOV            : int  11067 24218 15470 13964 15492 12005 18050 15992 15452 12005 ...
##  $ TYPE            : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ NUNITS          : int  1 1 1 1 100 32 1 8 1 24 ...
##  $ ROOMS           : int  6 6 7 6 4 3 6 5 7 3 ...
##  $ WEIGHT          : num  3117 2151 2214 2365 2315 ...
##  $ PER             : int  1 4 2 2 2 1 3 2 2 1 ...
##  $ ZINC2           : int  18021 122961 27974 32220 96874 14987 69962 32000 118987 47987 ...
##  $ ZSMHC           : int  533 487 1405 279 759 695 1165 976 1156 1100 ...
##  $ UTILITY         : num  169 245 159 179 146 ...
##  $ OTHERCOST       : num  213.8 58.3 37.5 70.7 12.5 ...
##  $ COST06          : num  649 1168 1193 1579 759 ...
##  $ COST12          : num  803 1670 1773 2351 759 ...
##  $ COST08          : num  697 1325 1375 1820 759 ...
##  $ COSTMED         : num  615 1059 1068 1412 759 ...
##  $ TOTSAL          : int  0 123000 28000 0 96900 15000 70001 20000 107000 48000 ...
##  $ GLMED           : int  73738 55846 55846 55846 60991 62066 60991 52322 50296 63221 ...
##  $ GL30            : int  15738 17165 13750 13750 14801 13170 16646 13489 13115 13338 ...
##  $ GL50            : int  26213 28604 22897 22897 24628 21924 27713 22471 21859 22199 ...
##  $ GL80            : int  40322 45744 36614 36614 39421 35073 44340 35929 34939 35501 ...
##  $ APLMED          : num  51617 55846 44677 44677 48793 ...
##  $ ABL30           : num  20235 19911 19938 17875 16651 ...
##  $ ABL50           : num  33702 33181 33201 29766 27707 ...
##  $ ABL80           : num  51843 53063 53090 47598 44349 ...
##  $ ABLMED          : num  66364 64781 64781 58080 54892 ...
##  $ BURDEN          : num  0.3549 0.0475 0.6027 0.1039 0.094 ...
##  $ INCRELAMIPCT    : num  34.9 220.2 62.6 72.1 198.5 ...
##  $ INCRELAMICAT    : int  2 7 4 4 7 2 7 4 7 6 ...
##  $ INCRELPOVPCT    : num  163 508 181 231 625 ...
##  $ INCRELFMRPCT    : num  47.1 279.5 63.6 84.9 328.6 ...
##  $ COST06RELAMIPCT : num  39.1 72.1 73.7 108.7 55.3 ...
##  $ COST06RELPOVPCT : num  234 193 309 452 196 ...
##  $ COST06RELFMRPCT : num  67.8 106.1 108.5 166.4 103 ...
##  $ COST08RELAMIPCT : num  42 81.8 84.9 125.4 55.3 ...
##  $ COST08RELPOVPCT : num  252 219 355 521 196 ...
##  $ COST08RELFMRPCT : num  72.9 120.4 125 191.8 103 ...
##  $ COST12RELAMIPCT : num  48.4 103.1 109.5 161.9 55.3 ...
##  $ COST12RELPOVPCT : num  290 276 458 673 196 ...
##  $ COST12RELFMRPCT : num  84 152 161 248 103 ...
##  $ COSTMedRELAMIPCT: num  37.1 65.4 65.9 97.2 55.3 ...
##  $ COSTMedRELPOVPCT: num  222 175 276 404 196 ...
##  $ COSTMedRELFMRPCT: num  64.3 96.3 97.1 148.8 103 ...
```

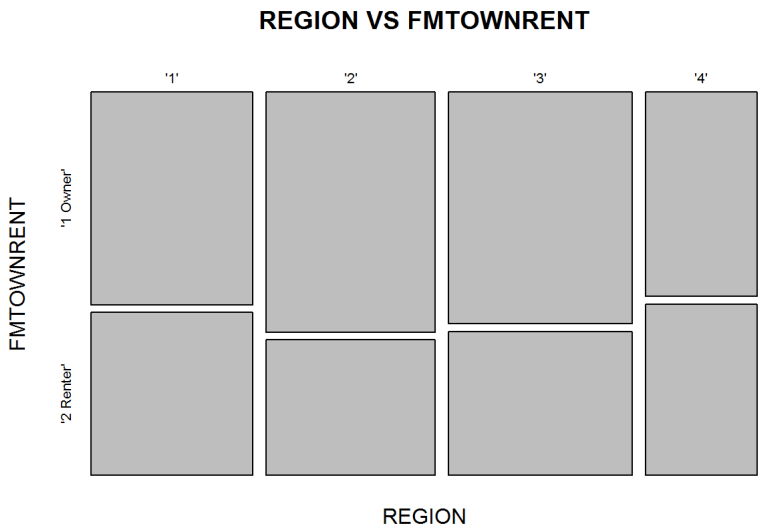
```
###
##for Catergory vs Catergory Variables, simpson method is use to test the correlation
plot(table(hads2013n_c$METRO3,hads2013n_c$FMTOWNRENT),main="METRO3 VS FMTOWNRENT",xlab="METRO3",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ METRO3,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ METRO3, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.3257  -0.9334  -0.7021   1.0360   1.8427
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.34203    0.01447   23.64   <2e-16 ***
## METRO3'2'   -0.94727    0.01990  -47.61   <2e-16 ***
## METRO3'3'   -1.83758    0.03517  -52.24   <2e-16 ***
## METRO3'4'   -0.50426    0.03464  -14.56   <2e-16 ***
## METRO3'5'   -1.61674    0.03354  -48.20   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 75688  on 60091  degrees of freedom
## AIC: 75698
##
## Number of Fisher Scoring iterations: 4
```

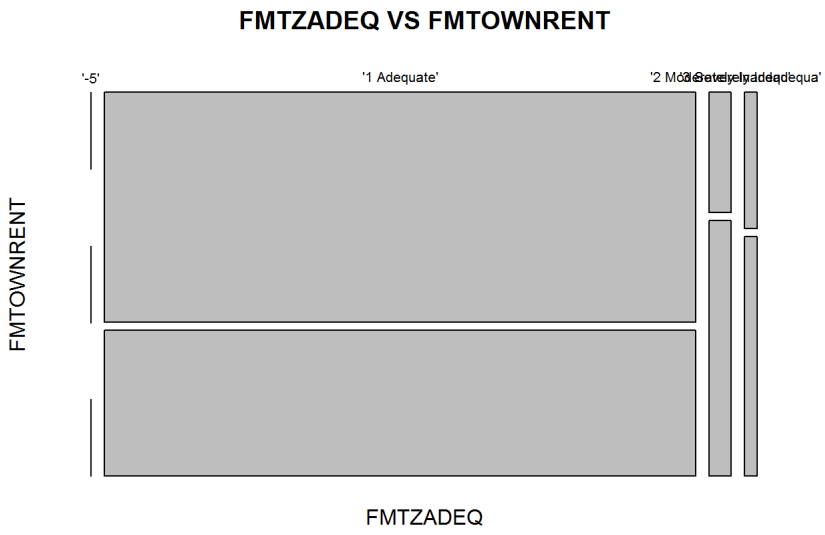
```
#This difference appears large enough to suggest that a relationship does
#exist between METRO3 and FMTOWNRENT.

plot(table(hads2013n_c$REGION,hads2013n_c$FMTOWNRENT),main="REGION VS FMTOWNRENT",xlab="REGION",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ REGION,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ REGION, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.1039  -0.9834  -0.9465   1.2921   1.4275
##
## Coefficients:
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.26564    0.01619 -16.413  < 2e-16 ***
## REGION'2'   -0.30530    0.02301 -13.271  < 2e-16 ***
## REGION'3'   -0.20943    0.02240  -9.348  < 2e-16 ***
## REGION'4'    0.09017    0.02527   3.569 0.000359 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 80720  on 60092  degrees of freedom
## AIC: 80728
##
## Number of Fisher Scoring iterations: 4
```

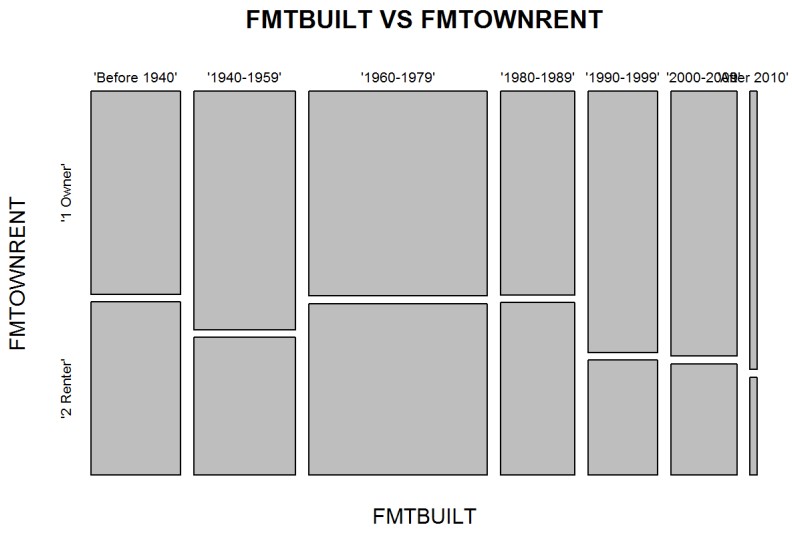
```
#This difference appears slightly enough to suggest that a relationship does
#exist between METRO3 and FMTOWNRENT.

plot(table(hads2013n_c$FMTZADEQ,hads2013n_c$FMTOWNRENT),main="FMTZADEQ VS FMTOWNRENT",xlab="FMTZADEQ",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ FMTZADEQ,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTZADEQ, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.5099  -0.9913  -0.9913   1.3757   1.3757
##
## Coefficients:
##                               Estimate Std. Error z value Pr(>|z|)
## (Intercept)                  -0.455012   0.008611  -52.84   <2e-16 ***
## FMTZADEQ'2 Moderately Inadequ'  1.209554   0.047055   25.70   <2e-16 ***
## FMTZADEQ'3 Severely Indadequa'  1.019029   0.061651   16.53   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 80072  on 60093  degrees of freedom
## AIC: 80078
##
## Number of Fisher Scoring iterations: 4
```

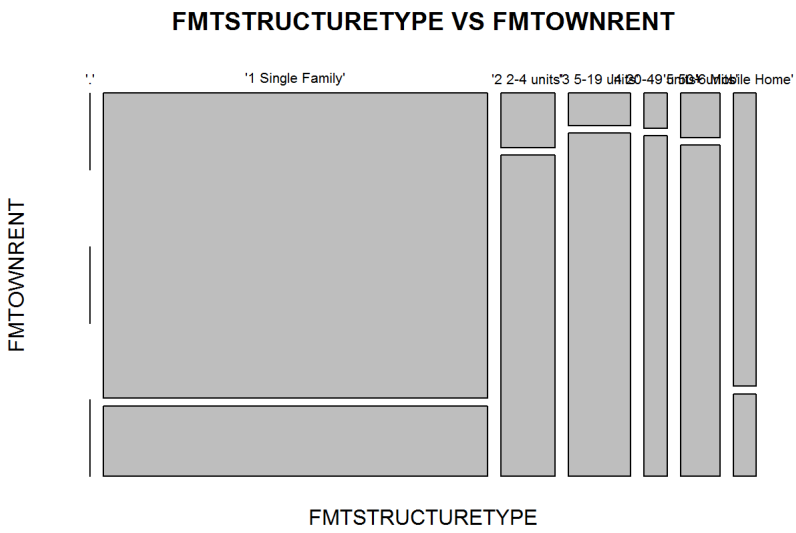
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTZADEQ and FMTOWNRENT.

plot(table(hads2013n_c$FMTBUILT,hads2013n_c$FMTOWNRENT),main="FMTBUILT VS FMTOWNRENT",xlab="FMTBUILT",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ FMTBUILT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTBUILT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.1110  -1.1032  -0.8544   1.2535   1.6401
##
## Coefficients:
##                       Estimate Std. Error z value Pr(>|z|)
## (Intercept)          -0.158287   0.020911  -7.570 3.75e-14 ***
## FMTBUILT'1940-1959'  -0.388711   0.029170 -13.326  < 2e-16 ***
## FMTBUILT'1960-1979'  -0.018867   0.025642  -0.736    0.462
## FMTBUILT'1980-1989'  -0.007907   0.031088  -0.254    0.799
## FMTBUILT'1990-1999'  -0.661557   0.033119 -19.975  < 2e-16 ***
## FMTBUILT'2000-2009'  -0.709243   0.033913 -20.913  < 2e-16 ***
## FMTBUILT'After 2010' -0.884808   0.089400  -9.897  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 79879  on 60089  degrees of freedom
## AIC: 79893
##
## Number of Fisher Scoring iterations: 4
```

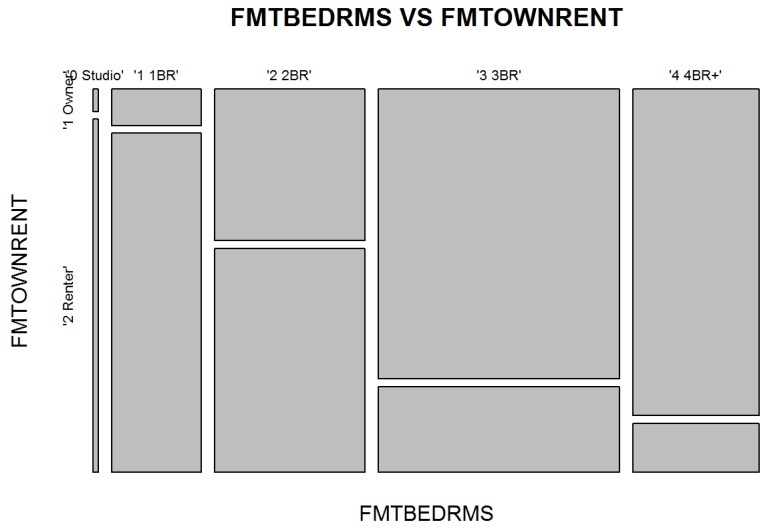
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTBUILT and FMTOWNRENT.

plot(table(hads2013n_c$FMTSTRUCTURETYPE,hads2013n_c$FMTOWNRENT),main="FMTSTRUCTURETYPE VS FMTOWNRENT",xlab="FMTSTRUCTURETYP
E",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ FMTSTRUCTURETYPE,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTSTRUCTURETYPE, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.2139  -0.6439  -0.6439   0.5018   1.8305
##
## Coefficients:
##                                Estimate Std. Error  z value Pr(>|z|)
## (Intercept)                    -1.46800    0.01292 -113.639  < 2e-16 ***
## FMTSTRUCTURETYPE'2 2-4 units'   3.24026    0.04012   80.768  < 2e-16 ***
## FMTSTRUCTURETYPE'3 5-19 units'  3.82841    0.04639   82.531  < 2e-16 ***
## FMTSTRUCTURETYPE'4 20-49 units' 3.73746    0.07135   52.381  < 2e-16 ***
## FMTSTRUCTURETYPE'5 50+ units'   3.47680    0.05020   69.262  < 2e-16 ***
## FMTSTRUCTURETYPE'6 Mobile Home' 0.19968    0.05220    3.826  0.00013 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 53207  on 60090  degrees of freedom
## AIC: 53219
##
## Number of Fisher Scoring iterations: 4
```

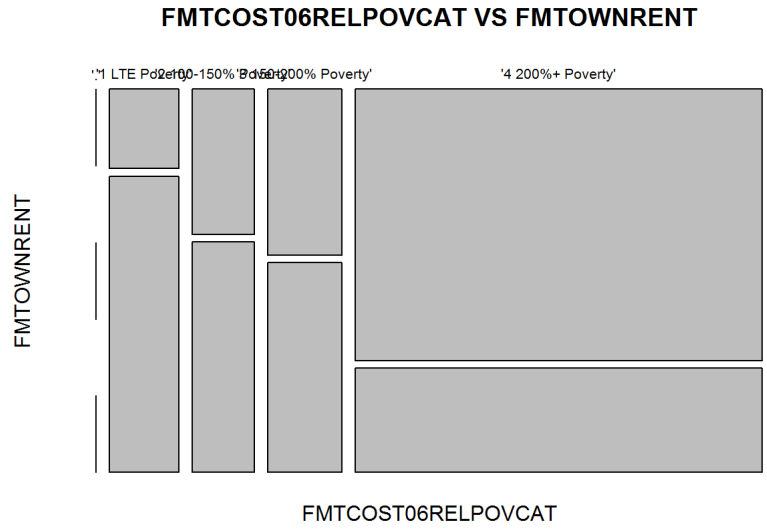
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTSTRUCTURETYPE and FMTOWNRENT.

plot(table(hads2013n_c$FMTBEDRMS,hads2013n_c$FMTOWNRENT),main="FMTBEDRMS VS FMTOWNRENT",xlab="FMTBEDRMS",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ FMTBEDRMS,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTBEDRMS, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.3763  -0.7200  -0.5299   1.0171   2.0163
##
## Coefficients:
##                   Estimate Std. Error z value Pr(>|z|)
## (Intercept)         2.7621     0.1882  14.673  < 2e-16 ***
## FMTBEDRMS'1 1BR'   -0.5305     0.1917  -2.768  0.00565 **
## FMTBEDRMS'2 2BR'   -2.3725     0.1890 -12.553  < 2e-16 ***
## FMTBEDRMS'3 3BR'   -3.9798     0.1889 -21.070  < 2e-16 ***
## FMTBEDRMS'4 4BR+'  -4.6545     0.1901 -24.481  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 60792  on 60091  degrees of freedom
## AIC: 60802
##
## Number of Fisher Scoring iterations: 5
```

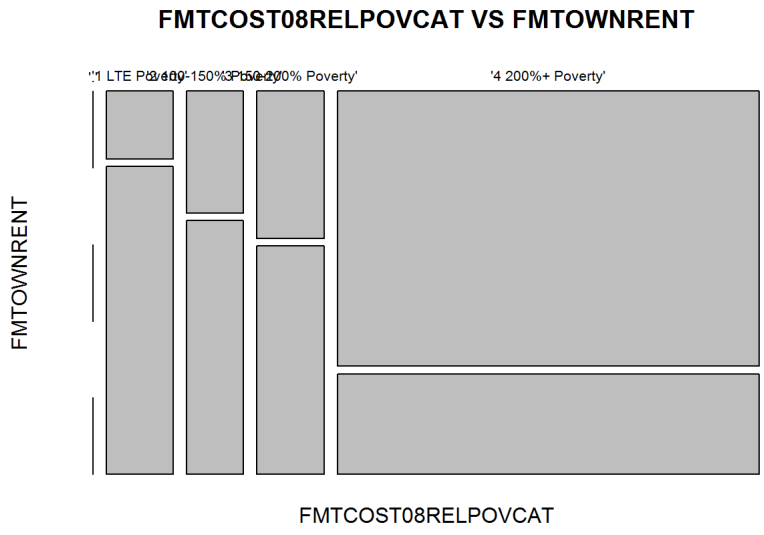
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTBEDRMS and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST06RELPOVCAT,hads2013n_c$FMTOWNRENT),main="FMTCOST06RELPOVCAT VS FMTOWNRENT",xlab="FMTCOST06REL
POVCAT",ylab="FMTOWNRENT")
```




```
summary(glm(FMTOWNRENT ~ FMTCOST06RELPOVCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST06RELPOVCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7637  -0.8062  -0.8062   1.0801   1.6014
##
## Coefficients:
##                                      Estimate Std. Error z value
## (Intercept)                           1.31822    0.02971   44.37
## FMTCOST06RELPOVCAT'2 100-150% Poverty' -0.85475    0.03966  -21.55
## FMTCOST06RELPOVCAT'3 150-200% Poverty' -1.08502    0.03797  -28.58
## FMTCOST06RELPOVCAT'4 200%+ Poverty'    -2.27543    0.03174  -71.68
##                                      Pr(>|z|)
## (Intercept)                            <2e-16 ***
## FMTCOST06RELPOVCAT'2 100-150% Poverty'   <2e-16 ***
## FMTCOST06RELPOVCAT'3 150-200% Poverty'   <2e-16 ***
## FMTCOST06RELPOVCAT'4 200%+ Poverty'      <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 72280  on 60092  degrees of freedom
## AIC: 72288
##
## Number of Fisher Scoring iterations: 4
```

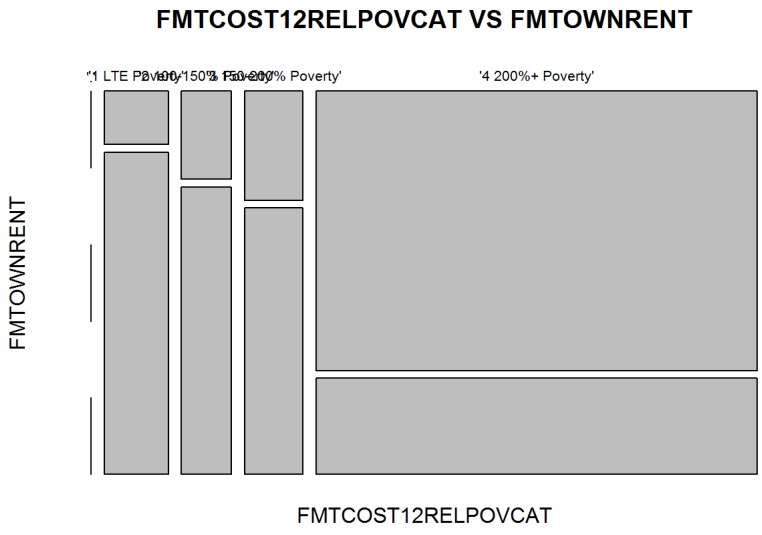
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST06RELPOVCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST08RELPOVCAT,hads2013n_c$FMTOWNRENT),main='FMTCOST08RELPOVCAT VS FMTOWNRENT',xlab='FMTCOST08REL
POVCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST08RELPOVCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST08RELPOVCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.8507  -0.7899  -0.7899   0.9974   1.6229
##
## Coefficients:
##                                      Estimate Std. Error z value
## (Intercept)                           1.51372    0.03214   47.09
## FMTCOST08RELPOVCAT'2 100-150% Poverty' -0.78117    0.04306  -18.14
## FMTCOST08RELPOVCAT'3 150-200% Poverty' -1.07447    0.04079  -26.34
## FMTCOST08RELPOVCAT'4 200%+ Poverty'    -2.51861    0.03401  -74.06
##                                      Pr(>|z|)
## (Intercept)                            <2e-16 ***
## FMTCOST08RELPOVCAT'2 100-150% Poverty'   <2e-16 ***
## FMTCOST08RELPOVCAT'3 150-200% Poverty'   <2e-16 ***
## FMTCOST08RELPOVCAT'4 200%+ Poverty'      <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 70152  on 60092  degrees of freedom
## AIC: 70160
##
## Number of Fisher Scoring iterations: 4
```

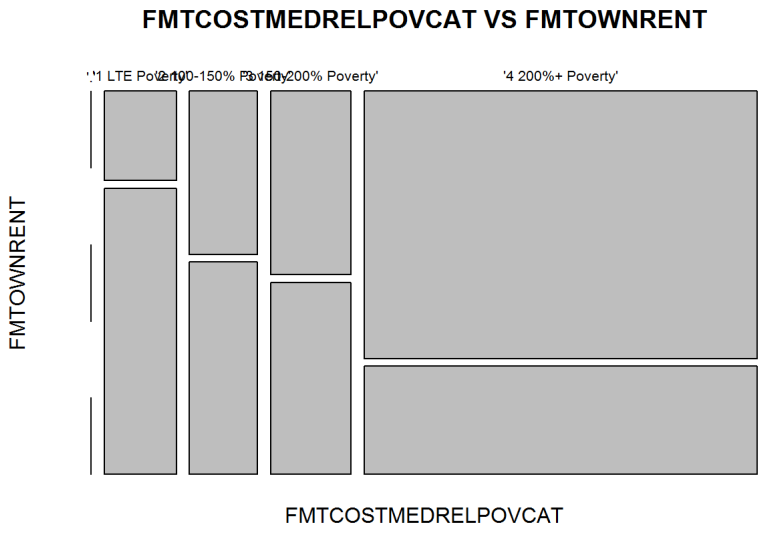
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST08RELPOVCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST12RELPOVCAT,hads2013n_c$FMTOWNRENT),main='FMTCOST12RELPOVCAT VS FMTOWNRENT',xlab='FMTCOST12REL
POVCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST12RELPOVCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST12RELPOVCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9759  -0.7695  -0.7695   0.8295   1.6502
##
## Coefficients:
##                                      Estimate Std. Error z value
## (Intercept)                           1.79887    0.03623   49.65
## FMTCOST12RELPOVCAT'2 100-150% Poverty' -0.61868    0.04946  -12.51
## FMTCOST12RELPOVCAT'3 150-200% Poverty' -0.90867    0.04649  -19.55
## FMTCOST12RELPOVCAT'4 200%+ Poverty'    -2.86438    0.03787  -75.64
##                                      Pr(>|z|)
## (Intercept)                            <2e-16 ***
## FMTCOST12RELPOVCAT'2 100-150% Poverty'   <2e-16 ***
## FMTCOST12RELPOVCAT'3 150-200% Poverty'   <2e-16 ***
## FMTCOST12RELPOVCAT'4 200%+ Poverty'      <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 66548  on 60092  degrees of freedom
## AIC: 66556
##
## Number of Fisher Scoring iterations: 4
```

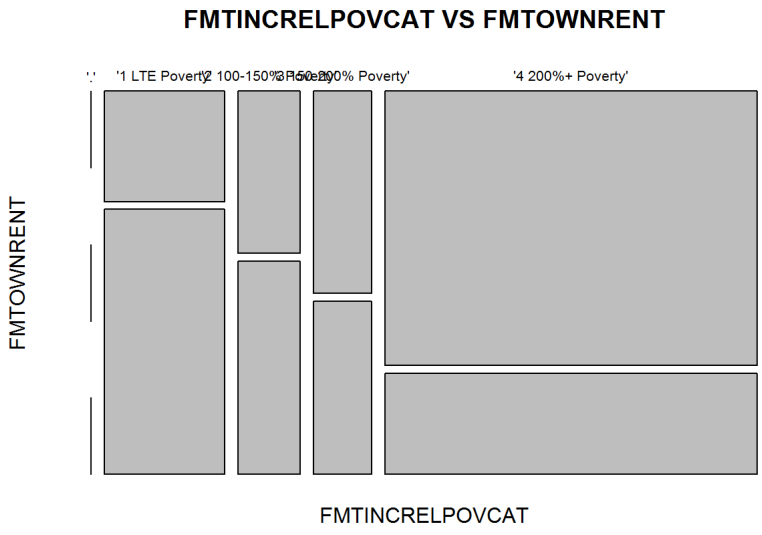
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST12RELPOVCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOSTMEDRELPOVCAT,hads2013n_c$FMTOWNRENT),main='FMTCOSTMEDRELPOVCAT VS FMTOWNRENT',xlab='FMTCOSTMED
RELPOVCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOSTMEDRELPOVCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOSTMEDRELPOVCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.6944  -0.8237  -0.8237   1.1583   1.5785
##
## Coefficients:
##                                      Estimate Std. Error z value
## (Intercept)                           1.16367    0.02798   41.59
## FMTCOSTMEDRELPOVCAT'2 100-150% Poverty' -0.89925    0.03737  -24.06
## FMTCOSTMEDRELPOVCAT'3 150-200% Poverty' -1.11845    0.03590  -31.16
## FMTCOSTMEDRELPOVCAT'4 200%+ Poverty'    -2.07029    0.03016  -68.64
##                                      Pr(>|z|)
## (Intercept)                            <2e-16 ***
## FMTCOSTMEDRELPOVCAT'2 100-150% Poverty'   <2e-16 ***
## FMTCOSTMEDRELPOVCAT'3 150-200% Poverty'   <2e-16 ***
## FMTCOSTMEDRELPOVCAT'4 200%+ Poverty'      <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 73991  on 60092  degrees of freedom
## AIC: 73999
##
## Number of Fisher Scoring iterations: 4
```

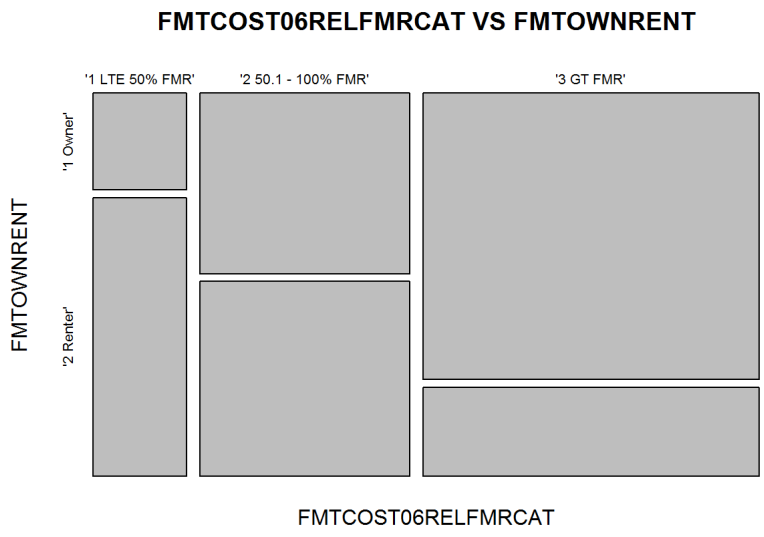
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOSTMEDRELPOVCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTINCRELPOVCAT,hads2013n_c$FMTOWNRENT),main='FMTINCRELPOVCAT VS FMTOWNRENT',xlab='FMTINCRELPOVCAT',y
lab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTINCRELPOVCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTINCRELPOVCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.5638  -0.7921  -0.7921   1.0638   1.6200
##
## Coefficients:
##                                  Estimate Std. Error z value Pr(>|z|)
## (Intercept)                       0.87405    0.02019   43.29   <2e-16
## FMTINCRELPOVCAT'2 100-150% Poverty' -0.60074    0.03283  -18.30   <2e-16
## FMTINCRELPOVCAT'3 150-200% Poverty' -1.03010    0.03337  -30.87   <2e-16
## FMTINCRELPOVCAT'4 200%+ Poverty'    -1.87251    0.02338  -80.07   <2e-16
##
## (Intercept)                      ***
## FMTINCRELPOVCAT'2 100-150% Poverty' ***
## FMTINCRELPOVCAT'3 150-200% Poverty' ***
## FMTINCRELPOVCAT'4 200%+ Poverty'    ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 73029  on 60092  degrees of freedom
## AIC: 73037
##
## Number of Fisher Scoring iterations: 4
```

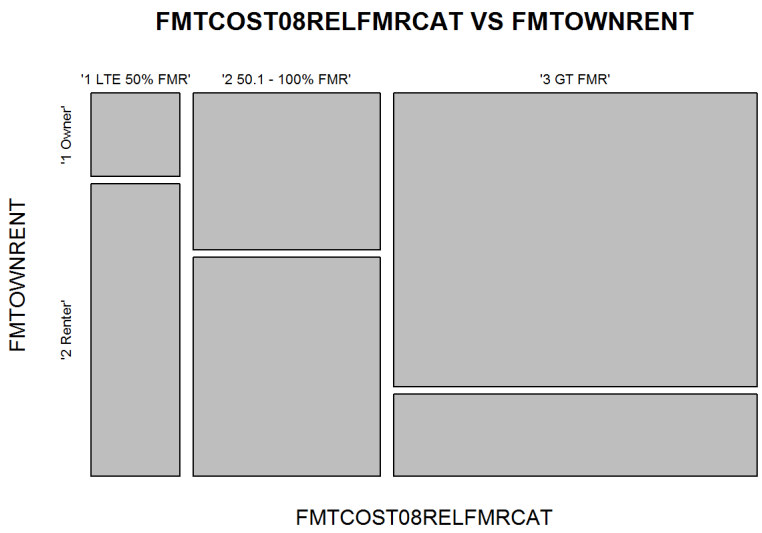
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTINCRELPOVCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST06RELFMRCAT,hads2013n_c$FMTOWNRENT),main='FMTCOST06RELFMRCAT VS FMTOWNRENT',xlab='FMTCOST06REL
FMRCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST06RELFMRCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST06RELFMRCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.6473  -0.7355  -0.7355   1.1457   1.6970
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.05901    0.02442   43.36   <2e-16
## FMTCOST06RELFMRCAT'2 50.1 - 100% FMR' -0.98401    0.02827  -34.81   <2e-16
## FMTCOST06RELFMRCAT'3 GT FMR'          -2.22843    0.02778  -80.22   <2e-16
##
## (Intercept)                         ***
## FMTCOST06RELFMRCAT'2 50.1 - 100% FMR' ***
## FMTCOST06RELFMRCAT'3 GT FMR'          ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 71941  on 60093  degrees of freedom
## AIC: 71947
##
## Number of Fisher Scoring iterations: 4
```

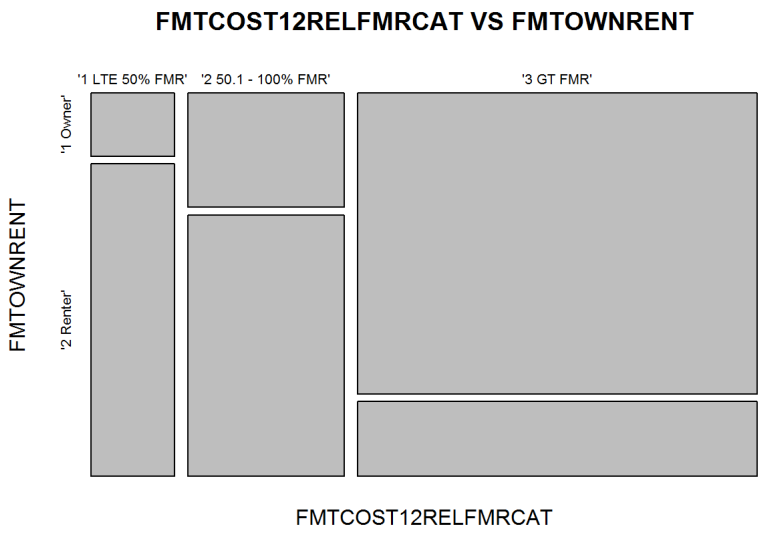
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST06RELFMRCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST08RELFMRCAT,hads2013n_c$FMTOWNRENT),main='FMTCOST08RELFMRCAT VS FMTOWNRENT',xlab='FMTCOST08REL
FMRCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST08RELFMRCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST08RELFMRCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7367  -0.7031  -0.7031   1.0388   1.7428
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.25777    0.02634   47.75   <2e-16
## FMTCOST08RELFMRCAT'2 50.1 - 100% FMR' -0.92266    0.03046  -30.29   <2e-16
## FMTCOST08RELFMRCAT'3 GT FMR'          -2.52919    0.02941  -85.99   <2e-16
##
## (Intercept)                         ***
## FMTCOST08RELFMRCAT'2 50.1 - 100% FMR' ***
## FMTCOST08RELFMRCAT'3 GT FMR'          ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 68635  on 60093  degrees of freedom
## AIC: 68641
##
## Number of Fisher Scoring iterations: 4
```

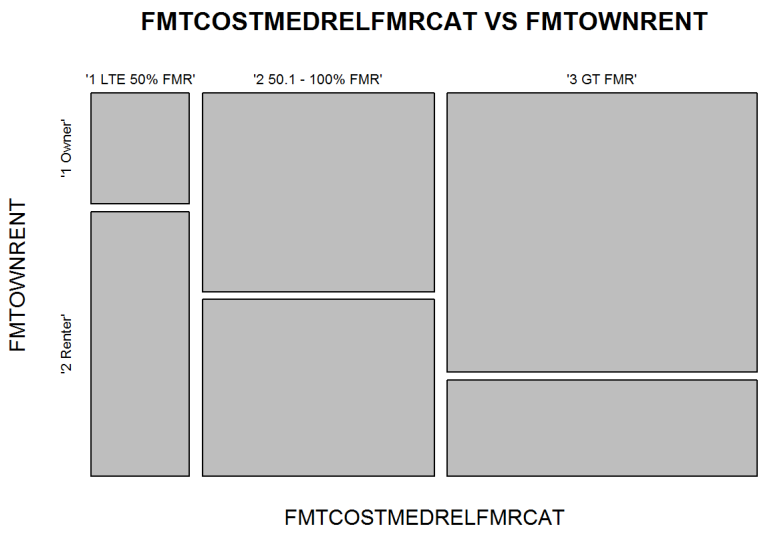
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST08RELFMRCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST12RELFMRCAT,hads2013n_c$FMTOWNRENT),main='FMTCOST12RELFMRCAT VS FMTOWNRENT',xlab='FMTCOST12REL
FMRCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST12RELFMRCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST12RELFMRCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.8897  -0.6665  -0.6665   0.8511   1.7964
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.60194    0.03026   52.94   <2e-16
## FMTCOST12RELFMRCAT'2 50.1 - 100% FMR' -0.77290    0.03517  -21.98   <2e-16
## FMTCOST12RELFMRCAT'3 GT FMR'          -2.99330    0.03291  -90.97   <2e-16
##
## (Intercept)                         ***
## FMTCOST12RELFMRCAT'2 50.1 - 100% FMR' ***
## FMTCOST12RELFMRCAT'3 GT FMR'          ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 62656  on 60093  degrees of freedom
## AIC: 62662
##
## Number of Fisher Scoring iterations: 4
```

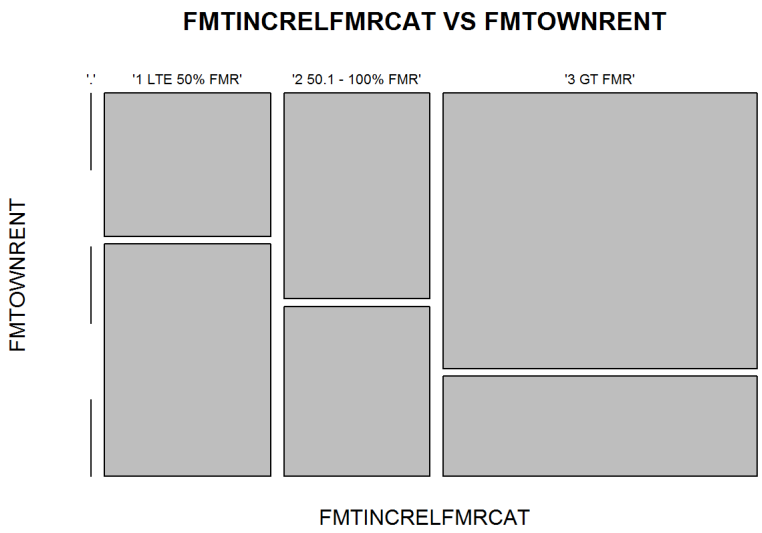
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST12RELFMRCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOSTMEDRELFMRCAT,hads2013n_c$FMTOWNRENT),main='FMTCOSTMEDRELFMRCAT VS FMTOWNRENT',xlab='FMTCOSTMED
RELFMRCAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOSTMEDRELFMRCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOSTMEDRELFMRCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.5628  -0.7709  -0.7709   1.2270   1.6483
##
## Coefficients:
##                                     Estimate Std. Error z value
## (Intercept)                          0.87176    0.02282   38.20
## FMTCOSTMEDRELFMRCAT'2 50.1 - 100% FMR' -0.98764    0.02656  -37.19
## FMTCOSTMEDRELFMRCAT'3 GT FMR'          -1.93313    0.02647  -73.02
##                                     Pr(>|z|)
## (Intercept)                           <2e-16 ***
## FMTCOSTMEDRELFMRCAT'2 50.1 - 100% FMR'   <2e-16 ***
## FMTCOSTMEDRELFMRCAT'3 GT FMR'            <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 74469  on 60093  degrees of freedom
## AIC: 74475
##
## Number of Fisher Scoring iterations: 4
```

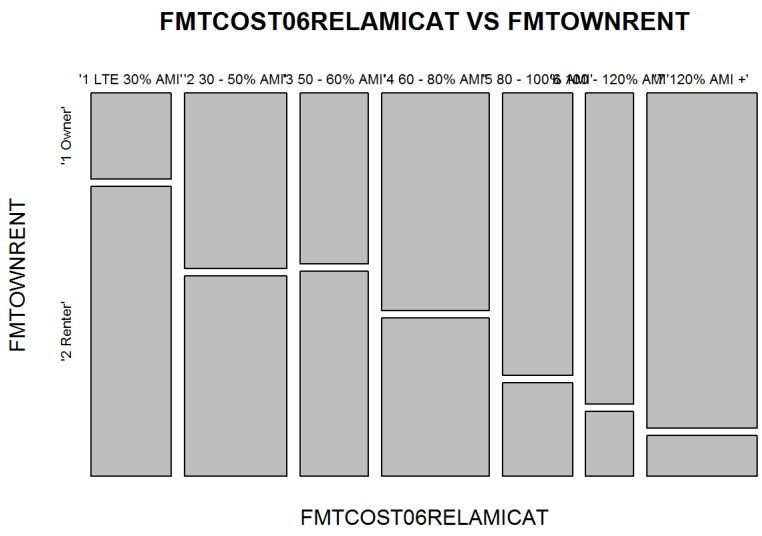
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOSTMEDRELFMRCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTINCRELFMRCAT,hads2013n_c$FMTOWNRENT),main='FMTINCRELFMRCAT VS FMTOWNRENT',xlab='FMTINCRELFMRCAT',y
lab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTINCRELFMRCAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTINCRELFMRCAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.3886  -0.7872  -0.7872   0.9800   1.6264
##
## Coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                      0.48391    0.01630   29.69   <2e-16
## FMTINCRELFMRCAT'2 50.1 - 100% FMR' -0.67310    0.02353  -28.60   <2e-16
## FMTINCRELFMRCAT'3 GT FMR'          -1.49677    0.02087  -71.73   <2e-16
##
## (Intercept)                      ***
## FMTINCRELFMRCAT'2 50.1 - 100% FMR' ***
## FMTINCRELFMRCAT'3 GT FMR'          ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 75440  on 60093  degrees of freedom
## AIC: 75446
##
## Number of Fisher Scoring iterations: 4
```

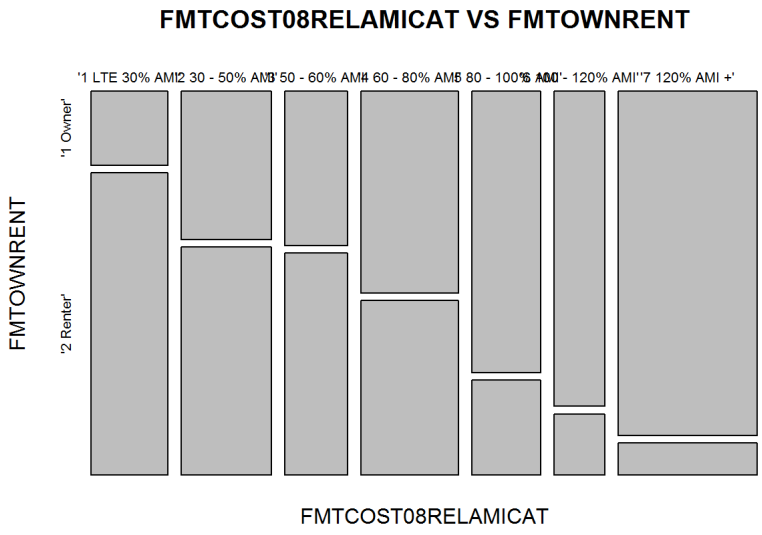
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTINCRELFMRCAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST06RELAMICAT,hads2013n_c$FMTOWNRENT),main='FMTCOST06RELAMICAT VS FMTOWNRENT',xlab='FMTCOST06REL
AMICAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST06RELAMICAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST06RELAMICAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.7196  -1.0468  -0.4782   1.1002   2.1096
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.21986    0.02634   46.31   <2e-16
## FMTCOST06RELAMICAT'2 30 - 50% AMI'  -1.08776    0.03280  -33.17   <2e-16
## FMTCOST06RELAMICAT'3 50 - 60% AMI'  -1.03554    0.03567  -29.03   <2e-16
## FMTCOST06RELAMICAT'4 60 - 80% AMI'  -1.53516    0.03264  -47.03   <2e-16
## FMTCOST06RELAMICAT'5 80 - 100% AMI' -2.32589    0.03791  -61.35   <2e-16
## FMTCOST06RELAMICAT'6 100 - 120% AMI' -2.78665    0.04613  -60.41   <2e-16
## FMTCOST06RELAMICAT'7 120% AMI +'    -3.33074    0.04015  -82.96   <2e-16
##
## (Intercept)                        ***
## FMTCOST06RELAMICAT'2 30 - 50% AMI'  ***
## FMTCOST06RELAMICAT'3 50 - 60% AMI'  ***
## FMTCOST06RELAMICAT'4 60 - 80% AMI'  ***
## FMTCOST06RELAMICAT'5 80 - 100% AMI' ***
## FMTCOST06RELAMICAT'6 100 - 120% AMI' ***
## FMTCOST06RELAMICAT'7 120% AMI +'    ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 68266  on 60089  degrees of freedom
## AIC: 68280
##
## Number of Fisher Scoring iterations: 4
```

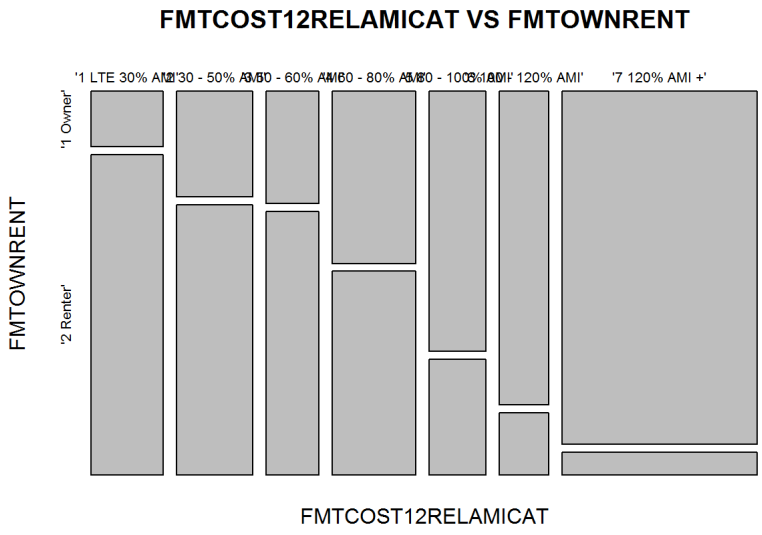
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST06RELAMICAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST08RELAMICAT,hads2013n_c$FMTOWNRENT),main='FMTCOST08RELAMICAT VS FMTOWNRENT',xlab='FMTCOST08REL
AMICAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST08RELAMICAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST08RELAMICAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.8046  -0.7633  -0.4233   1.0005   2.2168
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.40982    0.02839   49.66   <2e-16
## FMTCOST08RELAMICAT'2 30 - 50% AMI'  -0.97843    0.03548  -27.58   <2e-16
## FMTCOST08RELAMICAT'3 50 - 60% AMI'  -1.04425    0.03804  -27.45   <2e-16
## FMTCOST08RELAMICAT'4 60 - 80% AMI'  -1.55226    0.03475  -44.67   <2e-16
## FMTCOST08RELAMICAT'5 80 - 100% AMI' -2.49399    0.03941  -63.28   <2e-16
## FMTCOST08RELAMICAT'6 100 - 120% AMI' -3.04802    0.04714  -64.65   <2e-16
## FMTCOST08RELAMICAT'7 120% AMI +'    -3.77732    0.04125  -91.57   <2e-16
##
## (Intercept)                         ***
## FMTCOST08RELAMICAT'2 30 - 50% AMI'  ***
## FMTCOST08RELAMICAT'3 50 - 60% AMI'  ***
## FMTCOST08RELAMICAT'4 60 - 80% AMI'  ***
## FMTCOST08RELAMICAT'5 80 - 100% AMI' ***
## FMTCOST08RELAMICAT'6 100 - 120% AMI' ***
## FMTCOST08RELAMICAT'7 120% AMI +'    ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 63701  on 60089  degrees of freedom
## AIC: 63715
##
## Number of Fisher Scoring iterations: 5
```

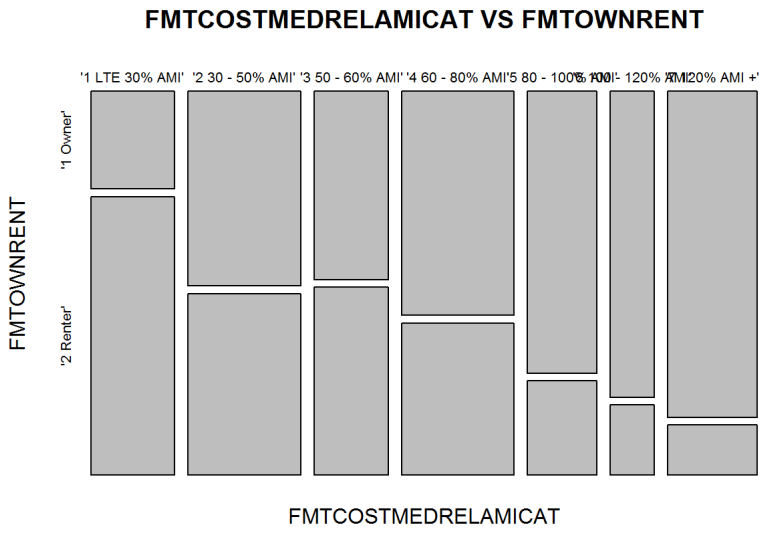
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST08RELAMICAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOST12RELAMICAT,hads2013n_c$FMTOWNRENT),main='FMTCOST12RELAMICAT VS FMTOWNRENT',xlab='FMTCOST12REL
AMICAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOST12RELAMICAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOST12RELAMICAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.9565  -0.6035  -0.3549   0.8122   2.3648
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.75435    0.03274   53.58   <2e-16
## FMTCOST12RELAMICAT'2 30 - 50% AMI'  -0.81452    0.04132  -19.71   <2e-16
## FMTCOST12RELAMICAT'3 50 - 60% AMI'  -0.89968    0.04418  -20.36   <2e-16
## FMTCOST12RELAMICAT'4 60 - 80% AMI'  -1.58515    0.03927  -40.37   <2e-16
## FMTCOST12RELAMICAT'5 80 - 100% AMI' -2.56342    0.04335  -59.13   <2e-16
## FMTCOST12RELAMICAT'6 100 - 120% AMI' -3.36521    0.04995  -67.37   <2e-16
## FMTCOST12RELAMICAT'7 120% AMI +'    -4.48742    0.04410 -101.77   <2e-16
##
## (Intercept)                        ***
## FMTCOST12RELAMICAT'2 30 - 50% AMI'  ***
## FMTCOST12RELAMICAT'3 50 - 60% AMI'  ***
## FMTCOST12RELAMICAT'4 60 - 80% AMI'  ***
## FMTCOST12RELAMICAT'5 80 - 100% AMI' ***
## FMTCOST12RELAMICAT'6 100 - 120% AMI' ***
## FMTCOST12RELAMICAT'7 120% AMI +'    ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 54846  on 60089  degrees of freedom
## AIC: 54860
##
## Number of Fisher Scoring iterations: 5
```

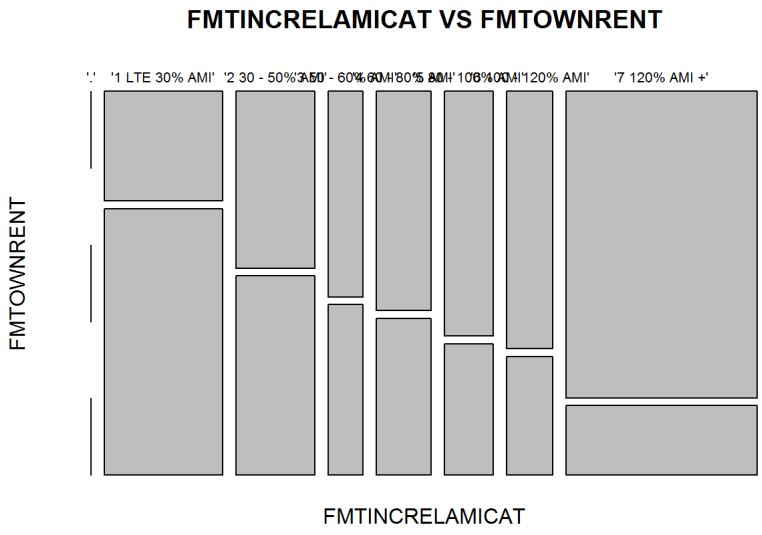
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOST12RELAMICAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTCOSTMEDRELAMICAT,hads2013n_c$FMTOWNRENT),main='FMTCOSTMEDRELAMICAT VS FMTOWNRENT',xlab='FMTCOSTMED
RELAMICAT',ylab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTCOSTMEDRELAMICAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTCOSTMEDRELAMICAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.6431  -1.0179  -0.5352   1.1780   2.0071
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         1.04984    0.02470   42.51   <2e-16
## FMTCOSTMEDRELAMICAT'2 30 - 50% AMI'  -1.11957    0.03090  -36.23   <2e-16
## FMTCOSTMEDRELAMICAT'3 50 - 60% AMI'  -1.05116    0.03369  -31.20   <2e-16
## FMTCOSTMEDRELAMICAT'4 60 - 80% AMI'  -1.43730    0.03116  -46.13   <2e-16
## FMTCOSTMEDRELAMICAT'5 80 - 100% AMI'  -2.14641    0.03681  -58.30   <2e-16
## FMTCOSTMEDRELAMICAT'6 100 - 120% AMI' -2.52137    0.04548  -55.44   <2e-16
## FMTCOSTMEDRELAMICAT'7 120% AMI +'     -2.92083    0.03944  -74.07   <2e-16
##
## (Intercept)                         ***
## FMTCOSTMEDRELAMICAT'2 30 - 50% AMI'  ***
## FMTCOSTMEDRELAMICAT'3 50 - 60% AMI'  ***
## FMTCOSTMEDRELAMICAT'4 60 - 80% AMI'  ***
## FMTCOSTMEDRELAMICAT'5 80 - 100% AMI'  ***
## FMTCOSTMEDRELAMICAT'6 100 - 120% AMI' ***
## FMTCOSTMEDRELAMICAT'7 120% AMI +'     ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 71537  on 60089  degrees of freedom
## AIC: 71551
##
## Number of Fisher Scoring iterations: 4
```

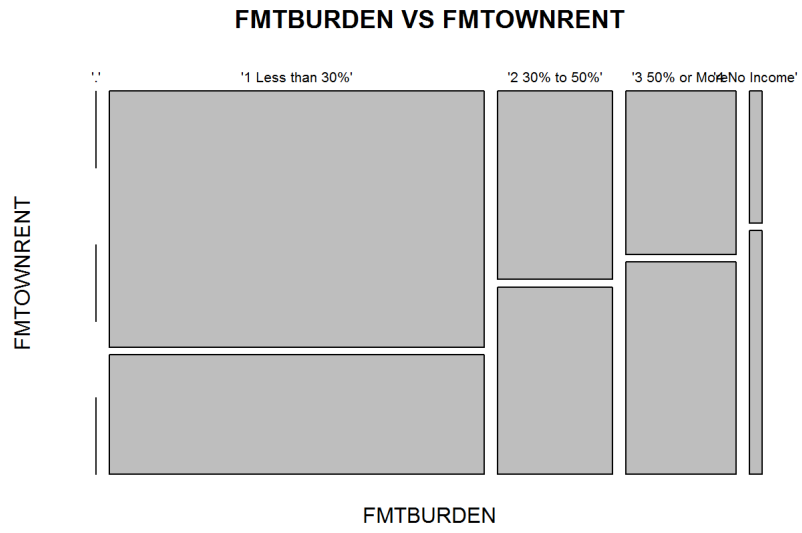
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTCOSTMEDRELAMICAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTINCRELAMICAT,hads2013n_c$FMTOWNRENT),main='FMTINCRELAMICAT VS FMTOWNRENT',xlab='FMTINCRELAMICAT',y
lab='FMTOWNRENT')
```




```
summary(glm(FMTOWNRENT ~ FMTINCRELAMICAT,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTINCRELAMICAT, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.5705  -0.9266  -0.6390   1.1274   1.8380
##
## Coefficients:
##                                Estimate Std. Error z value Pr(>|z|)
## (Intercept)                     0.88880    0.01978   44.94   <2e-16 ***
## FMTINCRELAMICAT'2 30 - 50% AMI'   -0.77005    0.02960  -26.02   <2e-16 ***
## FMTINCRELAMICAT'3 50 - 60% AMI'   -1.07654    0.03867  -27.84   <2e-16 ***
## FMTINCRELAMICAT'4 60 - 80% AMI'   -1.22421    0.03321  -36.86   <2e-16 ***
## FMTINCRELAMICAT'5 80 - 100% AMI'  -1.51210    0.03537  -42.75   <2e-16 ***
## FMTINCRELAMICAT'6 100 - 120% AMI' -1.66409    0.03658  -45.49   <2e-16 ***
## FMTINCRELAMICAT'7 120% AMI +'     -2.37384    0.02689  -88.26   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 71120  on 60089  degrees of freedom
## AIC: 71134
##
## Number of Fisher Scoring iterations: 4
```

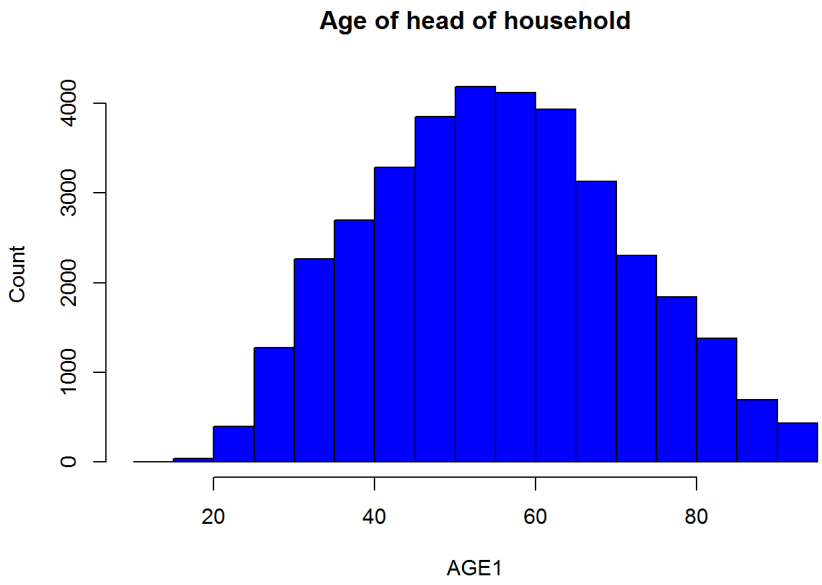
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTINCRELAMICAT and FMTOWNRENT.

plot(table(hads2013n_c$FMTBURDEN,hads2013n_c$FMTOWNRENT),main='FMTBURDEN VS FMTOWNRENT',xlab='FMTBURDEN',ylab='FMTOWNRENT')
```



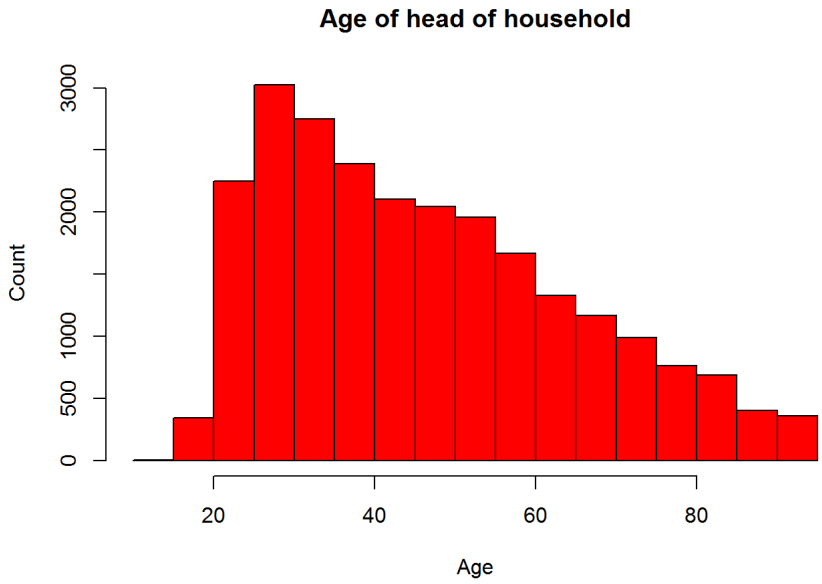

```
summary(glm(FMTOWNRENT ~ FMTBURDEN,family=binomial(link = "logit"),data=hads2013n_c))
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ FMTBURDEN, family = binomial(link = "logit"),
##     data = hads2013n_c)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.4471  -0.8755  -0.8755   1.1799   1.5130
##
## Coefficients:
##                          Estimate Std. Error z value Pr(>|z|)
## (Intercept)              -0.76133    0.01119  -68.01   <2e-16 ***
## FMTBURDEN'2 30% to 50%'   0.75549    0.02190   34.50   <2e-16 ***
## FMTBURDEN'3 50% or More'  1.02582    0.02239   45.81   <2e-16 ***
## FMTBURDEN'4 No Income'    1.37601    0.06131   22.44   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 81054  on 60095  degrees of freedom
## Residual deviance: 78049  on 60092  degrees of freedom
## AIC: 78057
##
## Number of Fisher Scoring iterations: 4
```

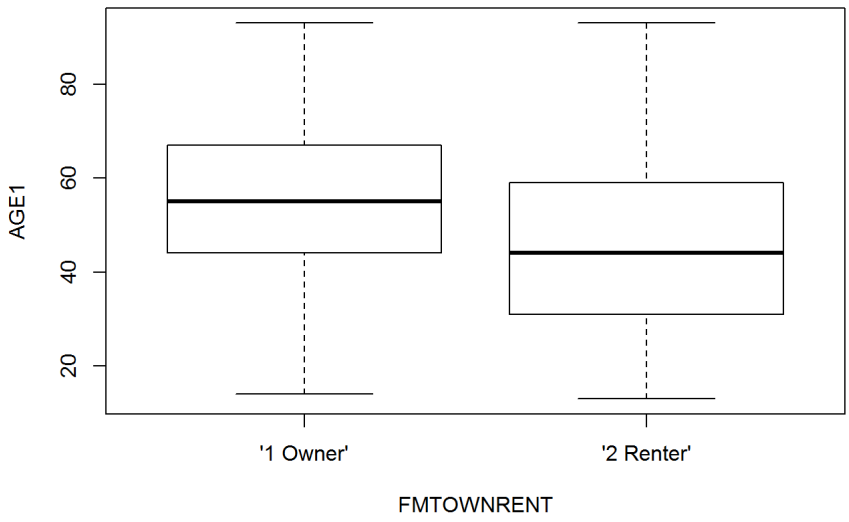
```
#This difference appears large enough to suggest that a relationship does
#exist between FMTBURDEN and FMTOWNRENT.


##
##
## FOr Catergory VS Numeric Variable
hist(hads2013n_c$AGE1[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Age of head of household', xlab='AGE1', ylab='Coun
t',col ='blue')
```



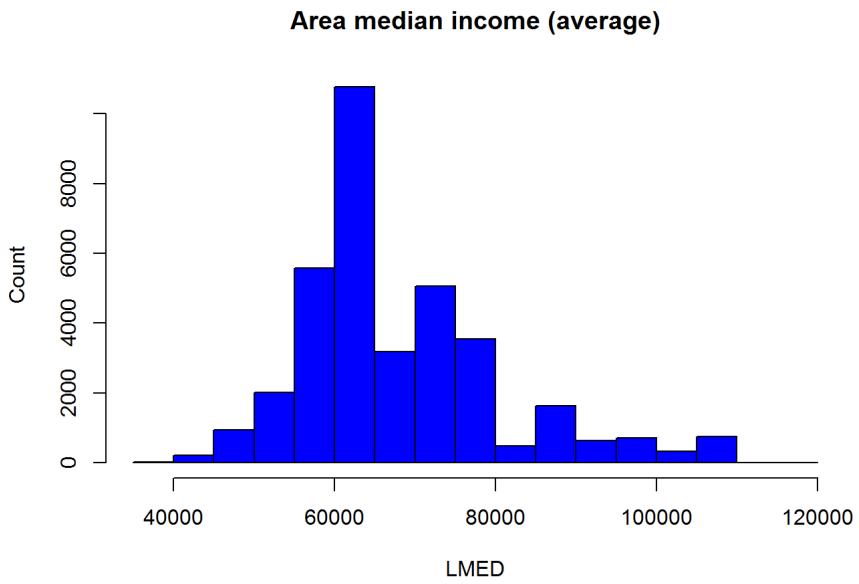

```
hist(hads2013n_c$AGE1[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Age of head of household', xlab='Age', ylab='Coun
t',col ='red')
```



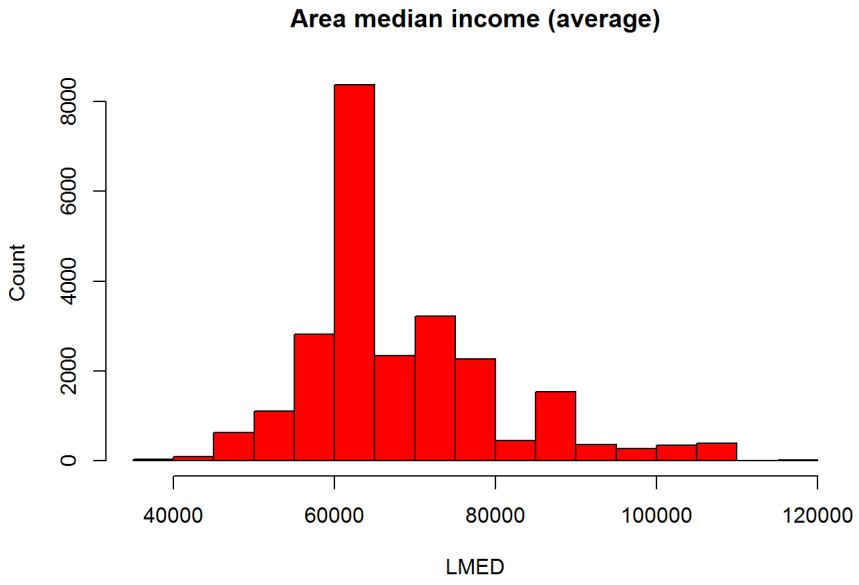

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$AGE1,xlab='FMTOWNRENT',ylab='AGE1')
```



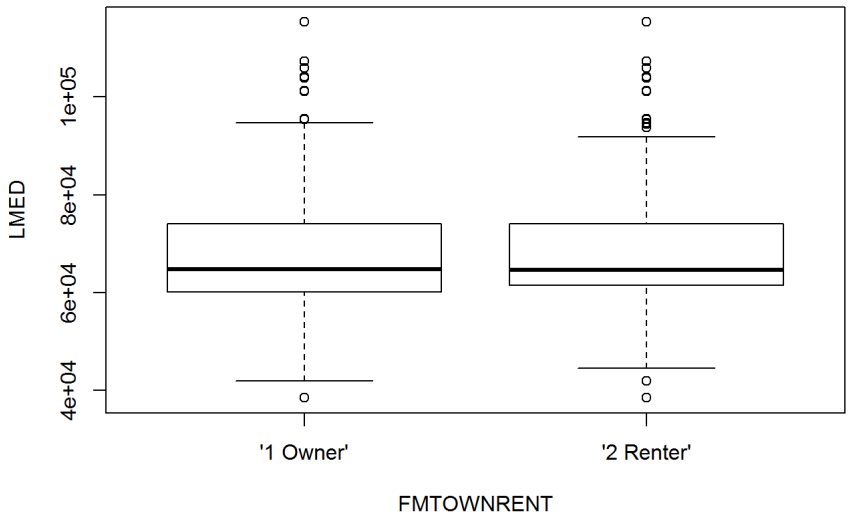

```
hist(hads2013n_c$LMED[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Area median income (average)', xlab='LMED',
ylab='Count',col ='blue')
```



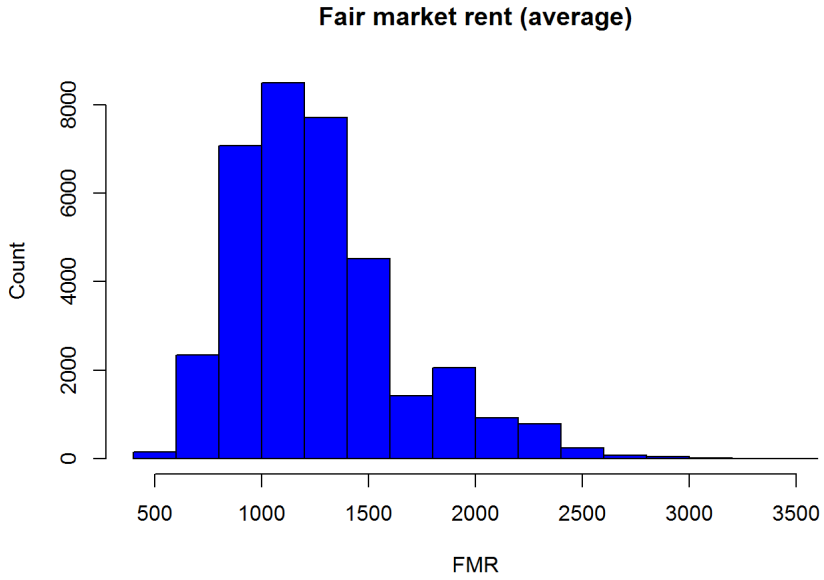

```
hist(hads2013n_c$LMED[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Area median income (average)', xlab='LMED',
ylab='Count',col ='red')
```



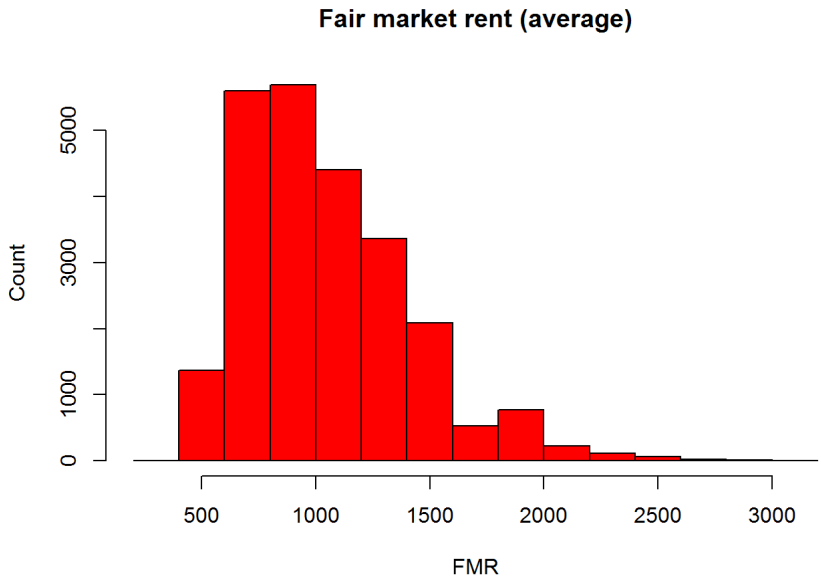

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$LMED,xlab='FMTOWNRENT',ylab='LMED')
```



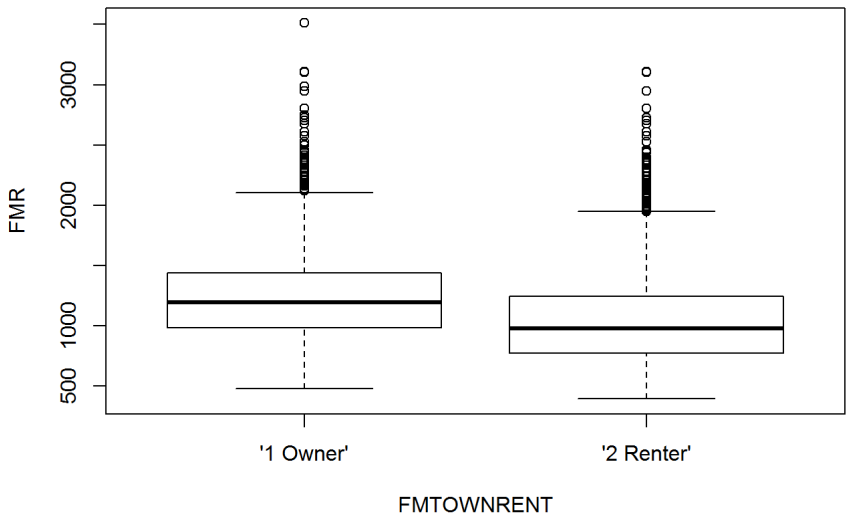

```
hist(hads2013n_c$FMR[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Fair market rent (average)', xlab='FMR', ylab='Coun
t',col ='blue')
```



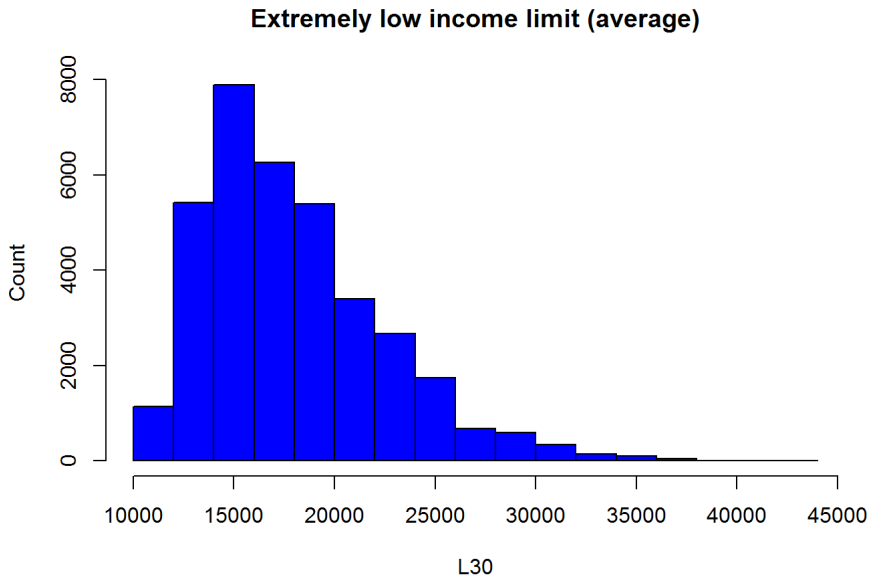

```
hist(hads2013n_c$FMR[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Fair market rent (average)', xlab='FMR', ylab='Cou
nt',col ='red')
```



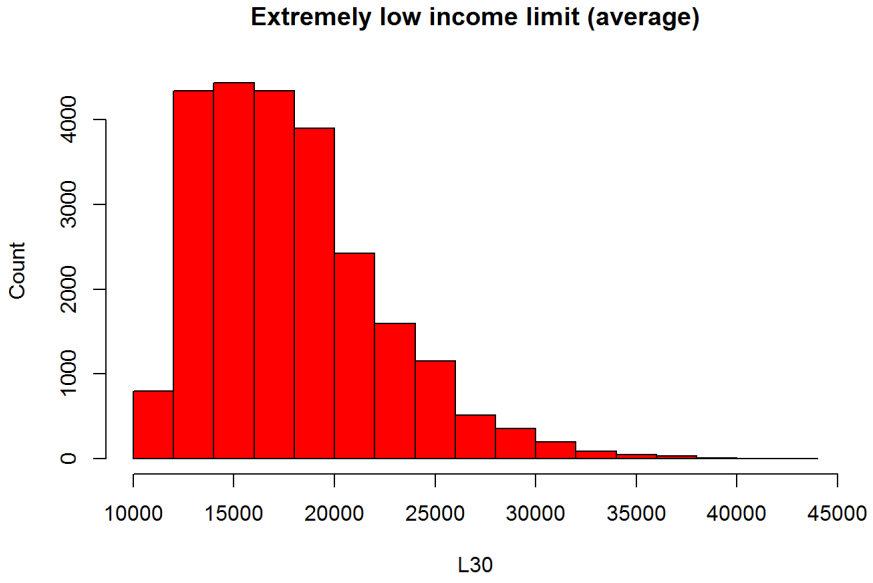

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$FMR,xlab='FMTOWNRENT',ylab='FMR')
```



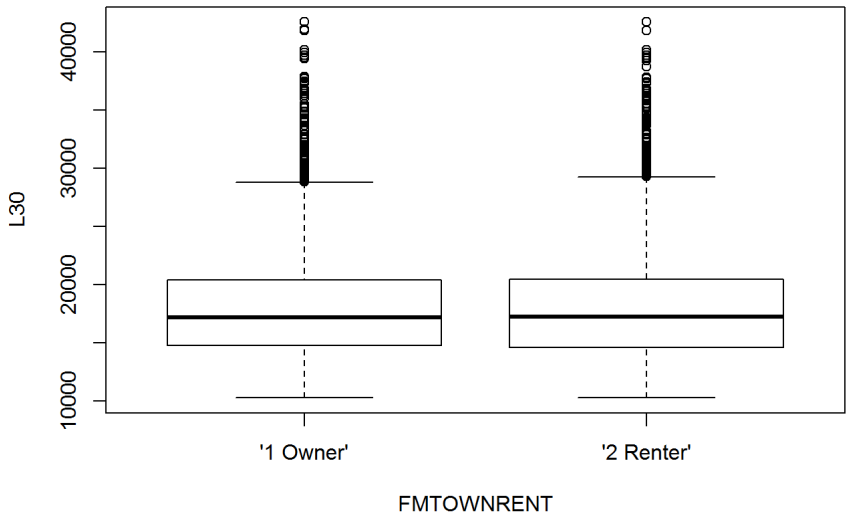

```
hist(hads2013n_c$L30[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Extremely low income limit (average)', xlab='L30',
ylab='Count',col ='blue')
```



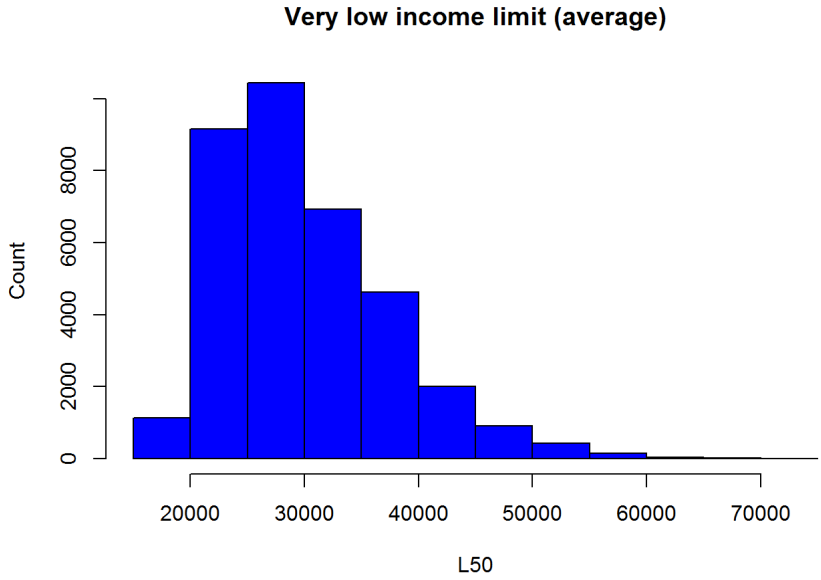

```
hist(hads2013n_c$L30[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Extremely low income limit (average)', xlab='L30',
 ylab='Count',col ='red')
```



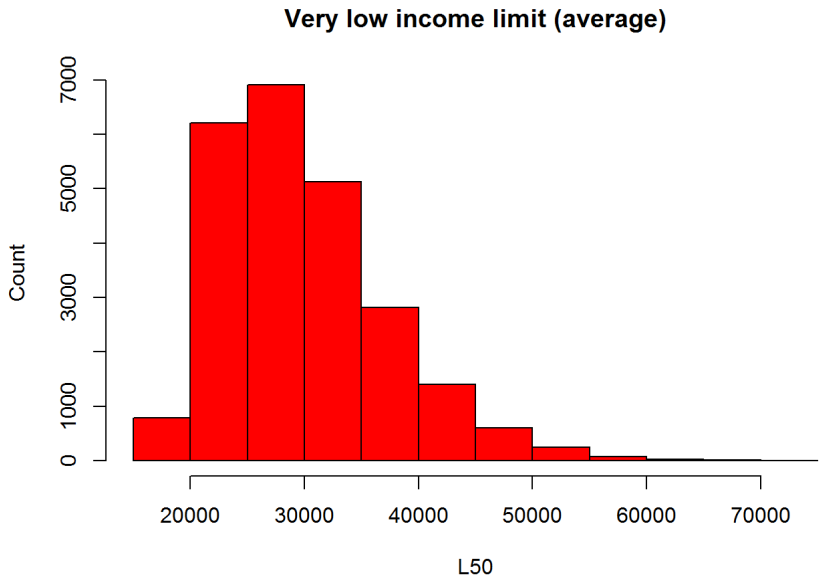

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$L30,xlab='FMTOWNRENT',ylab='L30')
```



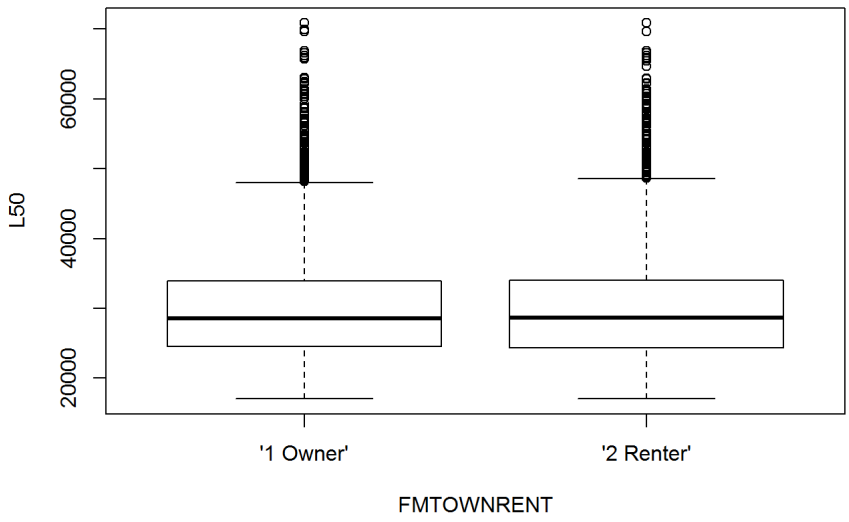

```
hist(hads2013n_c$L50[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Very low income limit (average)', xlab='L50',
ylab='Count',col ='blue')
```



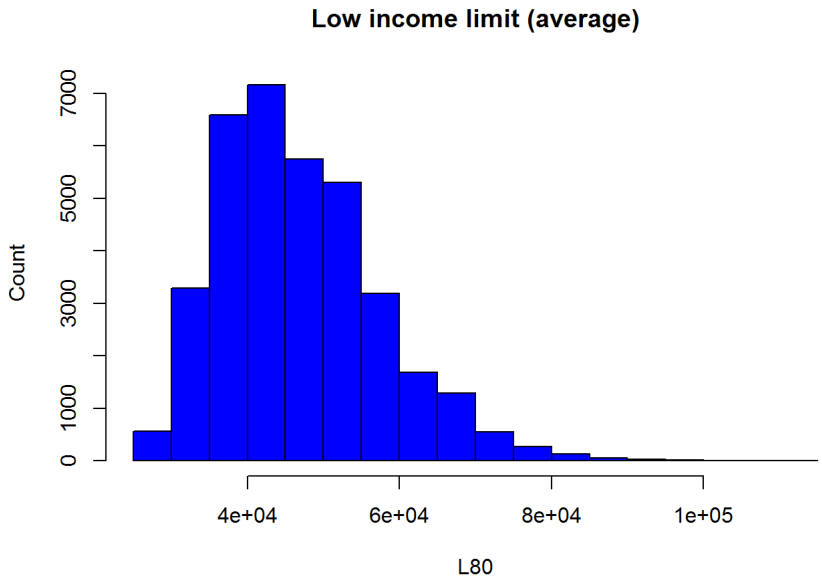

```
hist(hads2013n_c$L50[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Very low income limit (average)', xlab='L50',
ylab='Count',col ='red')
```



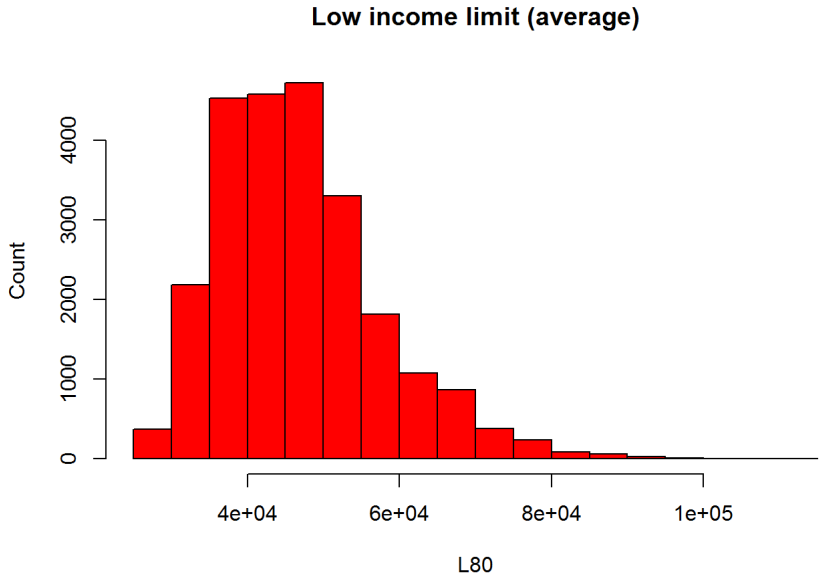

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$L50,xlab='FMTOWNRENT',ylab='L50')
```



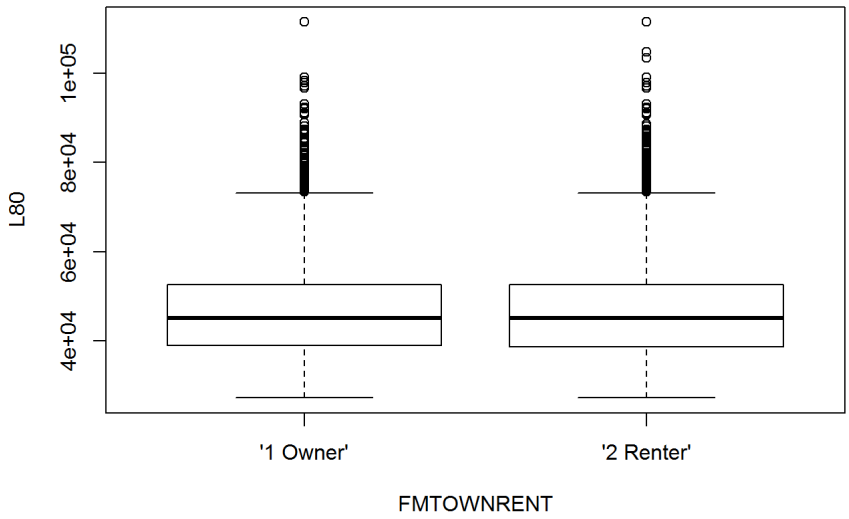

```
hist(hads2013n_c$L80[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Low income limit (average)', xlab='L80', ylab='Coun
t',col ='blue')
```



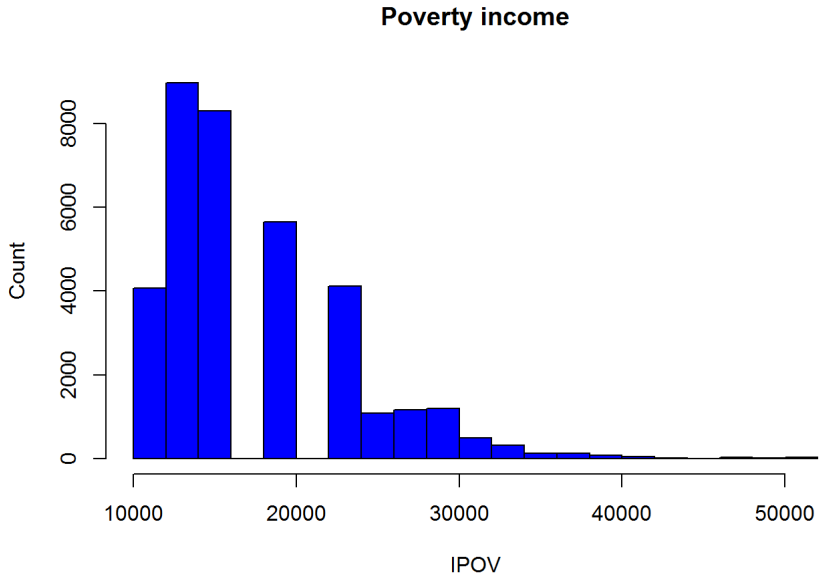

```
hist(hads2013n_c$L80[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Low income limit (average)', xlab='L80', ylab='Cou
nt',col ='red')
```



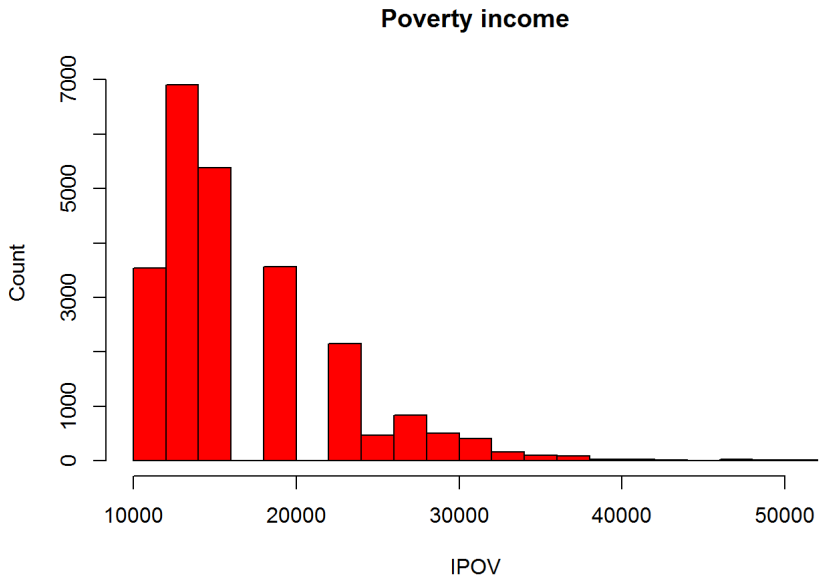

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$L80,xlab='FMTOWNRENT',ylab='L80')
```



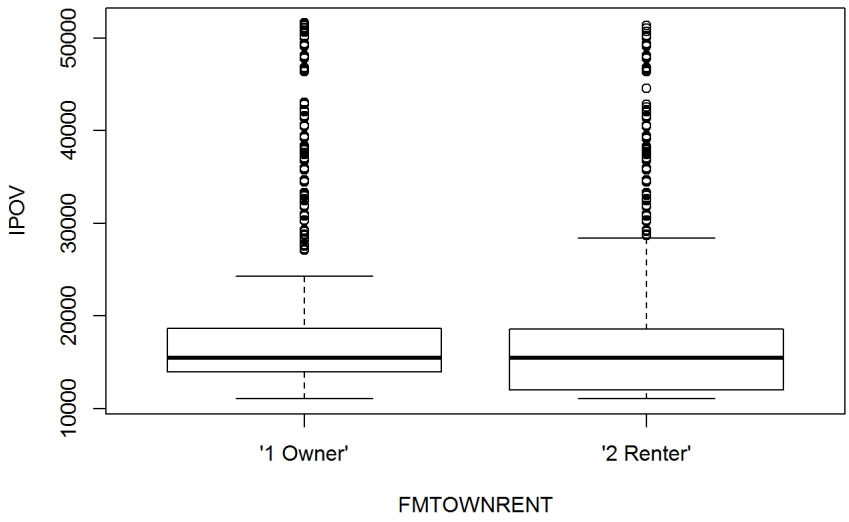

```
hist(hads2013n_c$IPOV[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Poverty income', xlab='IPOV', ylab='Count',col ='b
lue')
```



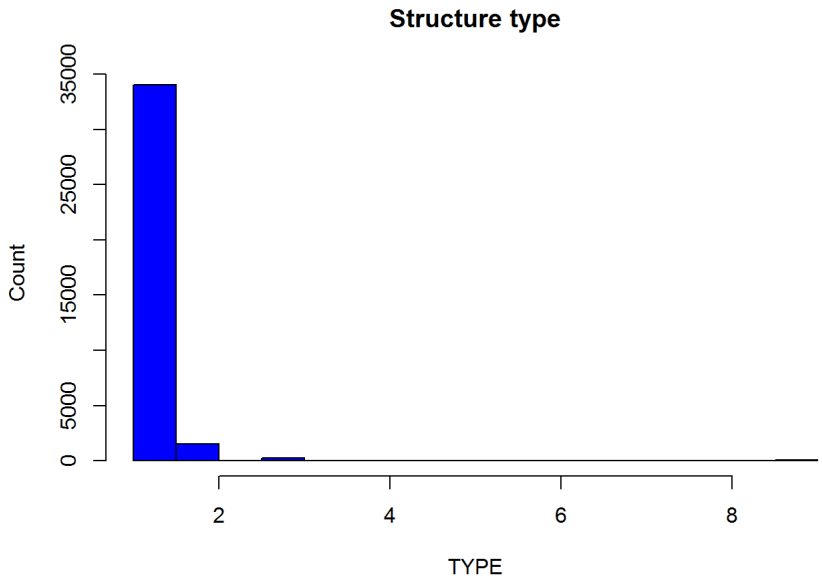

```
hist(hads2013n_c$IPOV[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Poverty income', xlab='IPOV', ylab='Count',col
='red')
```



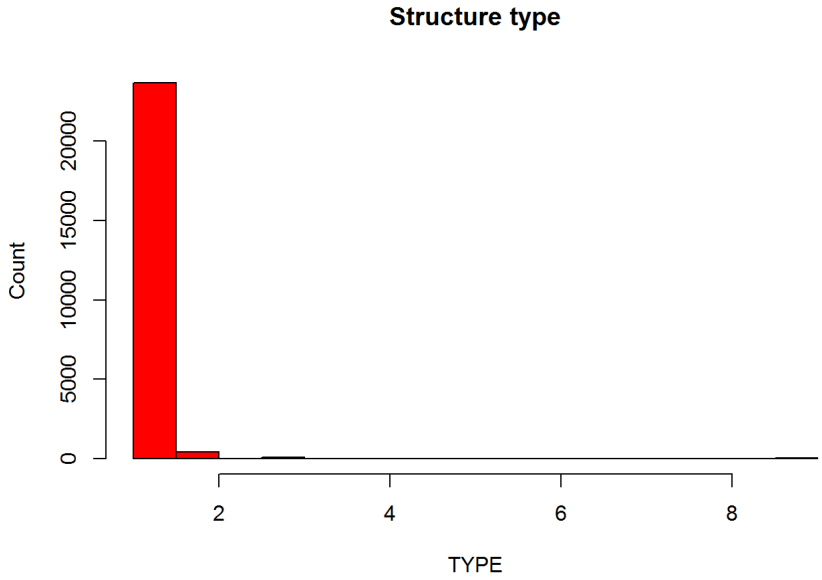

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$IPOV,xlab='FMTOWNRENT',ylab='IPOV')
```



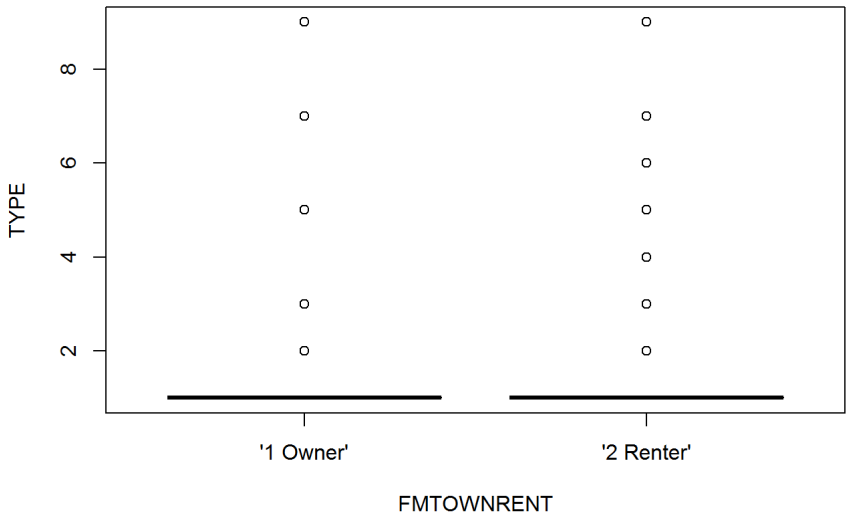

```
hist(hads2013n_c$TYPE[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Structure type', xlab='TYPE', ylab='Count',col ='b
lue')
```



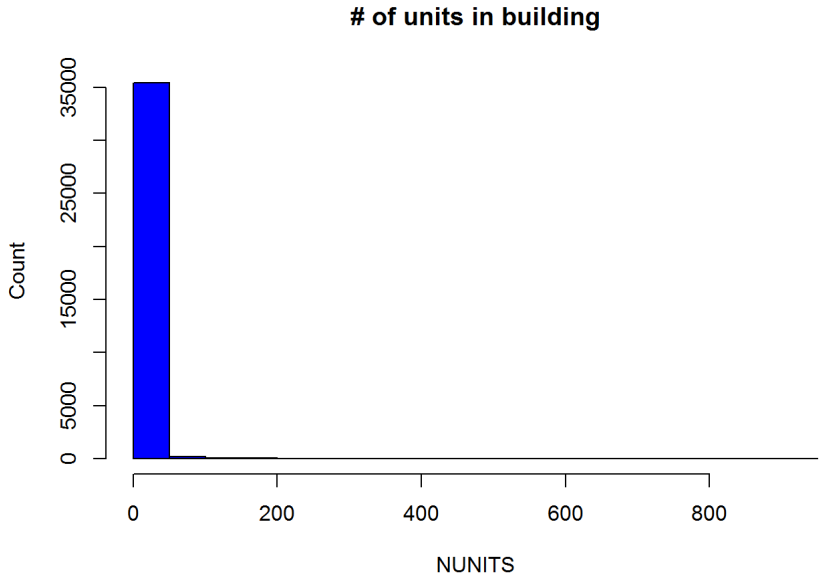

```
hist(hads2013n_c$TYPE[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Structure type', xlab='TYPE', ylab='Count',col
='red')
```



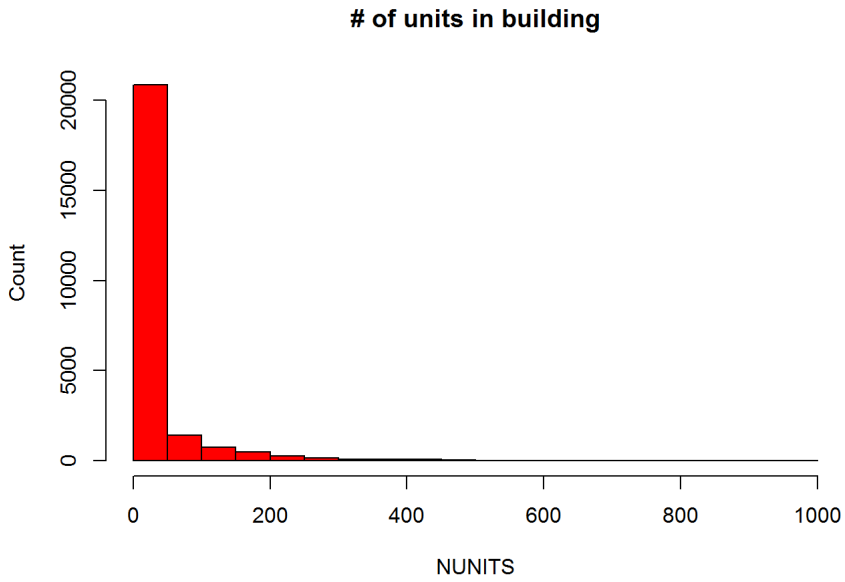

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$TYPE,xlab='FMTOWNRENT',ylab='TYPE')
```



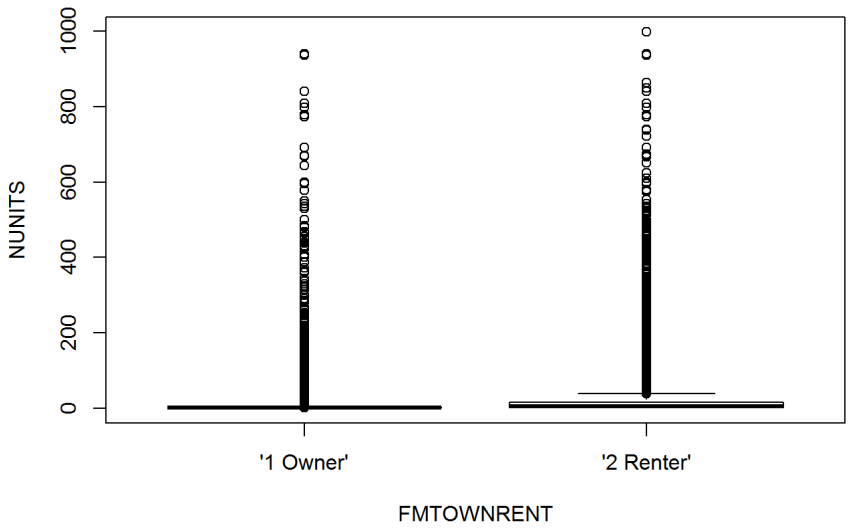

```
hist(hads2013n_c$NUNITS[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= '# of units in building', xlab='NUNITS', ylab='Co
unt',col ='blue')
```



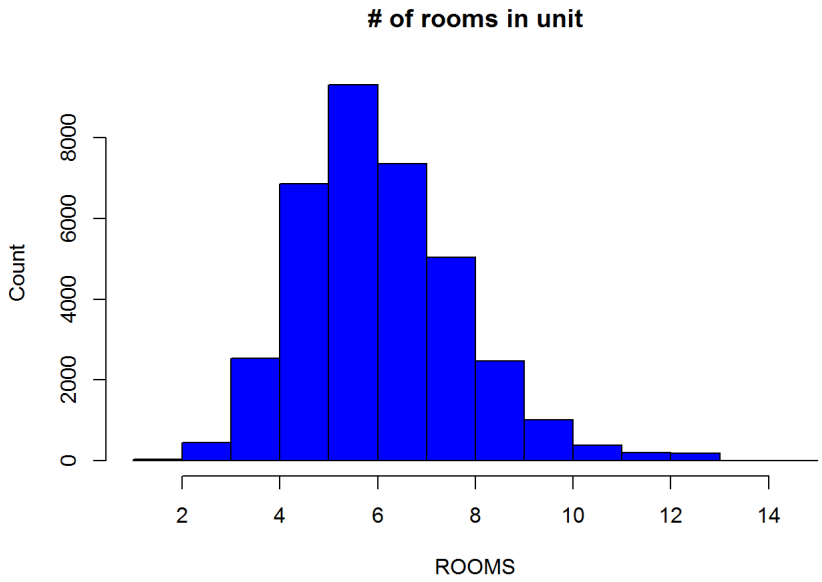

```
hist(hads2013n_c$NUNITS[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= '# of units in building', xlab='NUNITS', ylab='C
ount',col ='red')
```



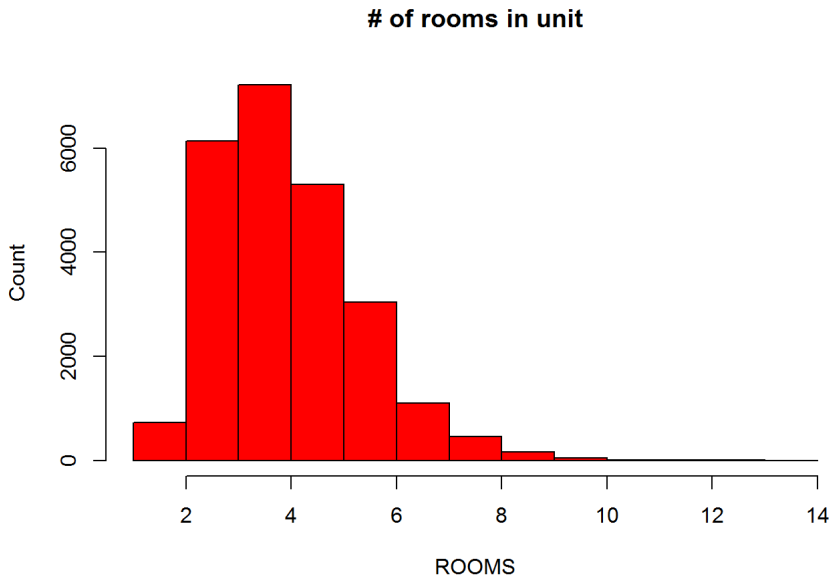

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$NUNITS,xlab='FMTOWNRENT',ylab='NUNITS')
```



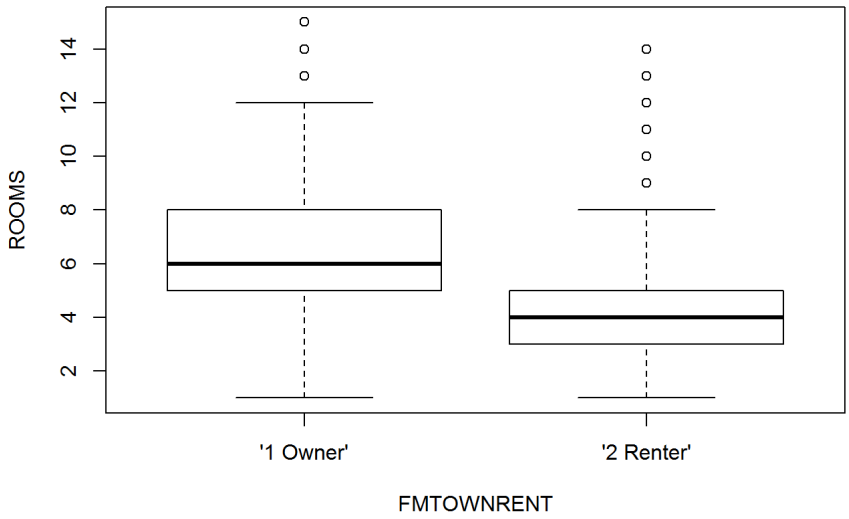

```
hist(hads2013n_c$ROOMS[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= '# of rooms in unit', xlab='ROOMS', ylab='Count',c
ol ='blue')
```



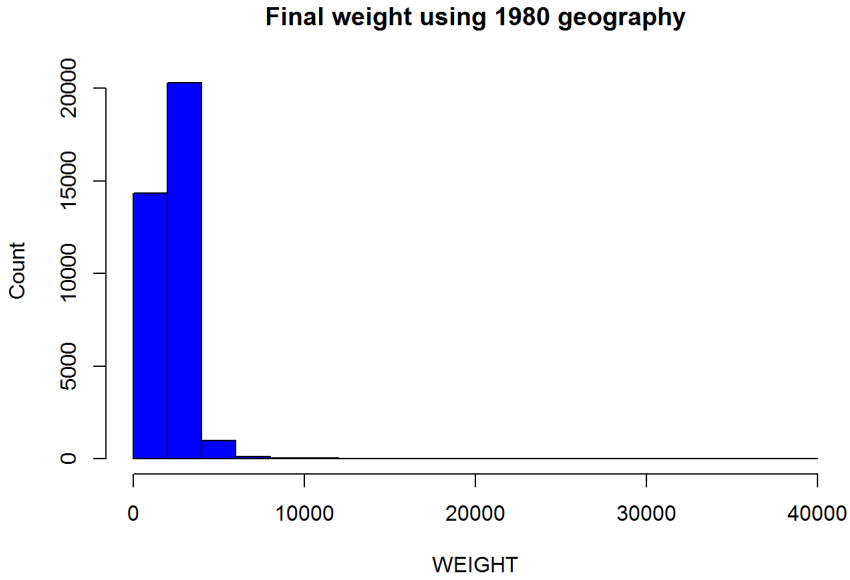

```
hist(hads2013n_c$ROOMS[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= '# of rooms in unit', xlab='ROOMS',
ylab='Count',col ='red')
```



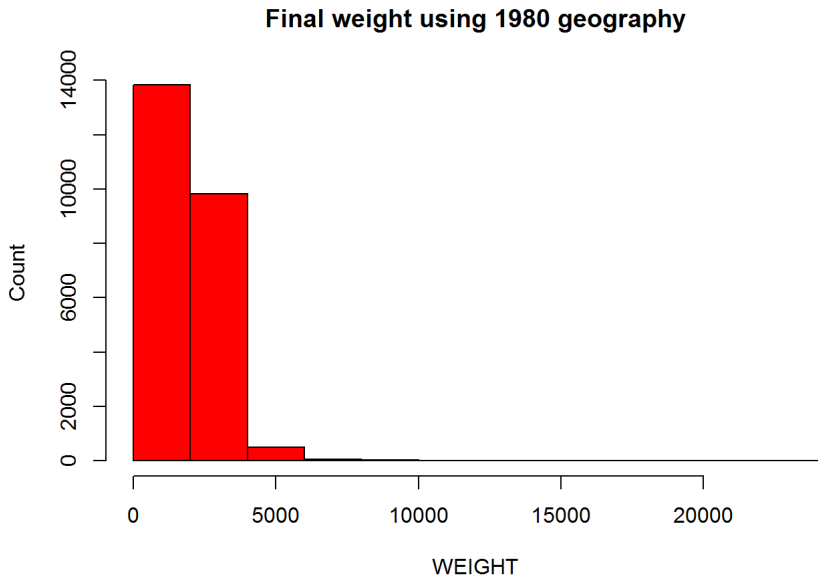

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$ROOMS,xlab='FMTOWNRENT',ylab='ROOMS')
```



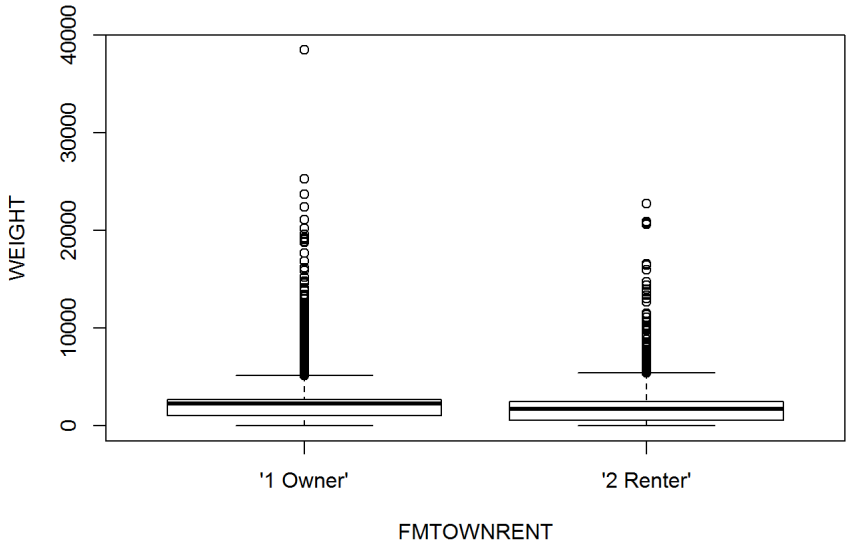

```
hist(hads2013n_c$WEIGHT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Final weight using 1980 geography', xlab='WEIGH
T', ylab='Count',col ='blue')
```



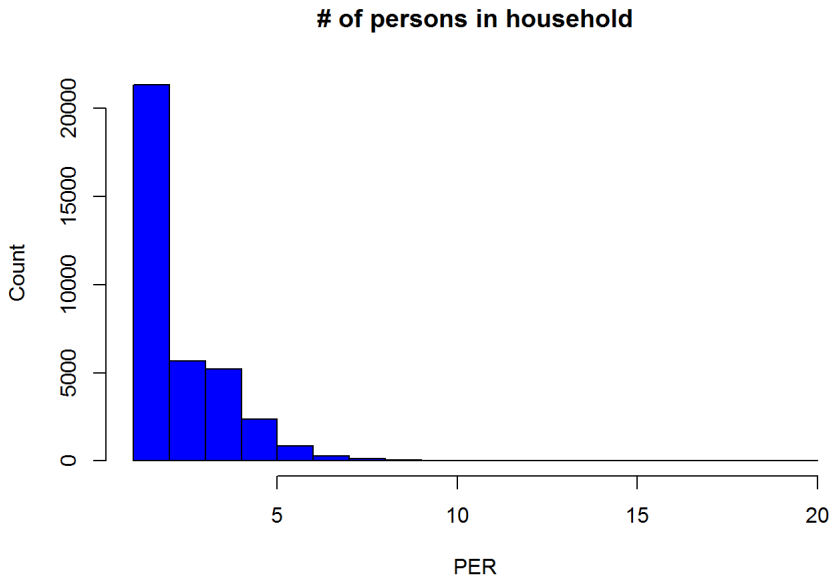

```
hist(hads2013n_c$WEIGHT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Final weight using 1980 geography', xlab='WEIGH
T', ylab='Count',col ='red')
```



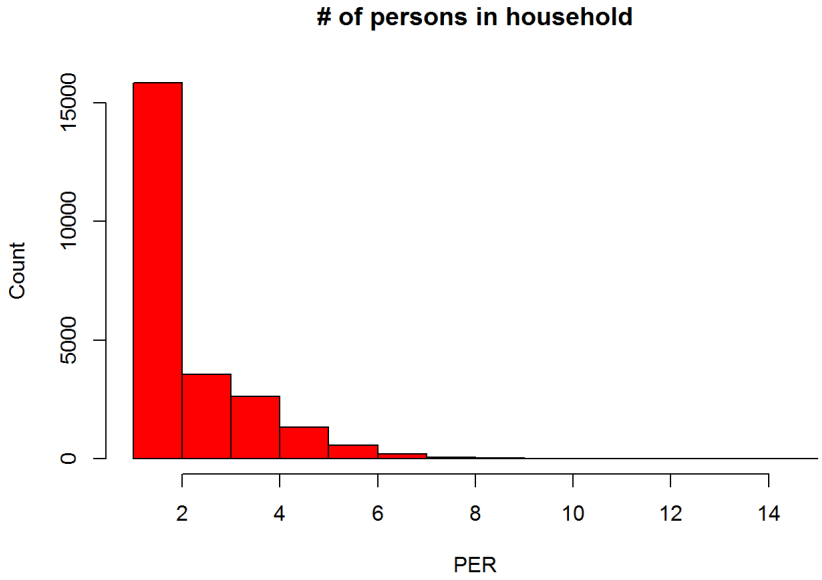

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$WEIGHT,xlab='FMTOWNRENT',ylab='WEIGHT')
```



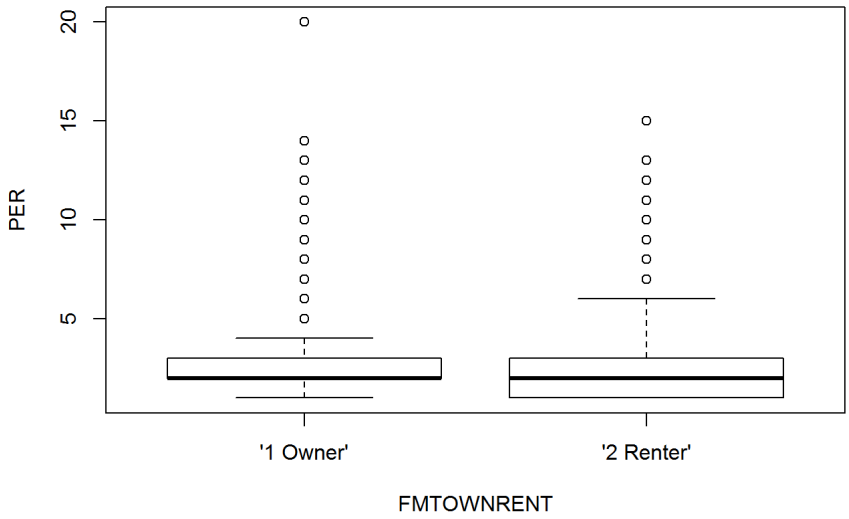

```
hist(hads2013n_c$PER[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= '# of persons in household', xlab='PER', ylab='Coun
t',col ='blue')
```



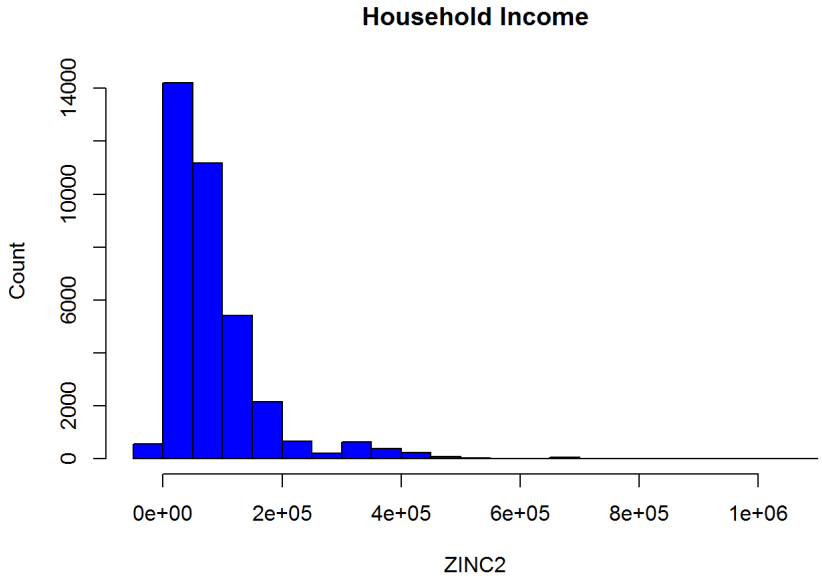

```
hist(hads2013n_c$PER[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= '# of persons in household', xlab='PER', ylab='Coun
t',col ='red')
```



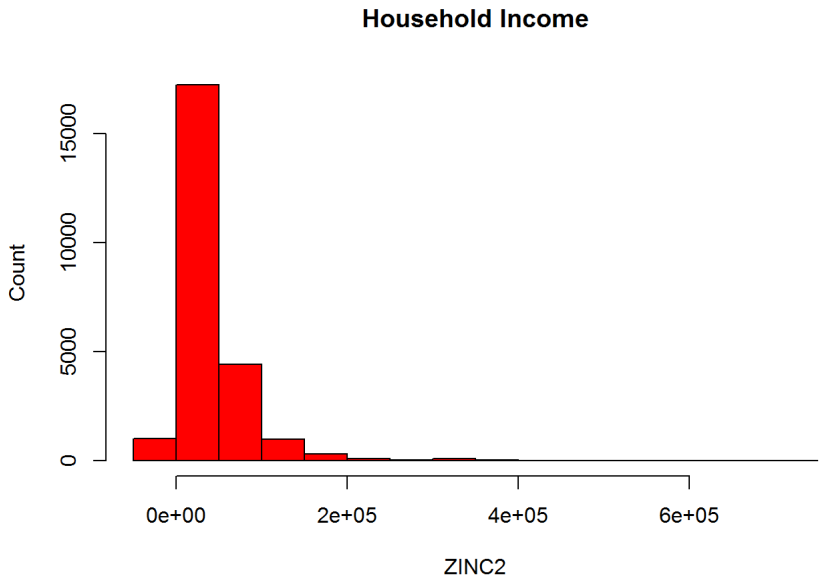

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$PER,xlab='FMTOWNRENT',ylab='PER')
```



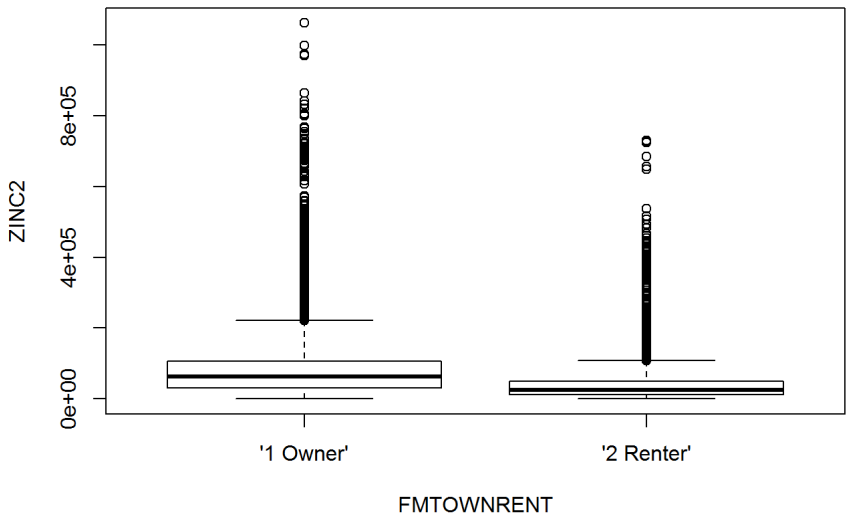

```
hist(hads2013n_c$ZINC2[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Household Income', xlab='ZINC2', ylab='Count',col
 ='blue')
```



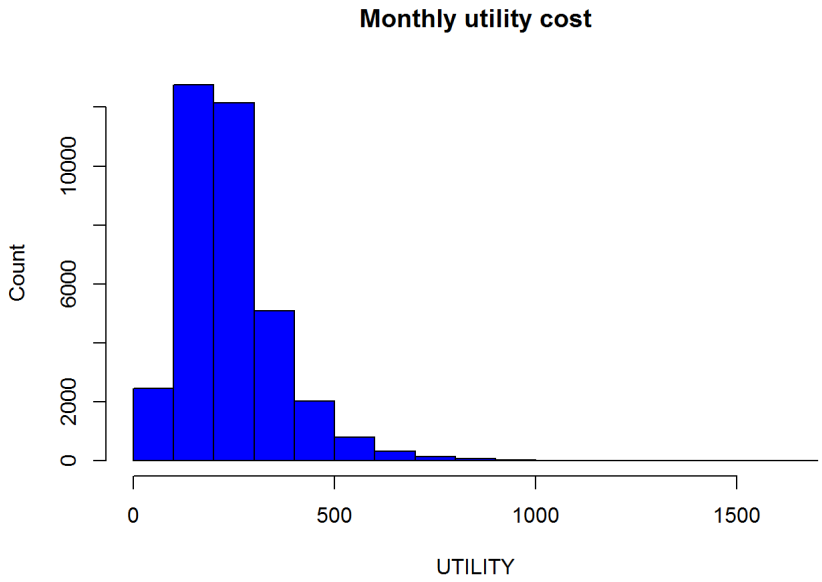

```
hist(hads2013n_c$ZINC2[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Household Income', xlab='ZINC2', ylab='Count',co
l ='red')
```



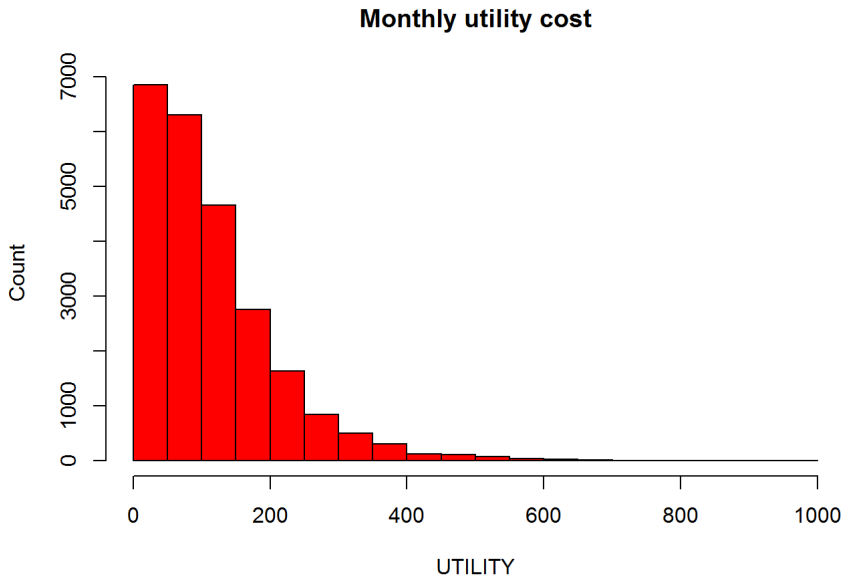

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$ZINC2,xlab='FMTOWNRENT',ylab='ZINC2')
```



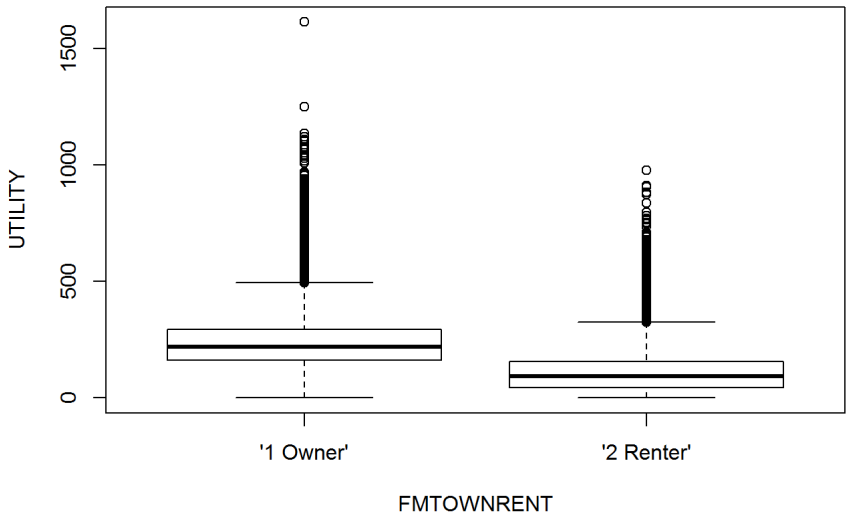

```
hist(hads2013n_c$UTILITY[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Monthly utility cost', xlab='UTILITY', ylab='Co
unt',col ='blue')
```



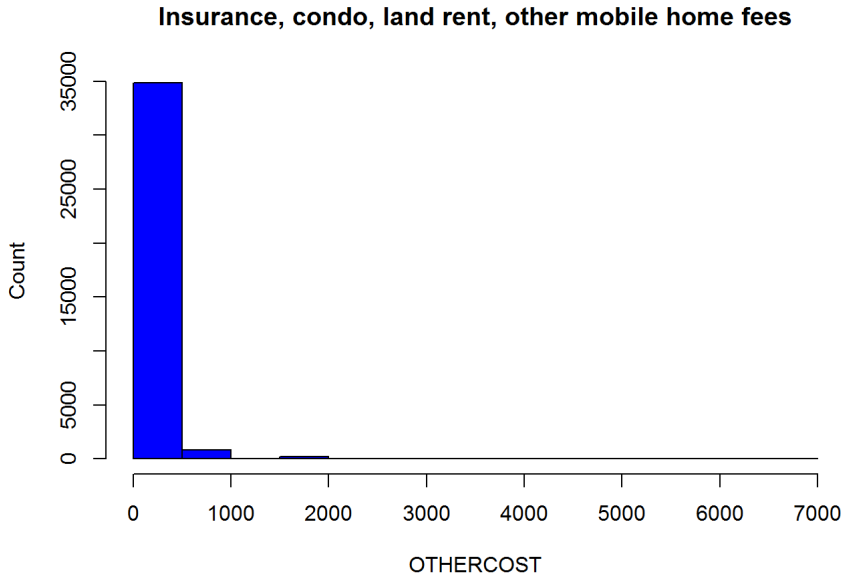

```
hist(hads2013n_c$UTILITY[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Monthly utility cost', xlab='UTILITY', ylab='C
ount',col ='red')
```



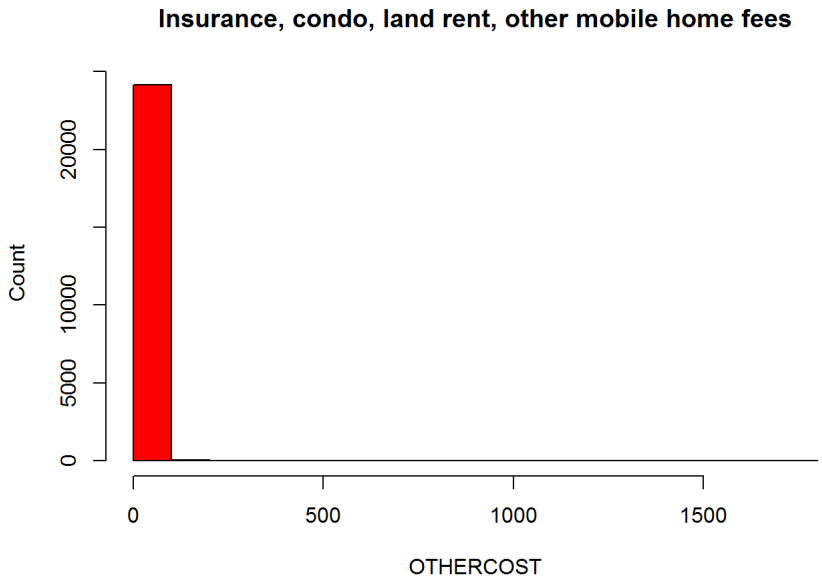

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$UTILITY,xlab='FMTOWNRENT',ylab='UTILITY')
```



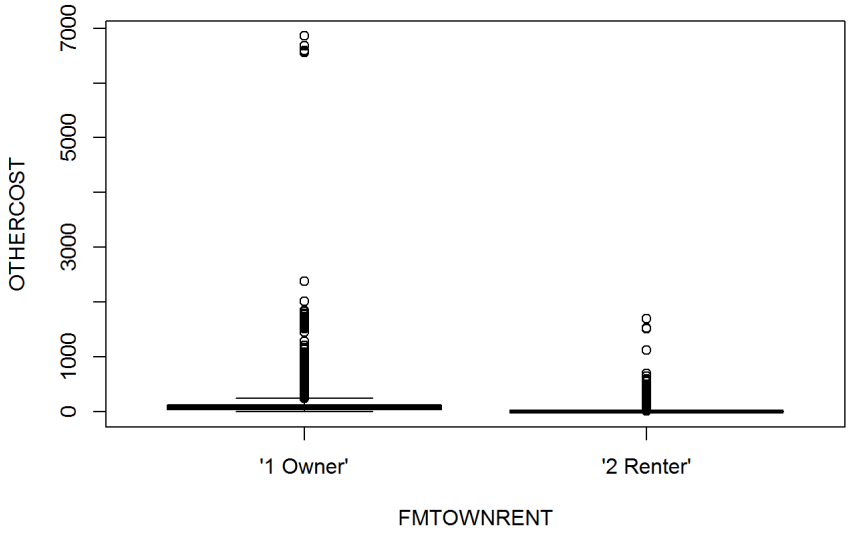

```
hist(hads2013n_c$OTHERCOST[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Insurance, condo, land rent, other mobile hom
e fees', xlab='OTHERCOST', ylab='Count',col ='blue')
```



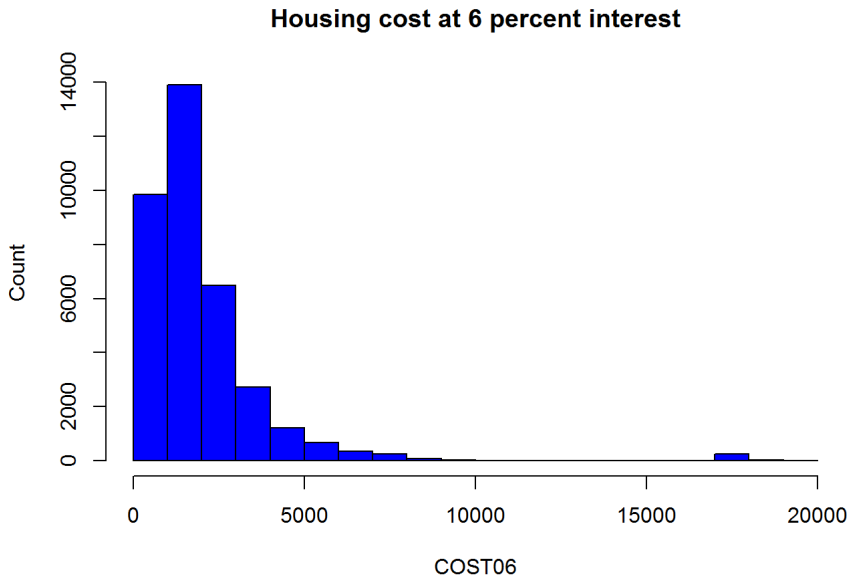

```
hist(hads2013n_c$OTHERCOST[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Insurance, condo, land rent, other mobile ho
me fees', xlab='OTHERCOST', ylab='Count',col ='red')
```



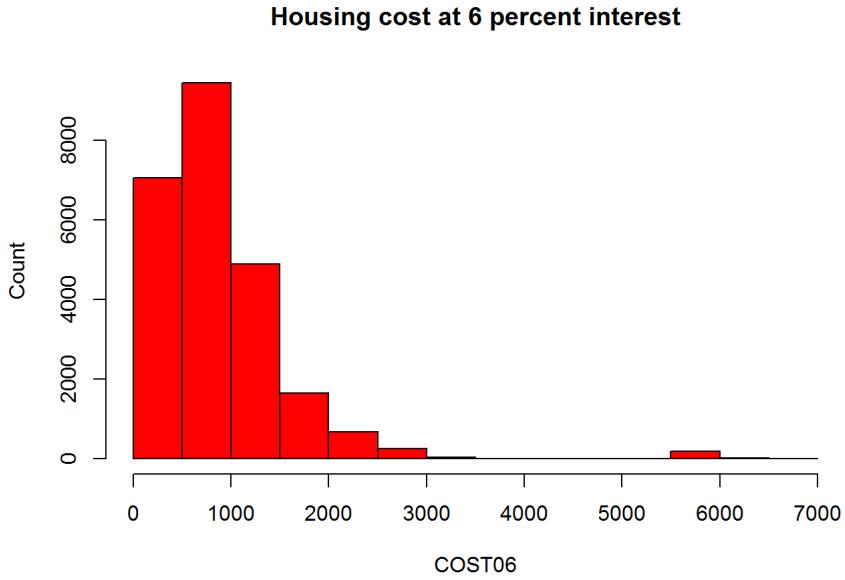

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$OTHERCOST,xlab='FMTOWNRENT',ylab='OTHERCOST')
```



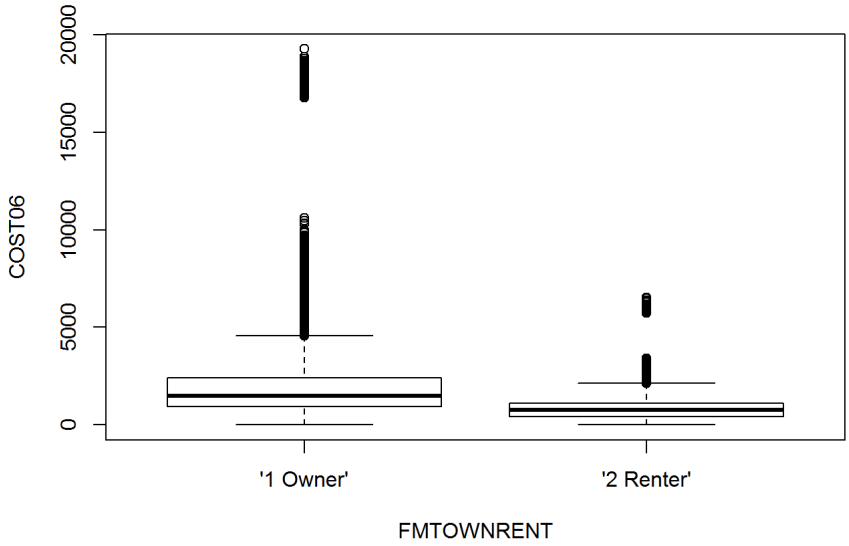

```
hist(hads2013n_c$COST06[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Housing cost at 6 percent interest', xlab='COST0
6', ylab='Count',col ='blue')
```



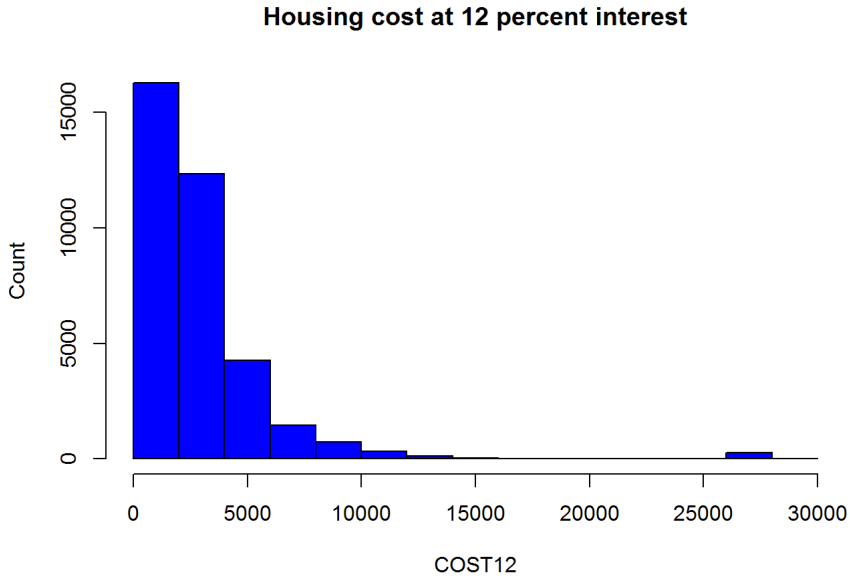

```
hist(hads2013n_c$COST06[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Housing cost at 6 percent interest', xlab='COST
06', ylab='Count',col ='red')
```



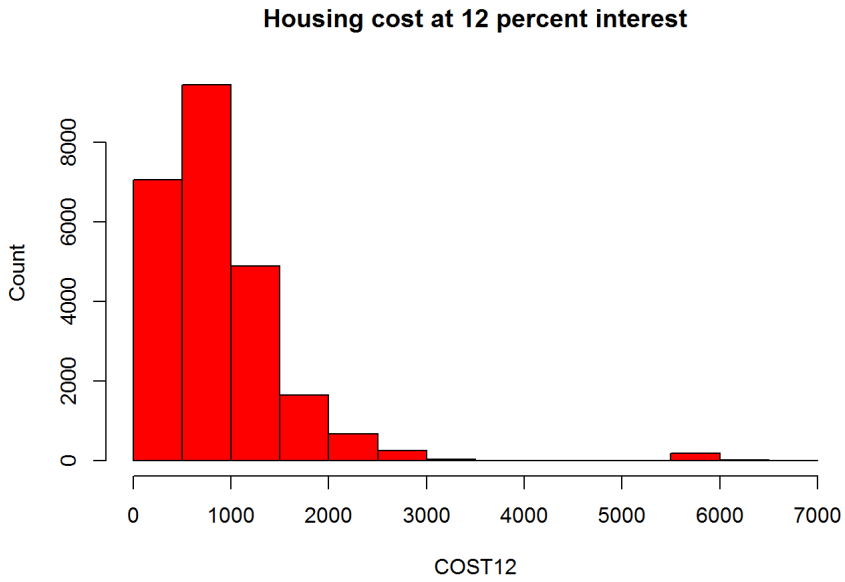

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST06,xlab='FMTOWNRENT',ylab='COST06')
```



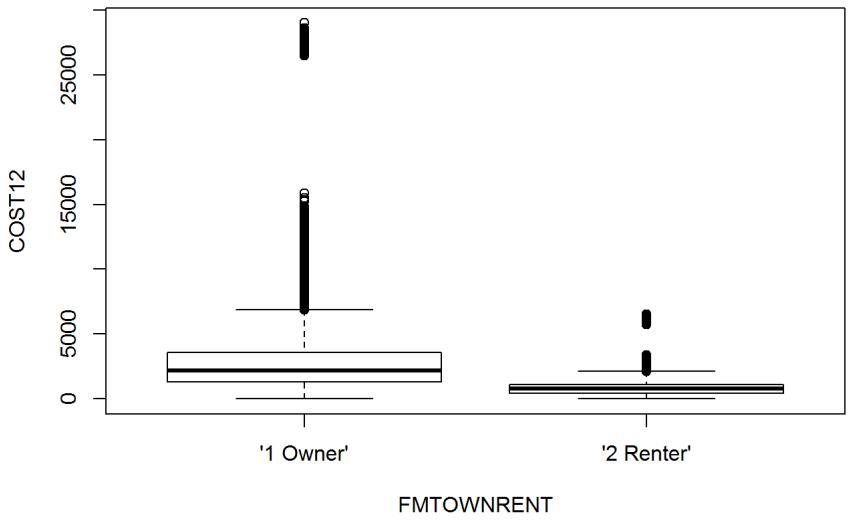

```
hist(hads2013n_c$COST12[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Housing cost at 12 percent interest', xlab='COST
12', ylab='Count',col ='blue')
```



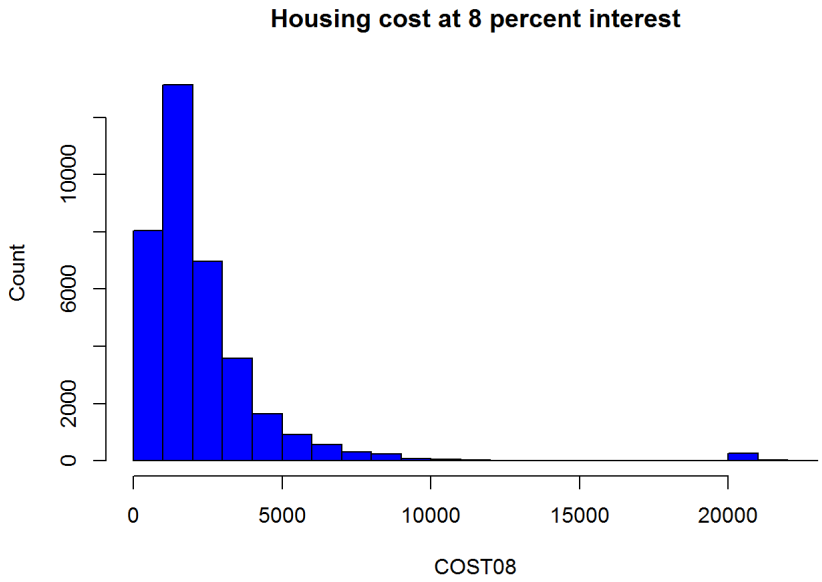

```
hist(hads2013n_c$COST12[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Housing cost at 12 percent interest', xlab='COS
T12', ylab='Count',col ='red')
```



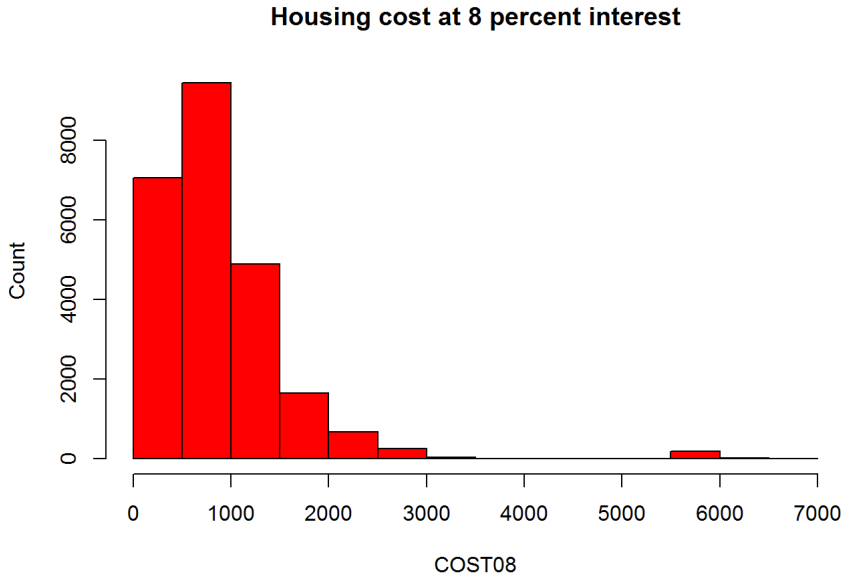

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST12,xlab='FMTOWNRENT',ylab='COST12')
```



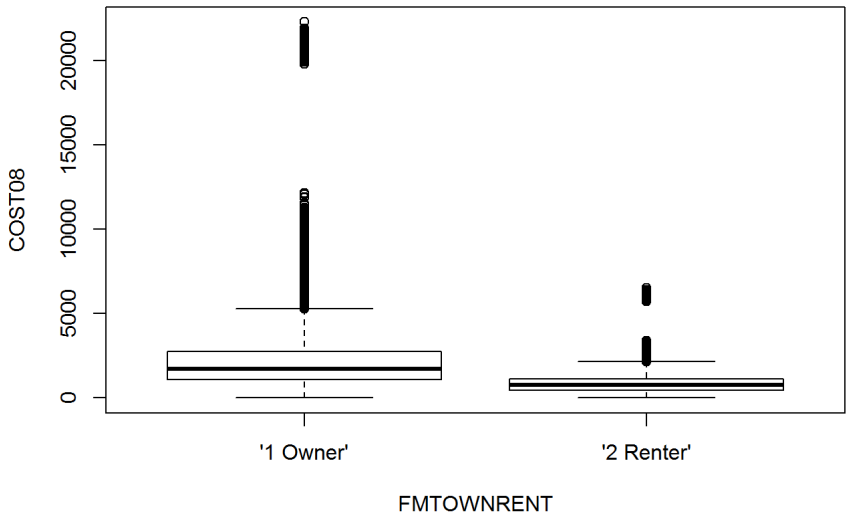

```
hist(hads2013n_c$COST08[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Housing cost at 8 percent interest', xlab='COST0
8', ylab='Count',col ='blue')
```



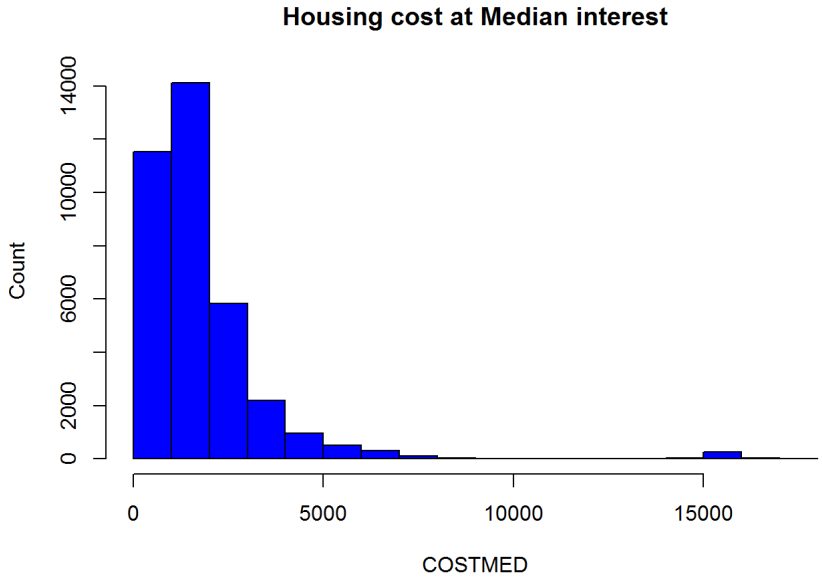

```
hist(hads2013n_c$COST08[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Housing cost at 8 percent interest', xlab='COST
08', ylab='Count',col ='red')
```



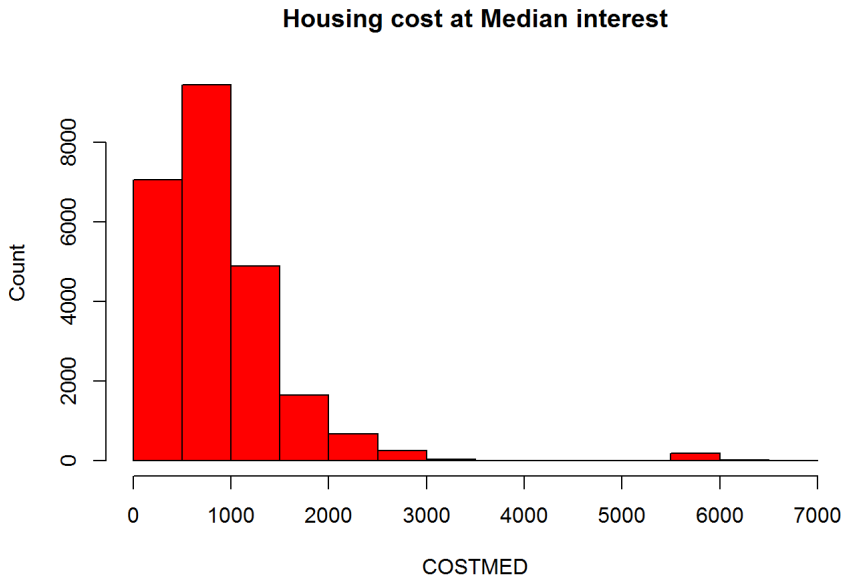

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST08,xlab='FMTOWNRENT',ylab='COST08')
```



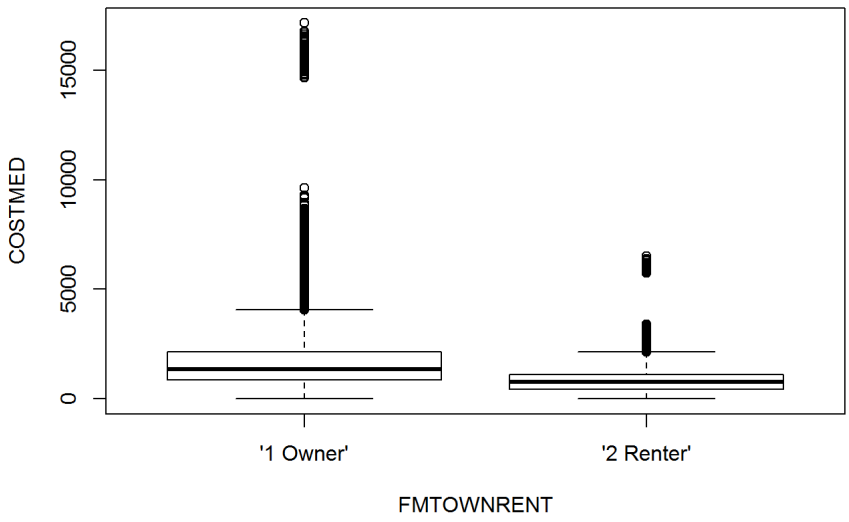

```
hist(hads2013n_c$COSTMED[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Housing cost at Median interest', xlab='COSTME
D', ylab='Count',col ='blue')
```



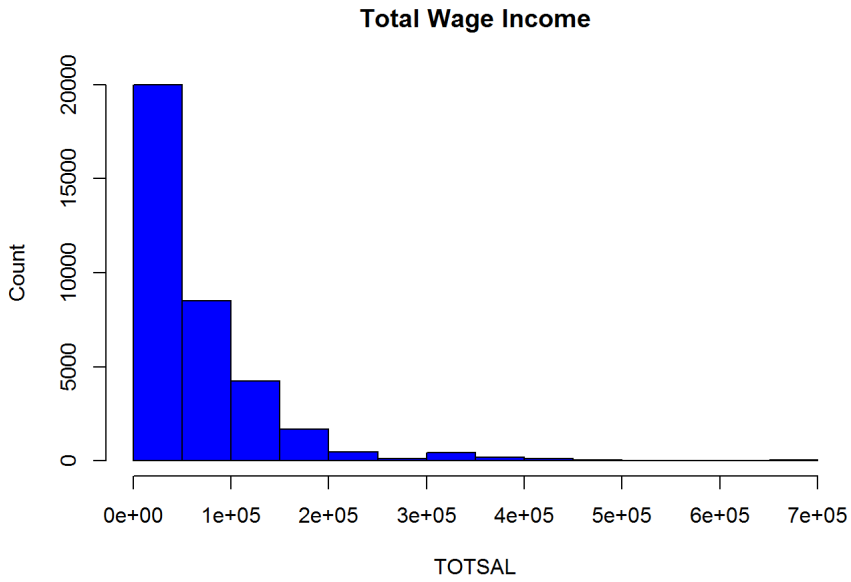

```
hist(hads2013n_c$COSTMED[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Housing cost at Median interest', xlab='COSTME
D', ylab='Count',col ='red')
```



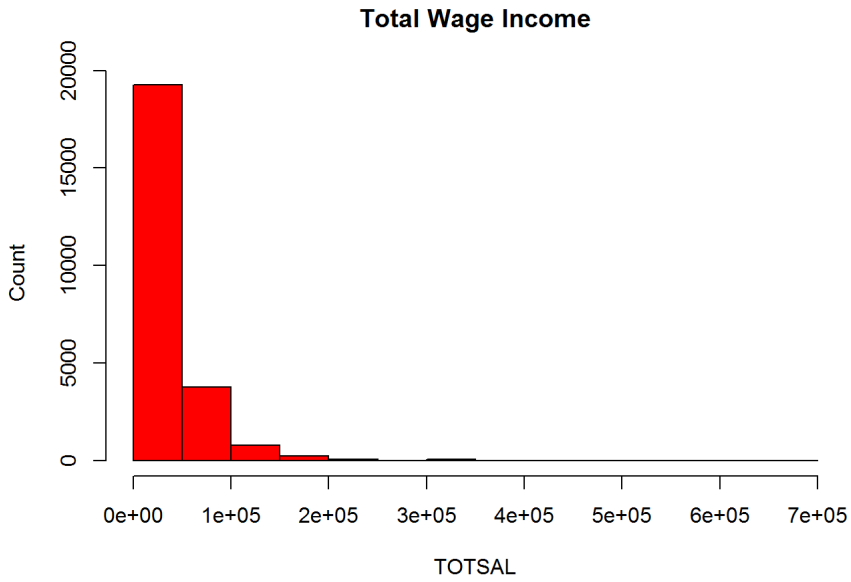

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COSTMED,xlab='FMTOWNRENT',ylab='COSTMED')
```




```
hist(hads2013n_c$TOTSAL[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Total Wage Income', xlab='TOTSAL',
ylab='Count',col ='blue')
```

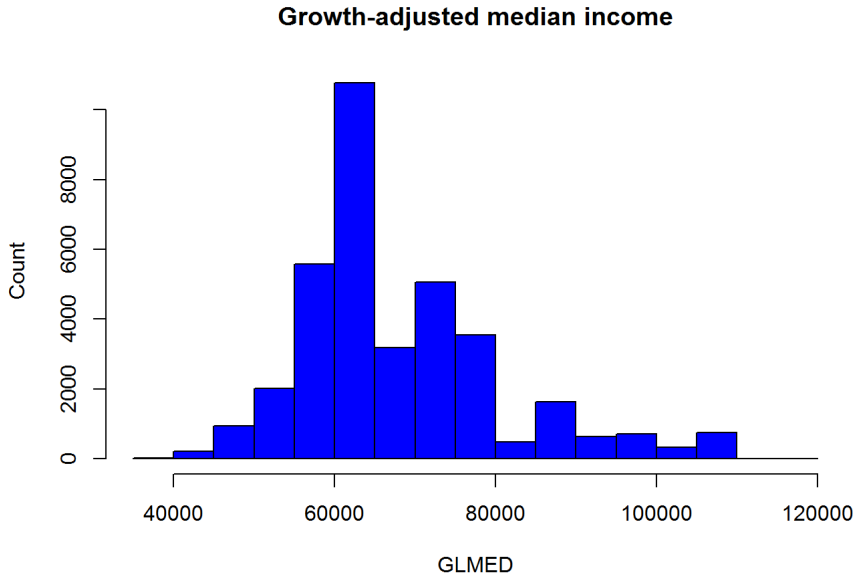



```
hist(hads2013n_c$TOTSAL[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Total Wage Income', xlab='TOTSAL',
ylab='Count',col ='red')
```

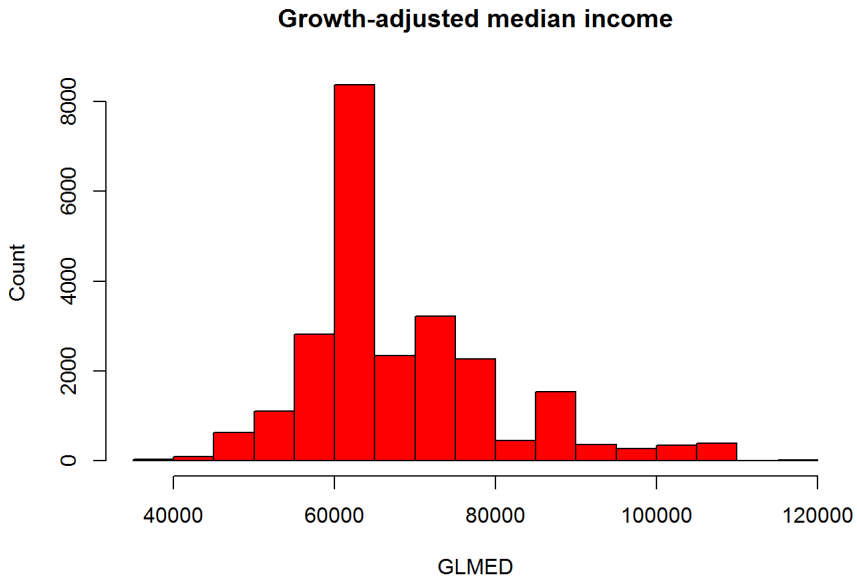



```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$TOTSAL,xlab='FMTOWNRENT',ylab='TOTSAL')
```

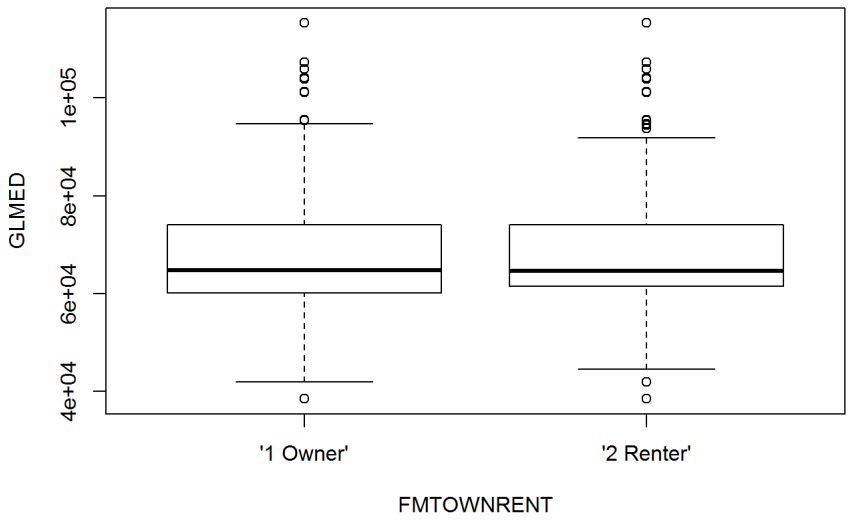

```
hist(hads2013n_c$GLMED[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Growth-adjusted median income', xlab='GLMED', yla
b='Count',col ='blue')
```



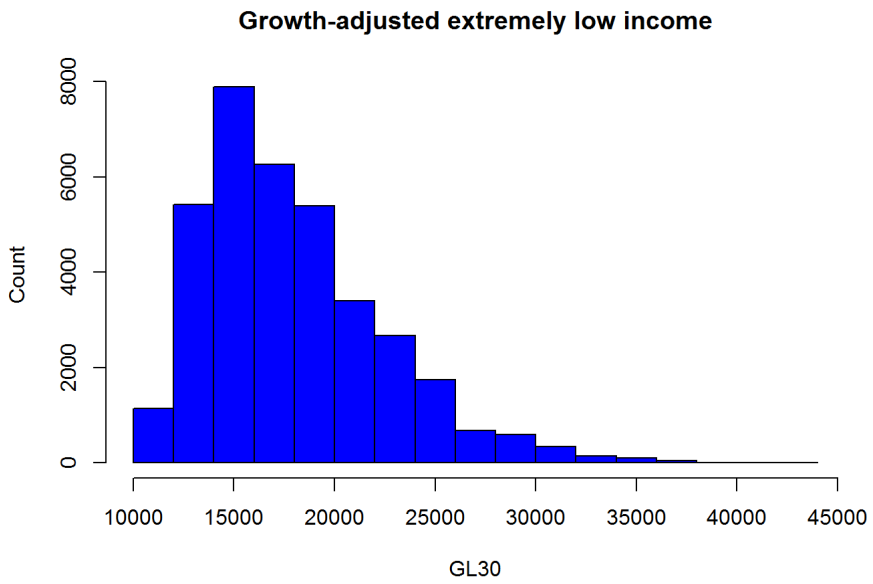

```
hist(hads2013n_c$GLMED[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Growth-adjusted median income', xlab='GLMED', yl
ab='Count',col ='red')
```



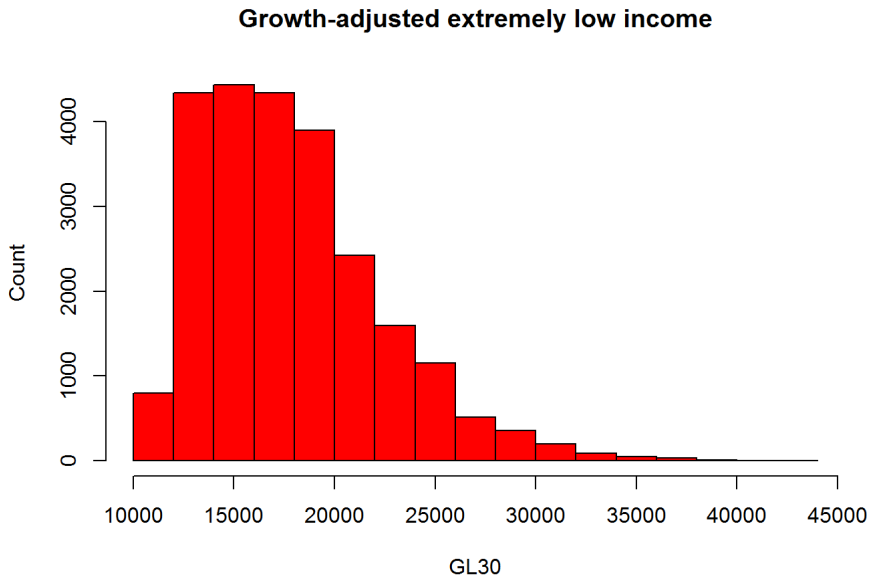

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$GLMED,xlab='FMTOWNRENT',ylab='GLMED')
```



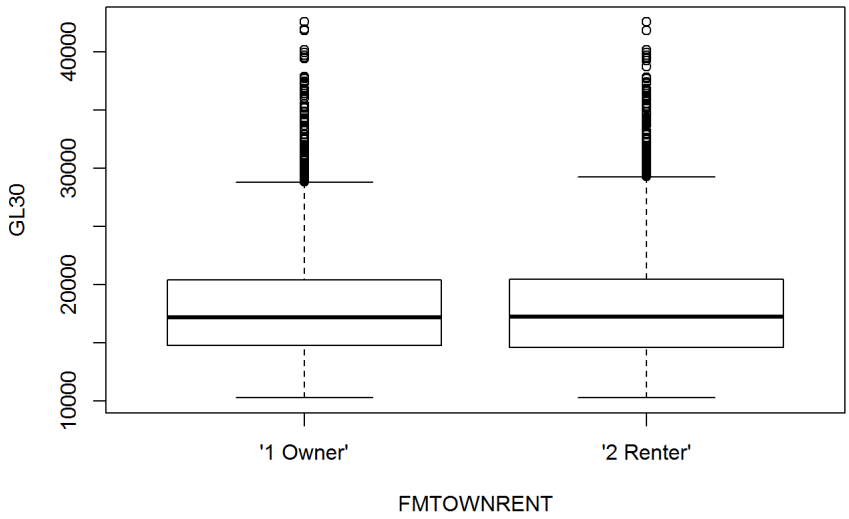

```
hist(hads2013n_c$GL30[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Growth-adjusted extremely low income',
xlab='GL30', ylab='Count',col ='blue')
```



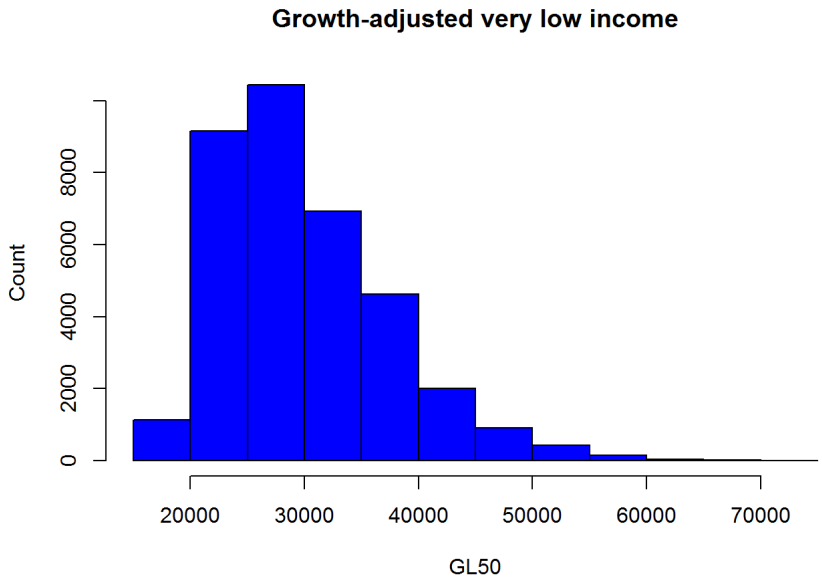

```
hist(hads2013n_c$GL30[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Growth-adjusted extremely low income', xlab='GL3
0', ylab='Count',col ='red')
```



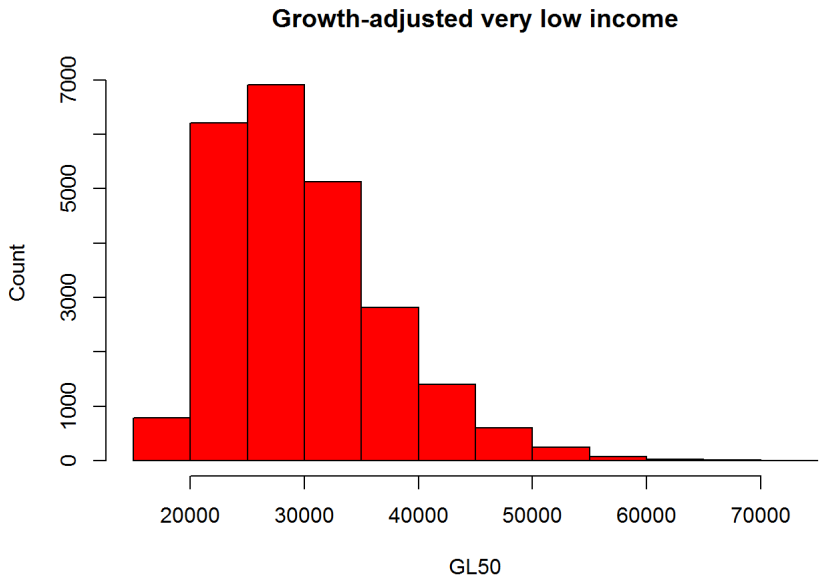

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$GL30,xlab='FMTOWNRENT',ylab='GL30')
```



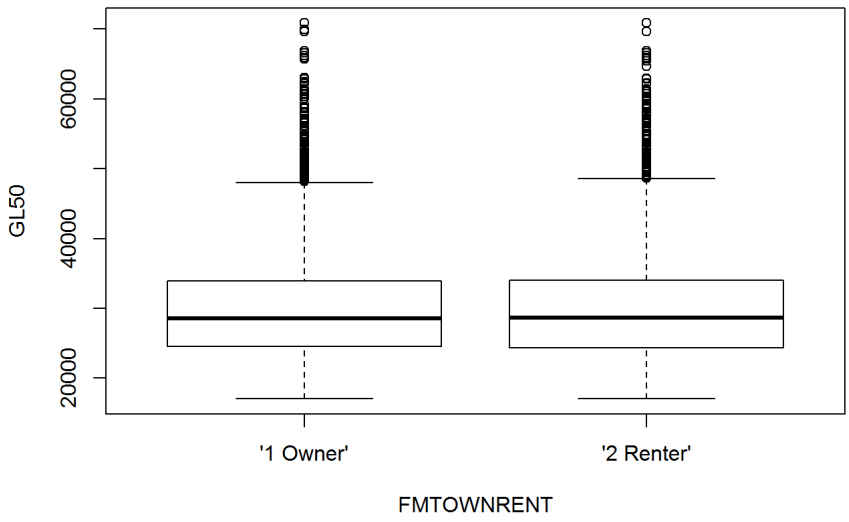

```
hist(hads2013n_c$GL50[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Growth-adjusted very low income', xlab='GL50', yla
b='Count',col ='blue')
```



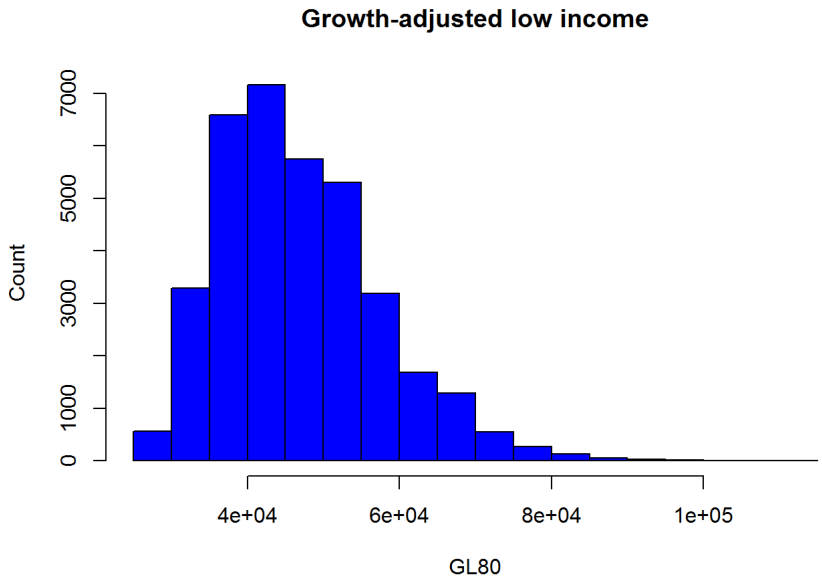

```
hist(hads2013n_c$GL50[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Growth-adjusted very low income', xlab='GL50', yl
ab='Count',col ='red')
```



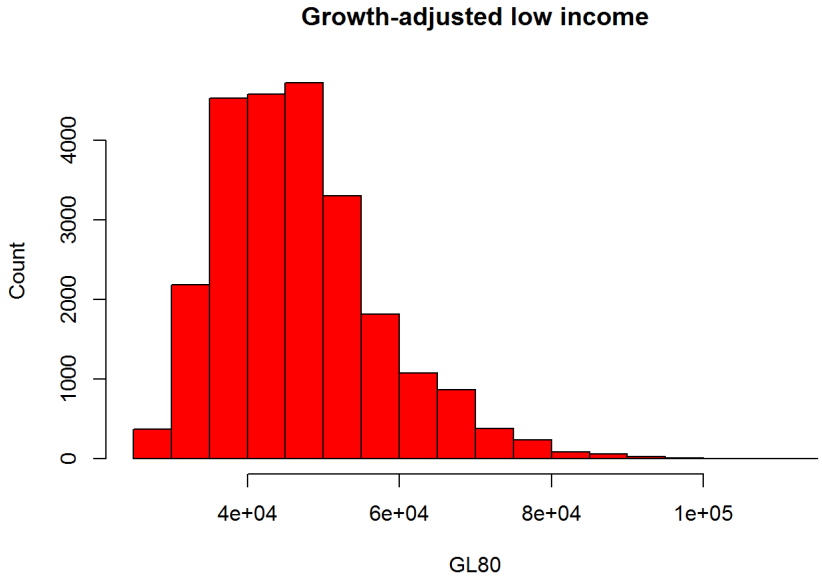

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$GL50,xlab='FMTOWNRENT',ylab='GL50')
```



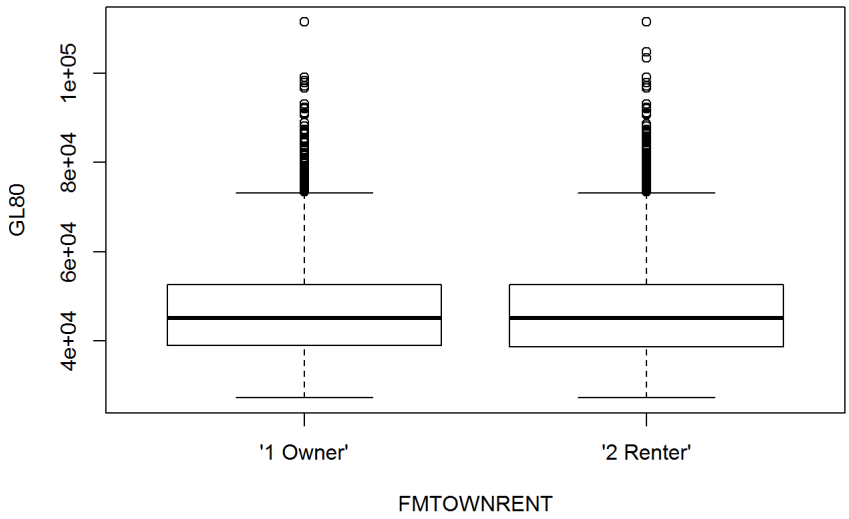

```
hist(hads2013n_c$GL80[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Growth-adjusted low income', xlab='GL80', ylab='Co
unt',col ='blue')
```



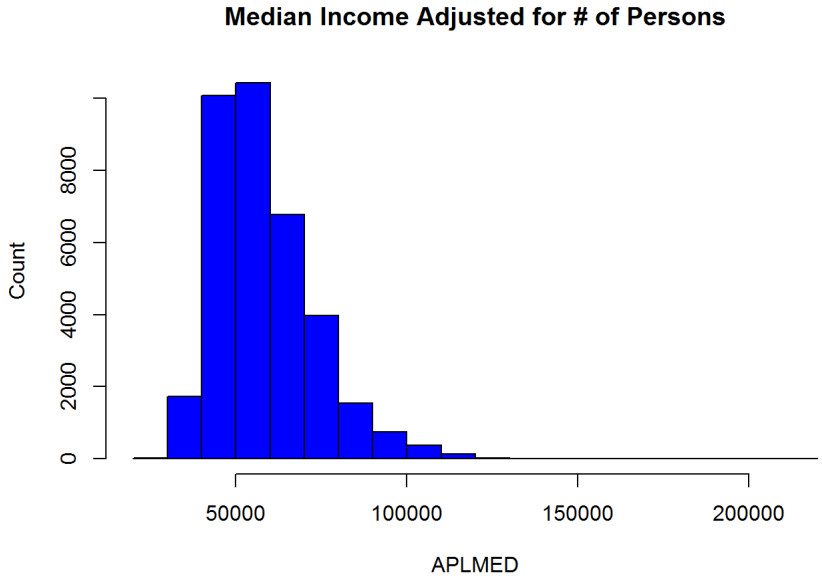

```
hist(hads2013n_c$GL80[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Growth-adjusted low income', xlab='GL80', ylab='C
ount',col ='red')
```



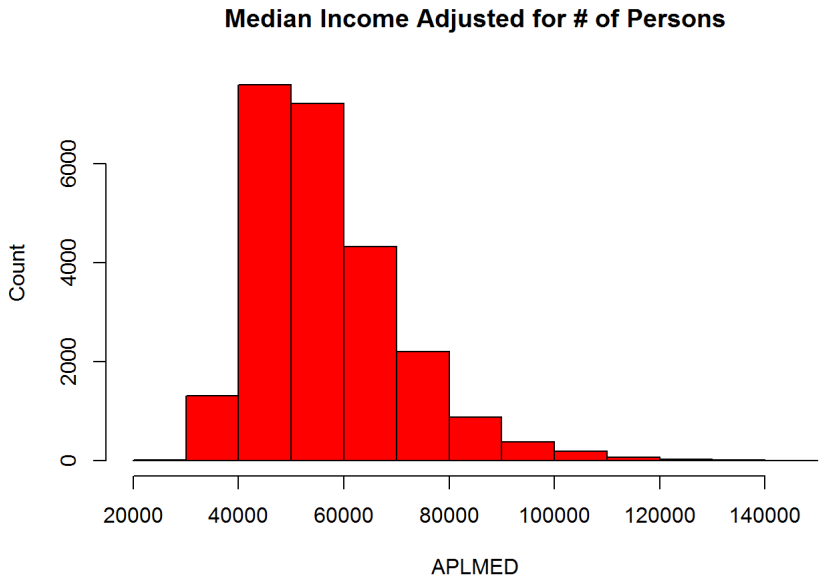

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$GL80,xlab='FMTOWNRENT',ylab='GL80')
```



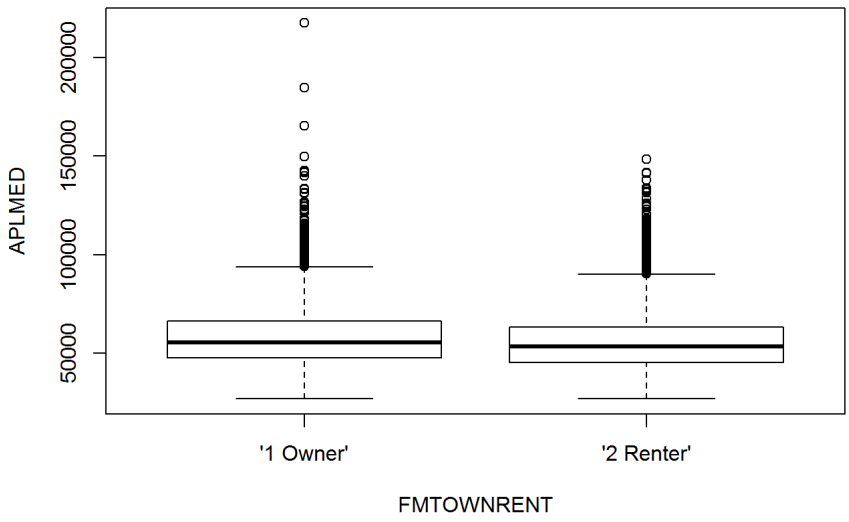

```
hist(hads2013n_c$APLMED[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Median Income Adjusted for # of Persons',
xlab='APLMED', ylab='Count',col ='blue')
```



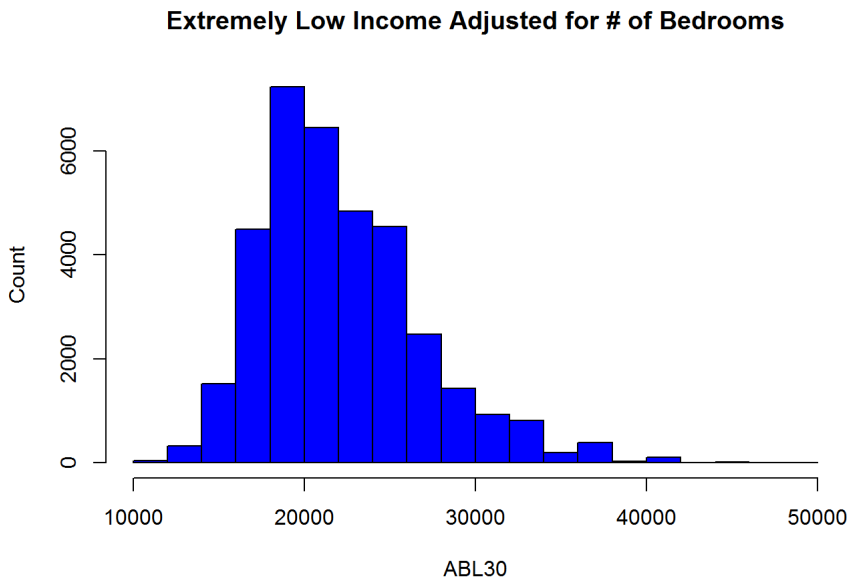

```
hist(hads2013n_c$APLMED[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Median Income Adjusted for # of Persons',
xlab='APLMED', ylab='Count',col ='red')
```



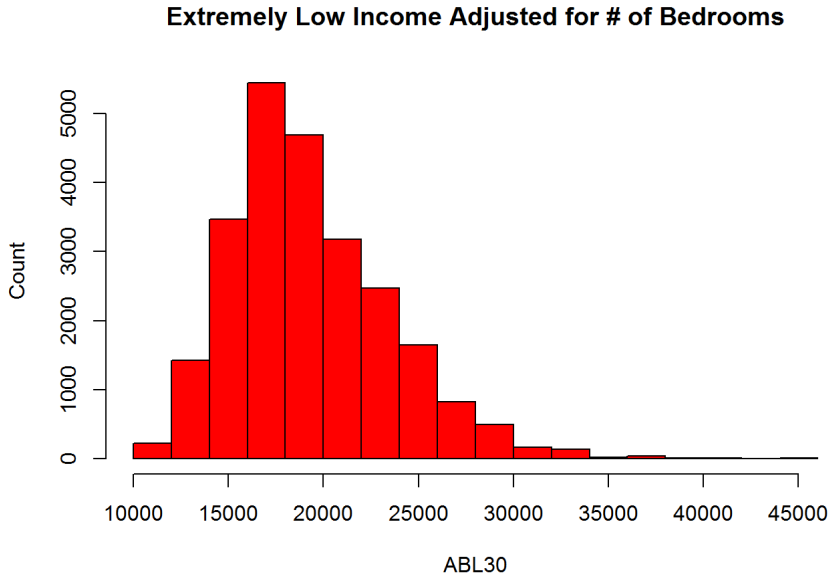

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$APLMED,xlab='FMTOWNRENT',ylab='APLMED')
```



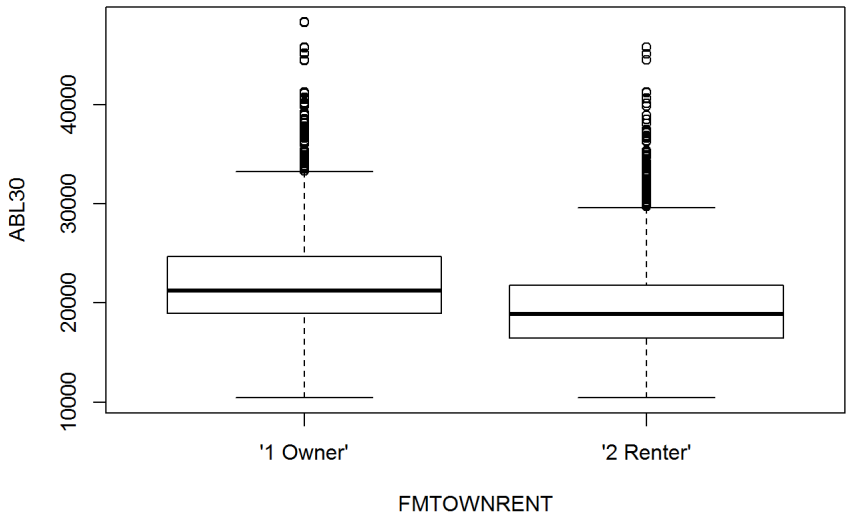

```
hist(hads2013n_c$ABL30[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Extremely Low Income Adjusted for # of Bedrooms',
 xlab='ABL30', ylab='Count',col ='blue')
```



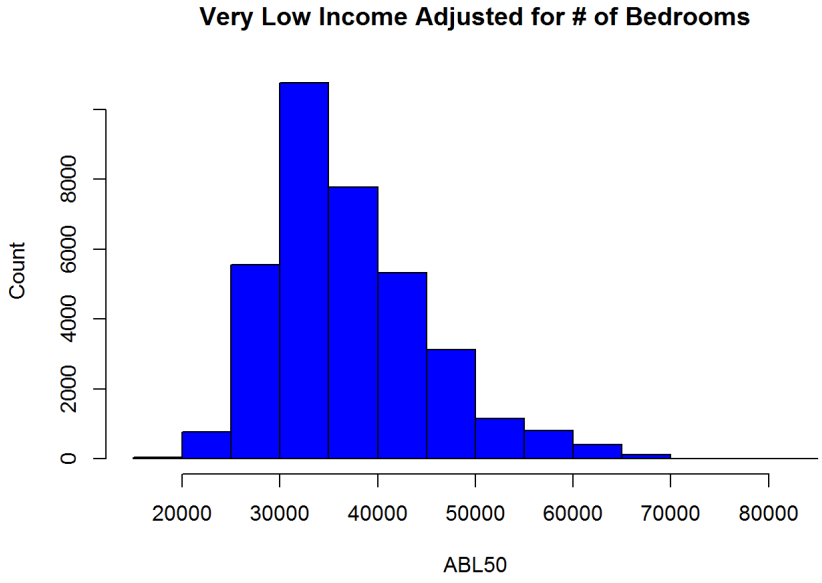

```
hist(hads2013n_c$ABL30[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Extremely Low Income Adjusted for # of
Bedrooms', xlab='ABL30', ylab='Count',col ='red')
```



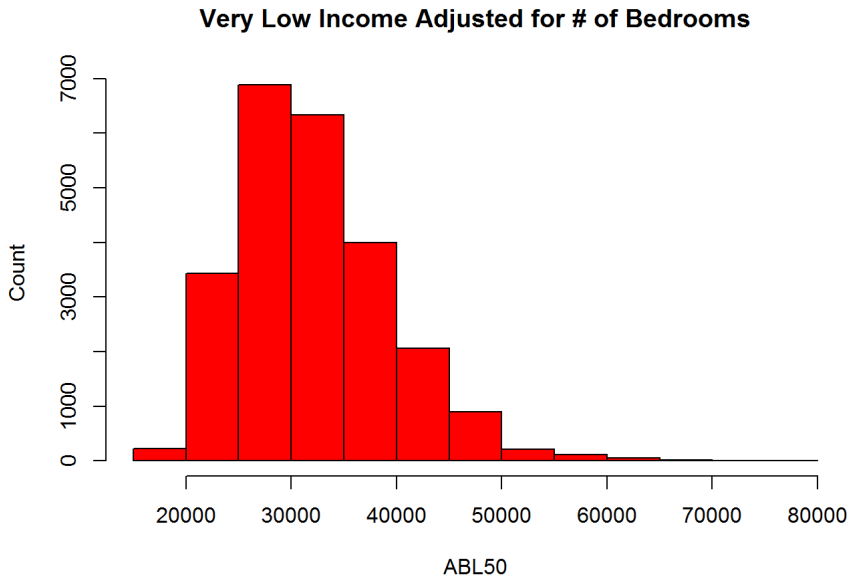

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$ABL30,xlab='FMTOWNRENT',ylab='ABL30')
```



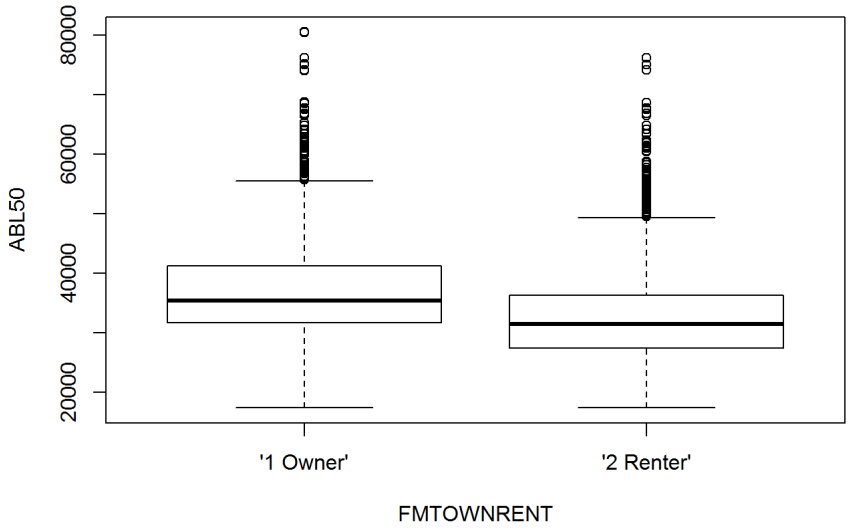

```
hist(hads2013n_c$ABL50[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Very Low Income Adjusted for # of Bedrooms',
xlab='ABL50', ylab='Count',col ='blue')
```



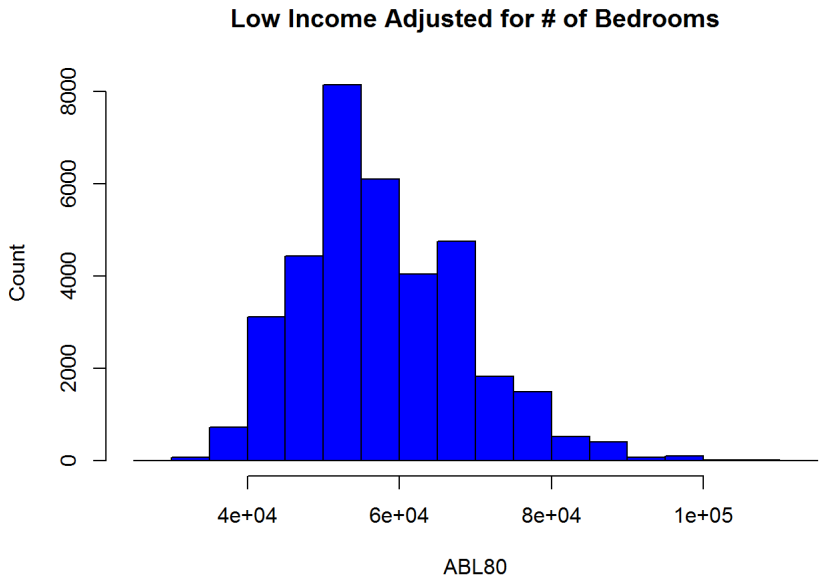

```
hist(hads2013n_c$ABL50[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Very Low Income Adjusted for # of Bedrooms', xla
b='ABL50', ylab='Count',col ='red')
```



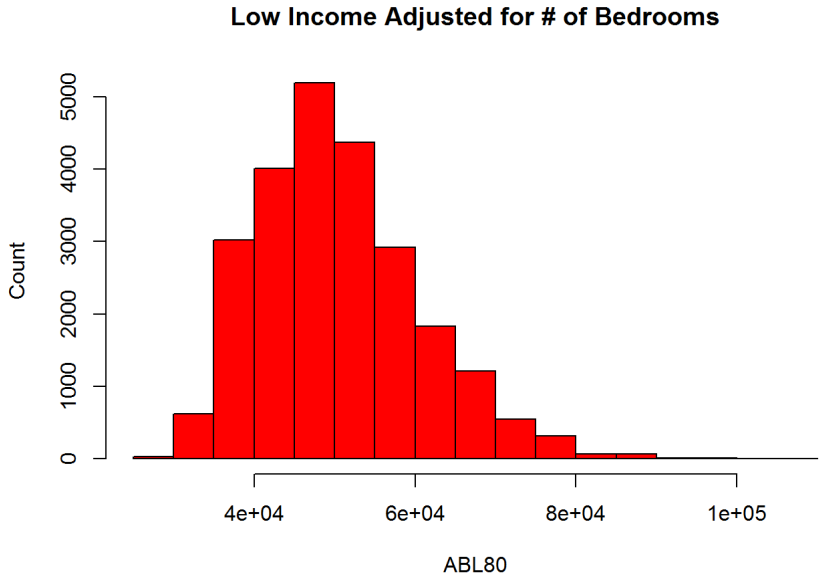

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$ABL50,xlab='FMTOWNRENT',ylab='ABL50')
```



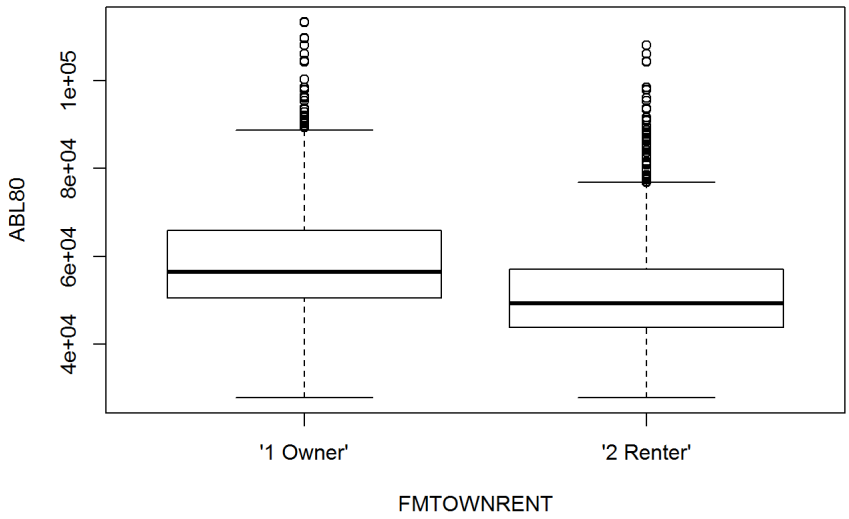

```
hist(hads2013n_c$ABL80[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Low Income Adjusted for # of Bedrooms', xlab='ABL
80', ylab='Count',col ='blue')
```



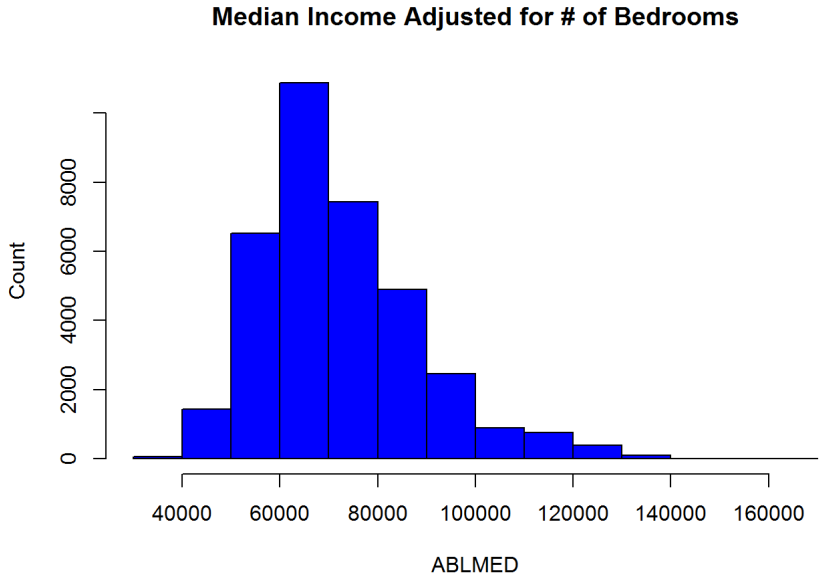

```
hist(hads2013n_c$ABL80[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Low Income Adjusted for # of Bedrooms', xlab='AB
L80', ylab='Count',col ='red')
```



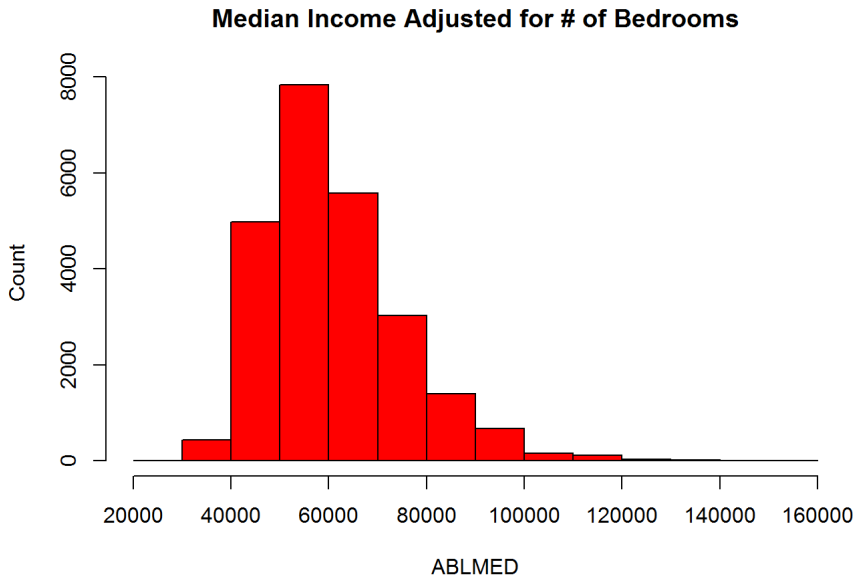

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$ABL80,xlab='FMTOWNRENT',ylab='ABL80')
```



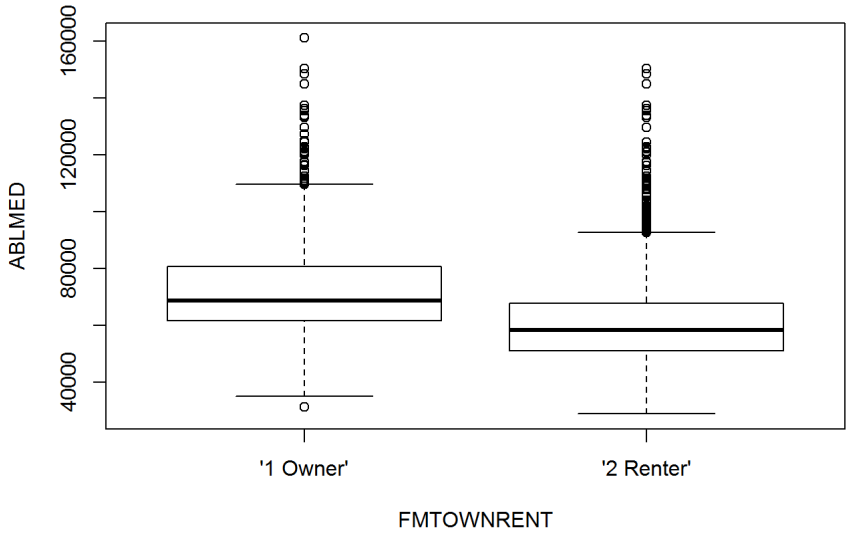

```
hist(hads2013n_c$ABLMED[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Median Income Adjusted for # of Bedrooms',
xlab='ABLMED', ylab='Count',col ='blue')
```



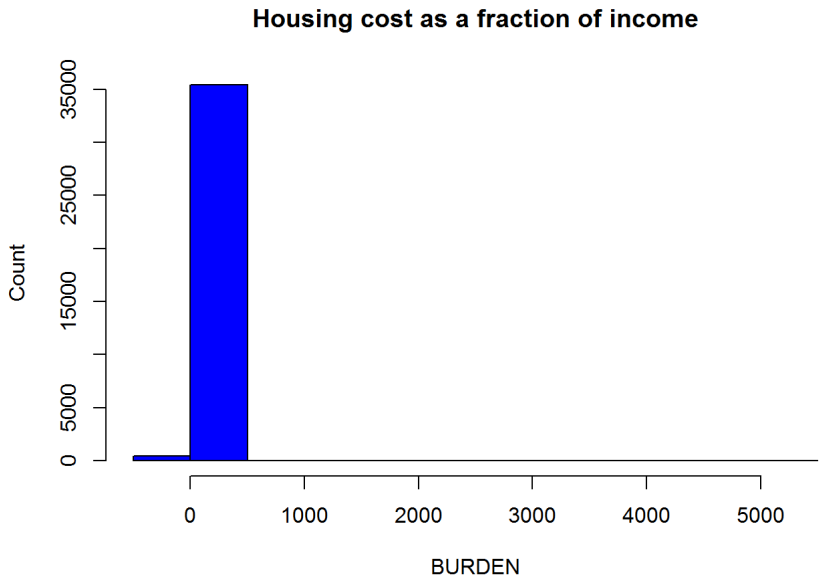

```
hist(hads2013n_c$ABLMED[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Median Income Adjusted for # of Bedrooms',
xlab='ABLMED', ylab='Count',col ='red')
```



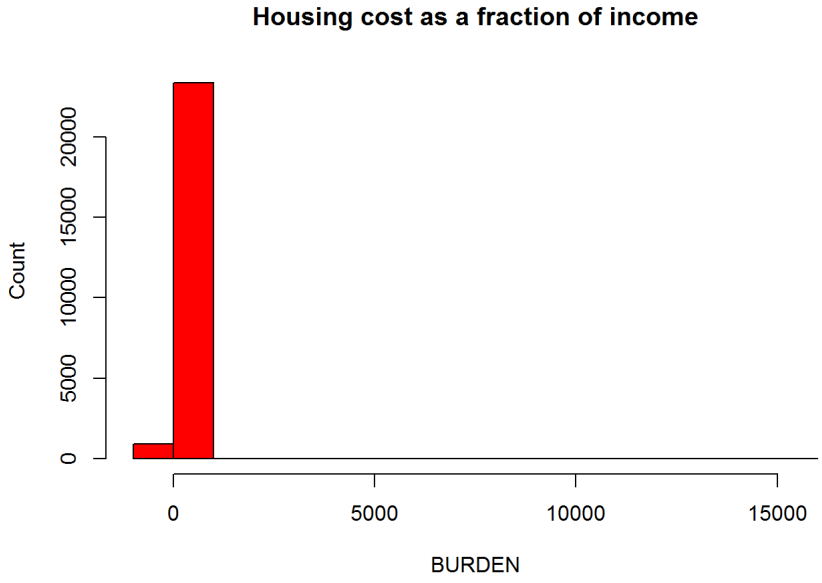

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$ABLMED,xlab='FMTOWNRENT',ylab='ABLMED')
```



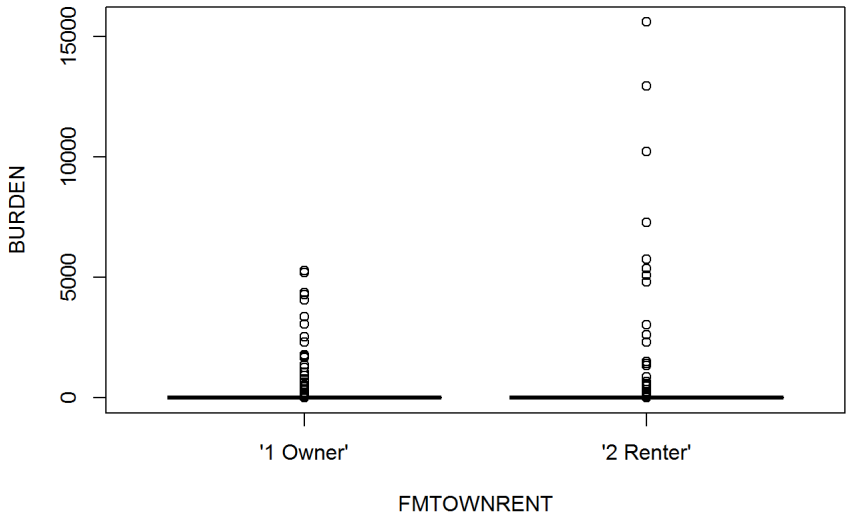

```
hist(hads2013n_c$BURDEN[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Housing cost as a fraction of income', xlab='BUR
DEN', ylab='Count',col ='blue')
```



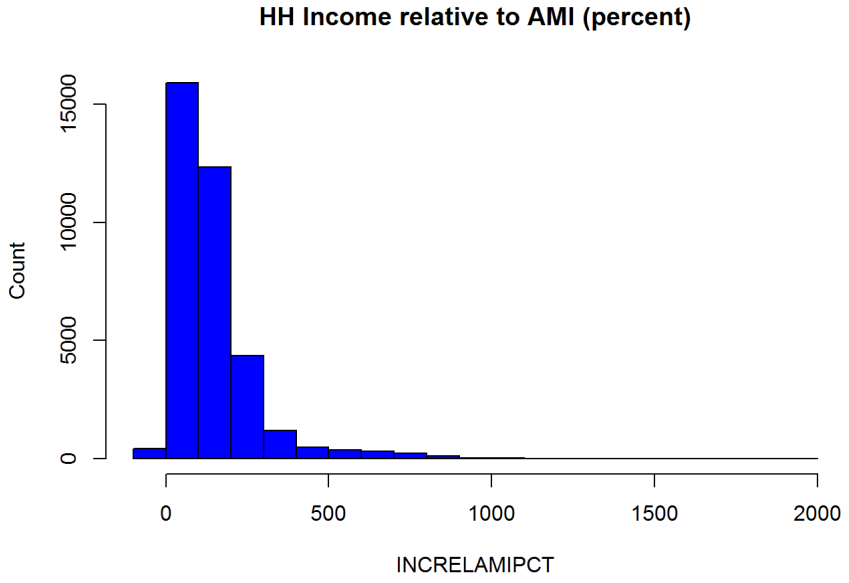

```
hist(hads2013n_c$BURDEN[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Housing cost as a fraction of income', xlab='BU
RDEN', ylab='Count',col ='red')
```



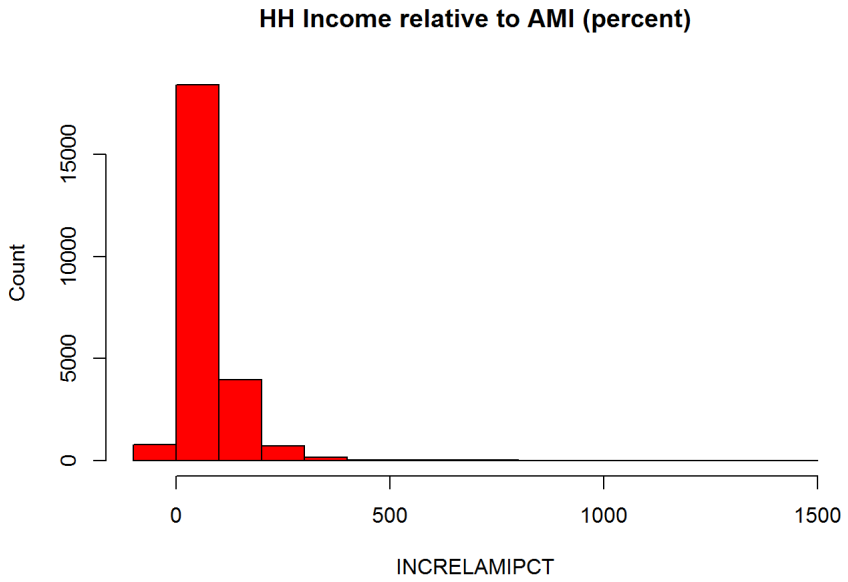

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$BURDEN,xlab='FMTOWNRENT',ylab='BURDEN')
```



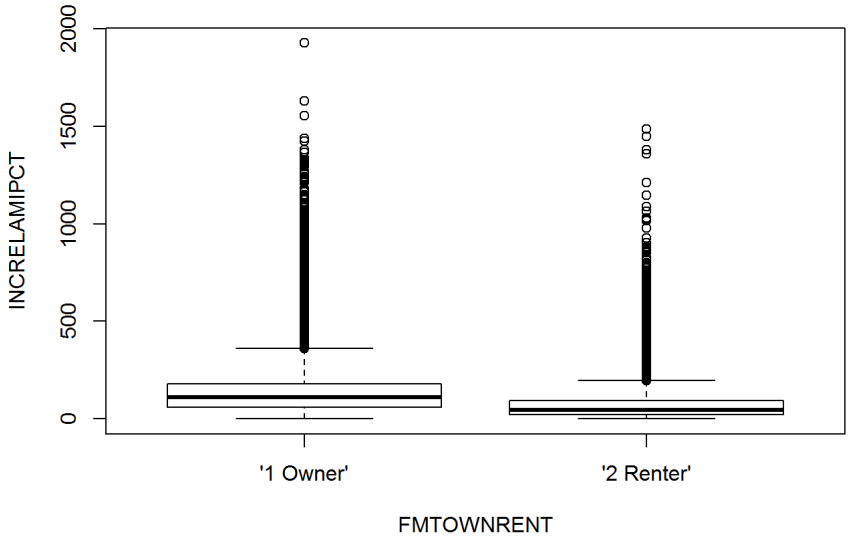

```
hist(hads2013n_c$INCRELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'HH Income relative to AMI (percent)',
xlab='INCRELAMIPCT', ylab='Count',col ='blue')
```



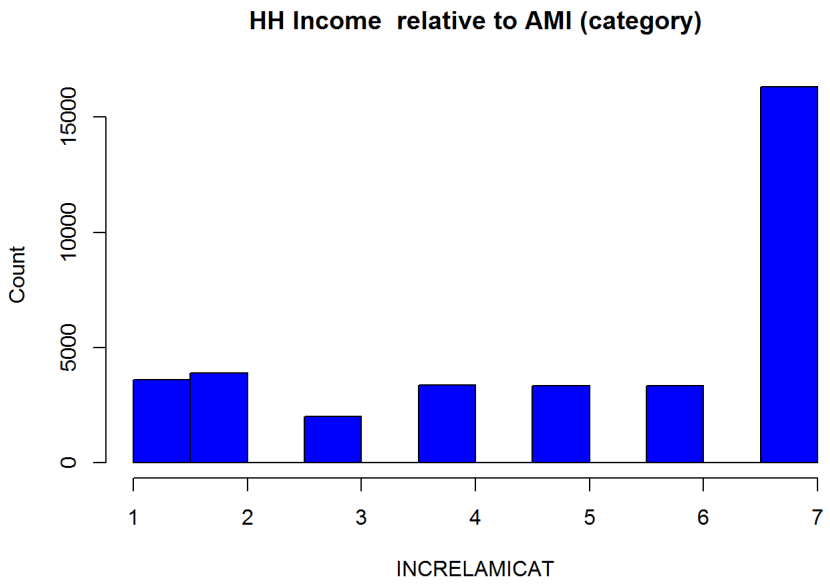

```
hist(hads2013n_c$INCRELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'HH Income relative to AMI (percent)', xla
b='INCRELAMIPCT', ylab='Count',col ='red')
```



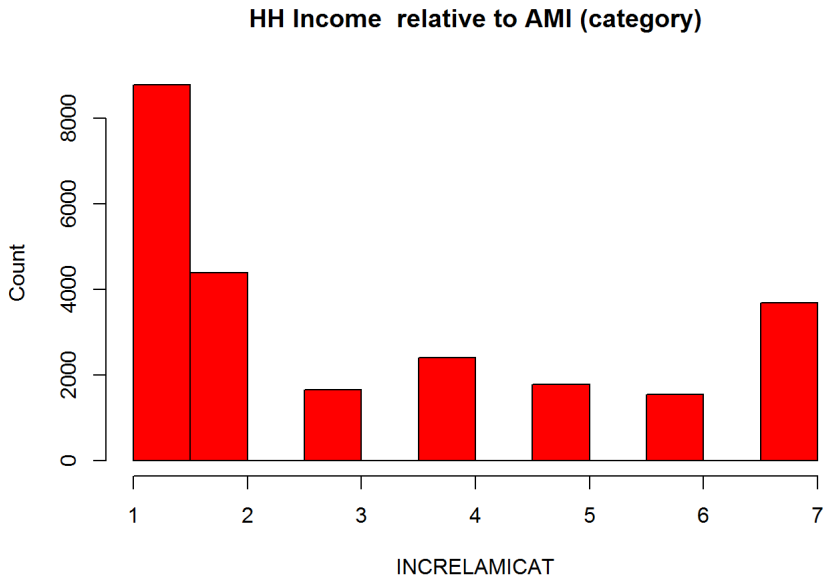

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$INCRELAMIPCT,xlab='FMTOWNRENT',ylab='INCRELAMIPCT')
```



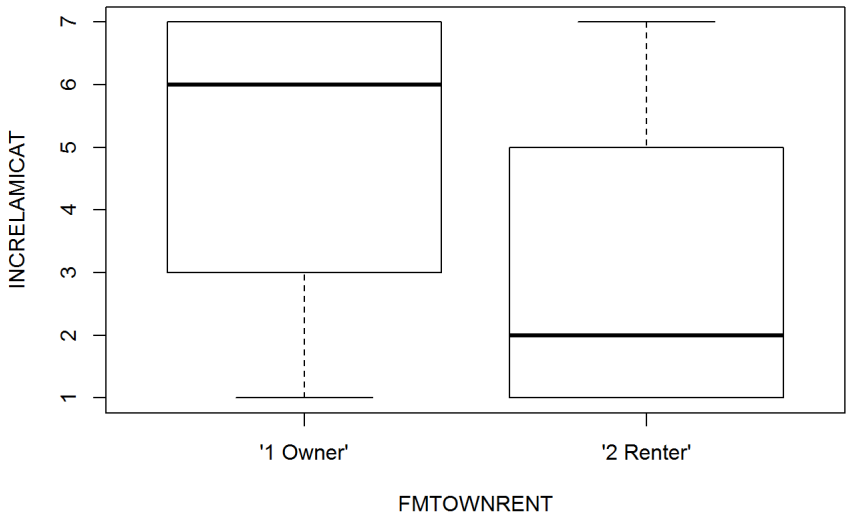

```
hist(hads2013n_c$INCRELAMICAT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'HH Income  relative to AMI (category)', xl
ab='INCRELAMICAT', ylab='Count',col ='blue')
```



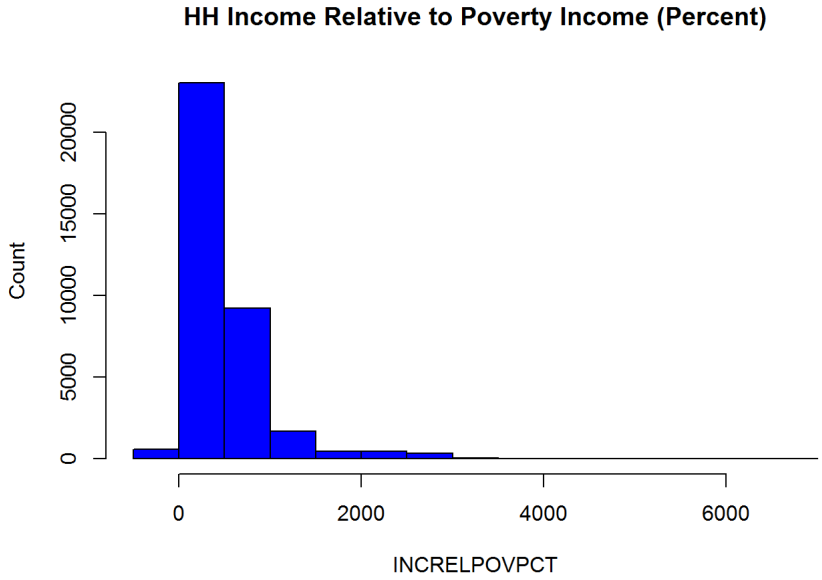

```
hist(hads2013n_c$INCRELAMICAT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'HH Income  relative to AMI (category)', x
lab='INCRELAMICAT', ylab='Count',col ='red')
```



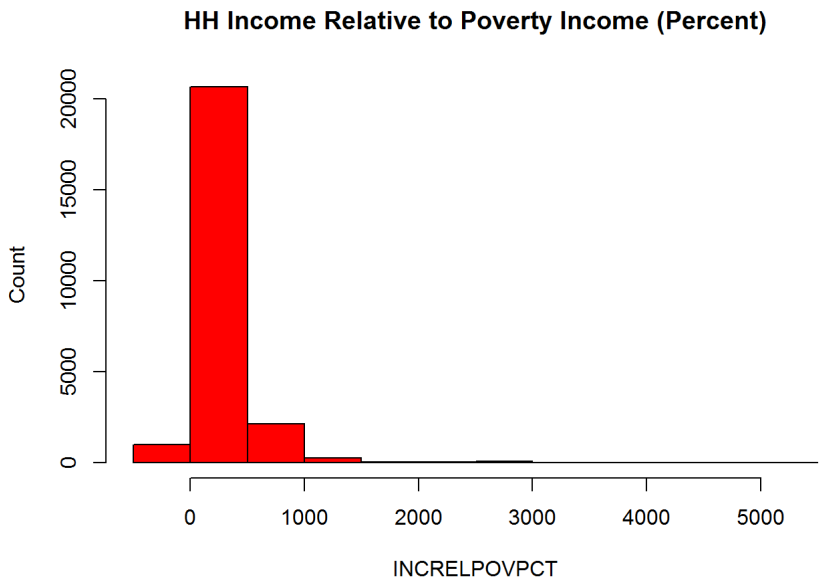

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$INCRELAMICAT,xlab='FMTOWNRENT',ylab='INCRELAMICAT')
```



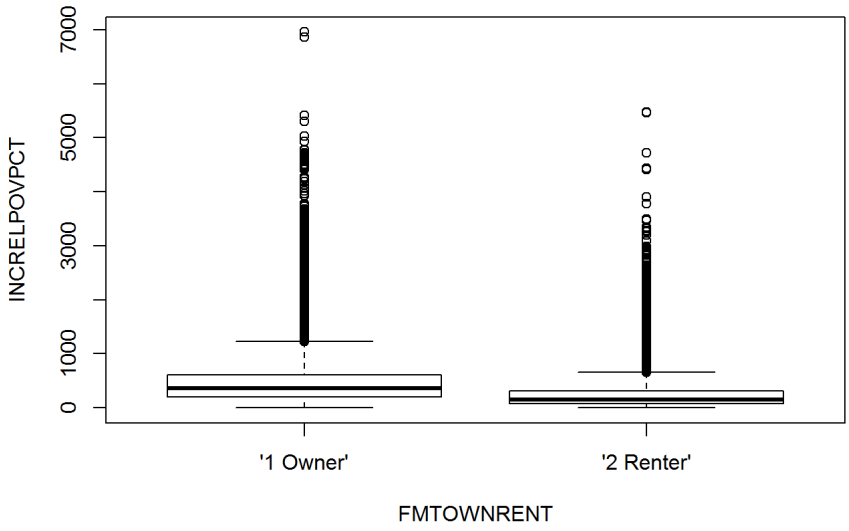

```
hist(hads2013n_c$INCRELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'HH Income Relative to Poverty Income (Perc
ent)', xlab='INCRELPOVPCT', ylab='Count',col ='blue')
```



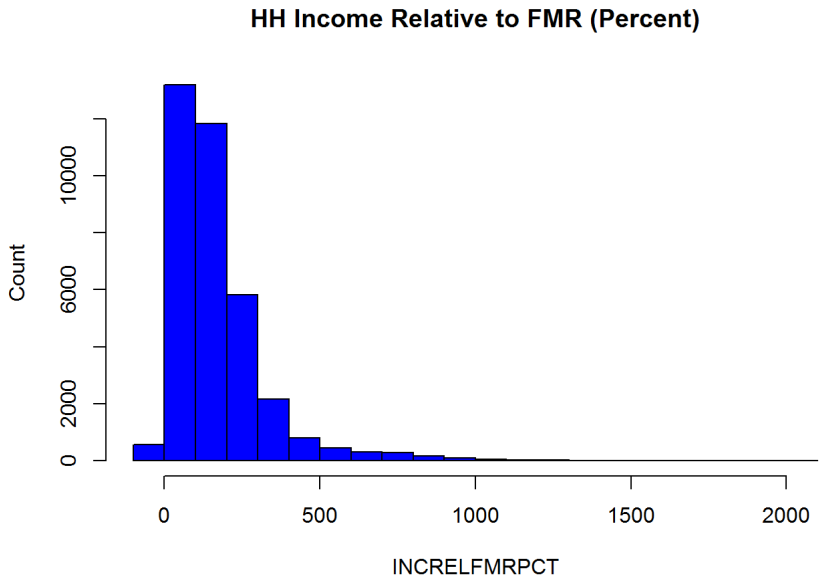

```
hist(hads2013n_c$INCRELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'HH Income Relative to Poverty Income (Per
cent)', xlab='INCRELPOVPCT', ylab='Count',col ='red')
```



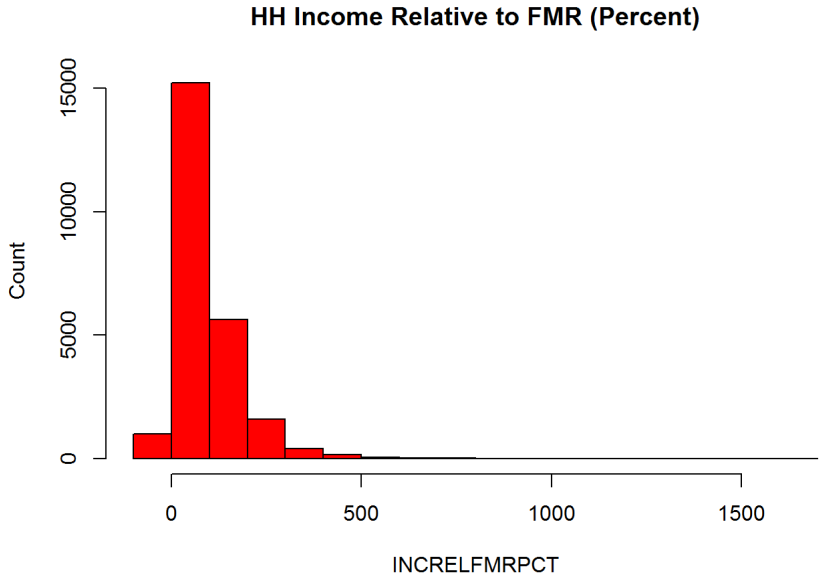

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$INCRELPOVPCT,xlab='FMTOWNRENT',ylab='INCRELPOVPCT')
```



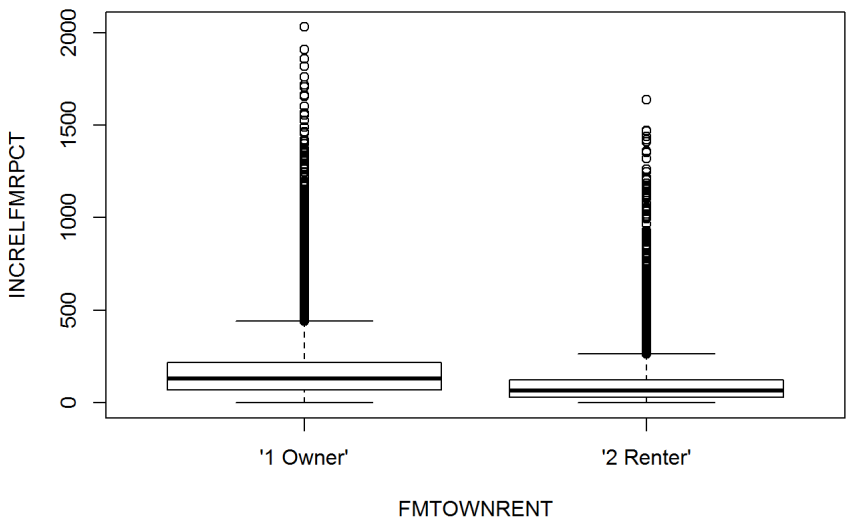

```
hist(hads2013n_c$INCRELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'HH Income Relative to FMR (Percent)',
xlab='INCRELFMRPCT', ylab='Count',col ='blue')
```



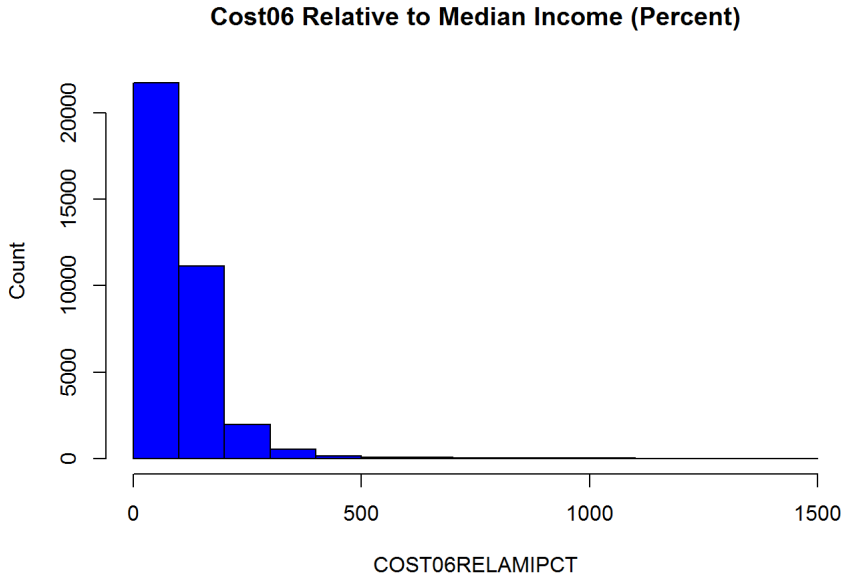

```
hist(hads2013n_c$INCRELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'HH Income Relative to FMR (Percent)', xla
b='INCRELFMRPCT', ylab='Count',col ='red')
```



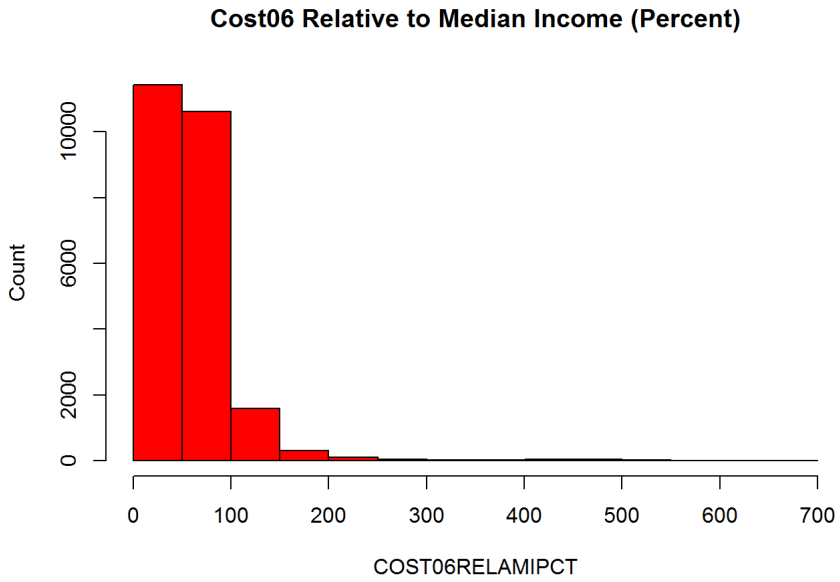

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$INCRELFMRPCT,xlab='FMTOWNRENT',ylab='INCRELFMRPCT')
```



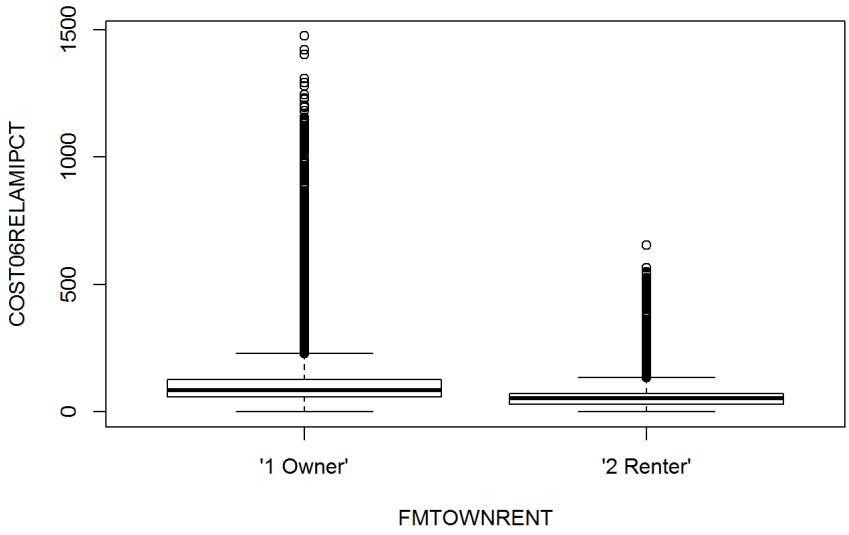

```
hist(hads2013n_c$COST06RELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost06 Relative to Median Income (Perce
nt)', xlab='COST06RELAMIPCT', ylab='Count',col ='blue')
```



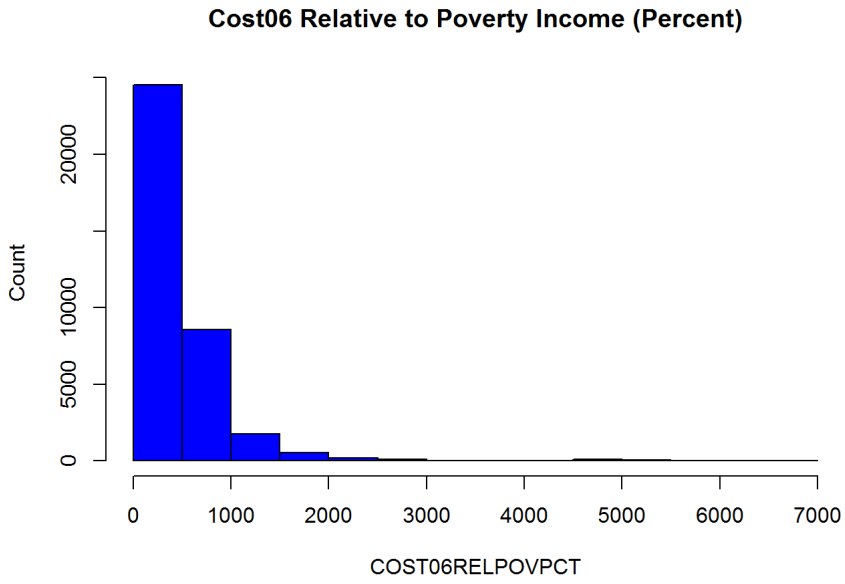

```
hist(hads2013n_c$COST06RELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost06 Relative to Median Income (Perc
ent)', xlab='COST06RELAMIPCT', ylab='Count',col ='red')
```



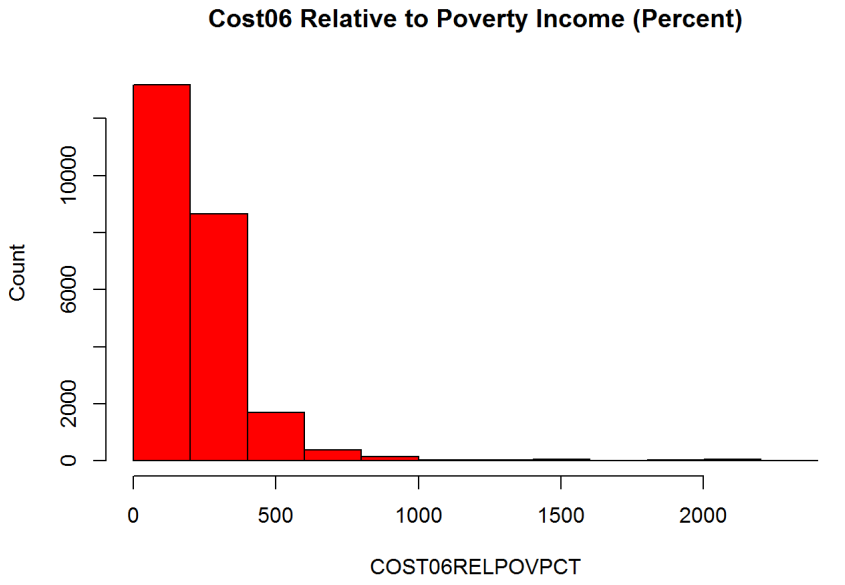

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST06RELAMIPCT,xlab='FMTOWNRENT',ylab='COST06RELAMIPCT')
```



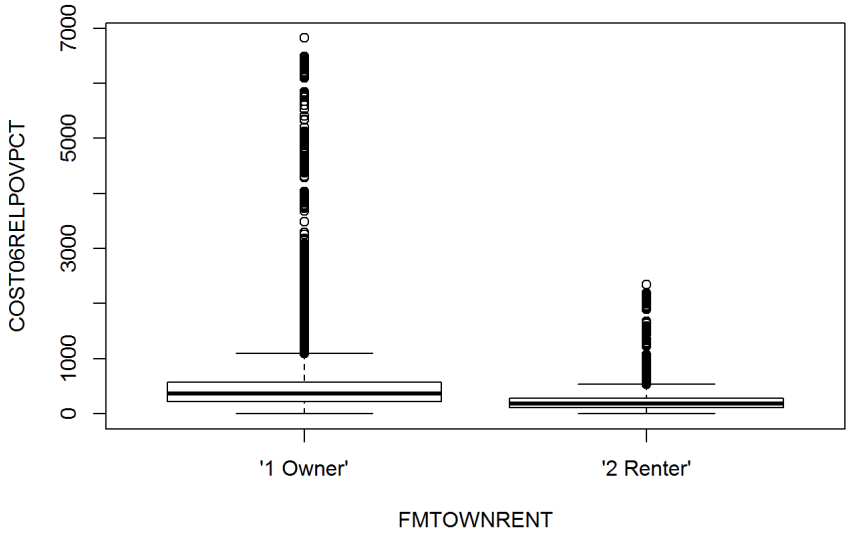

```
hist(hads2013n_c$COST06RELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost06 Relative to Poverty Income (Perc
ent)', xlab='COST06RELPOVPCT', ylab='Count',col ='blue')
```



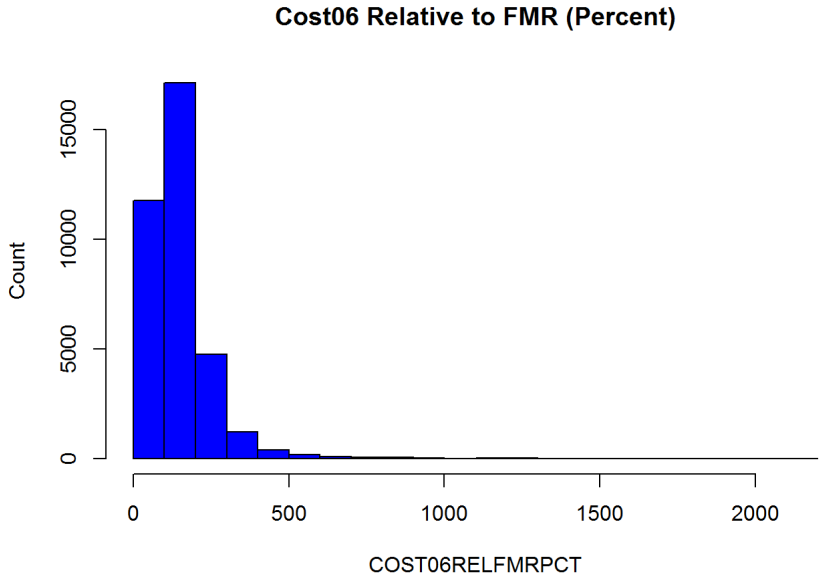

```
hist(hads2013n_c$COST06RELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost06 Relative to Poverty Income (Per
cent)', xlab='COST06RELPOVPCT', ylab='Count',col ='red')
```



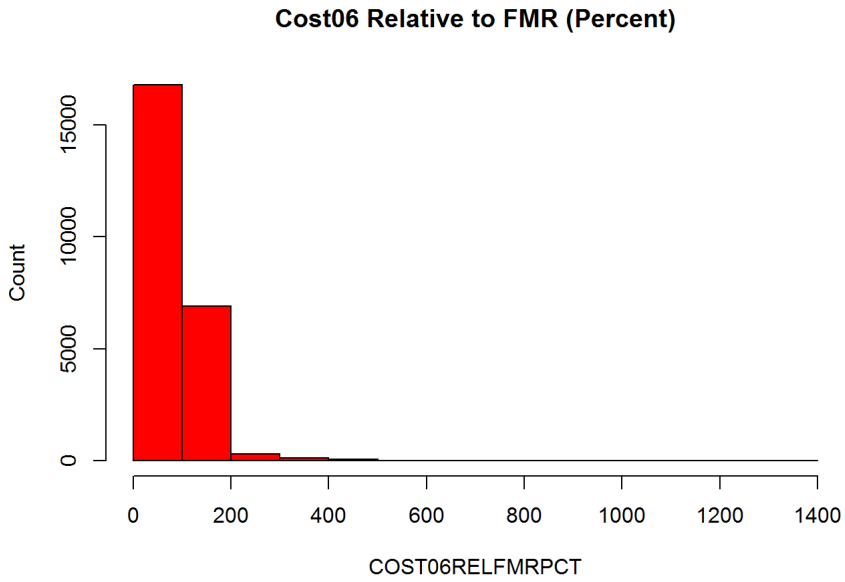

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST06RELPOVPCT,xlab='FMTOWNRENT',ylab='COST06RELPOVPCT')
```



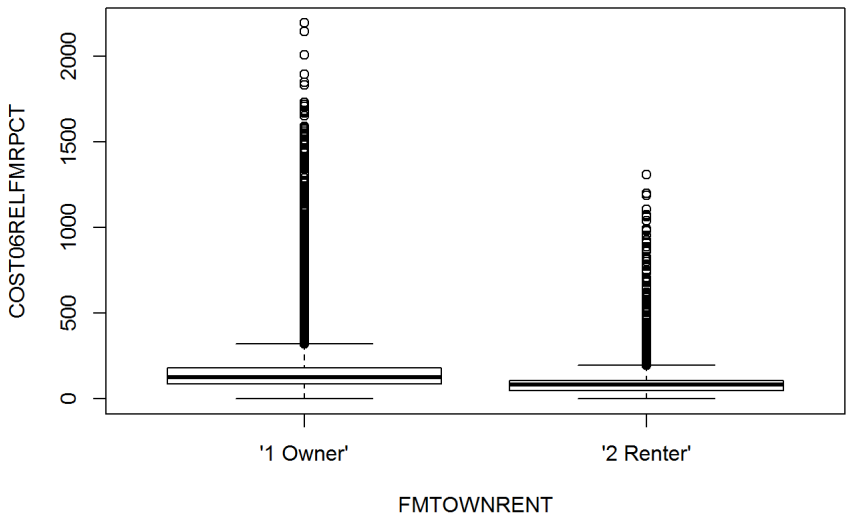

```
hist(hads2013n_c$COST06RELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost06 Relative to FMR (Percent)',
xlab='COST06RELFMRPCT', ylab='Count',col ='blue')
```



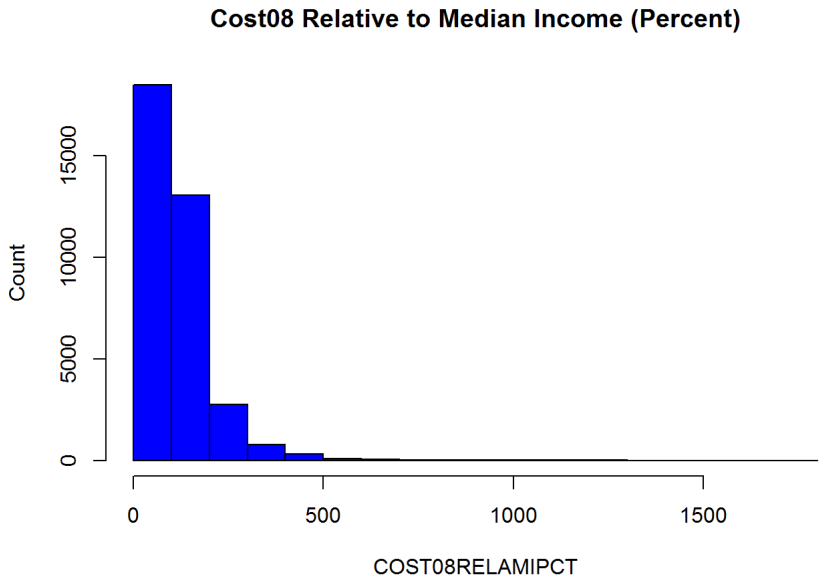

```
hist(hads2013n_c$COST06RELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost06 Relative to FMR (Percent)', xla
b='COST06RELFMRPCT', ylab='Count',col ='red')
```



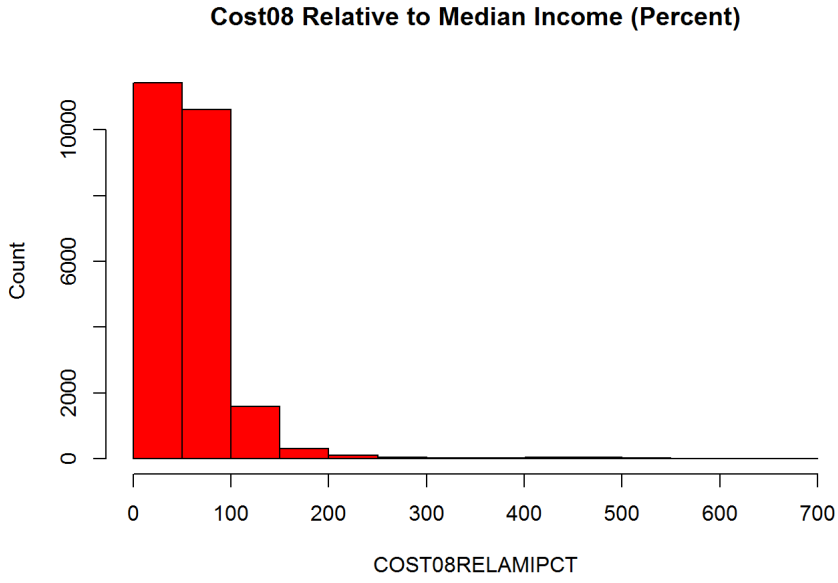

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST06RELFMRPCT,xlab='FMTOWNRENT',ylab='COST06RELFMRPCT')
```



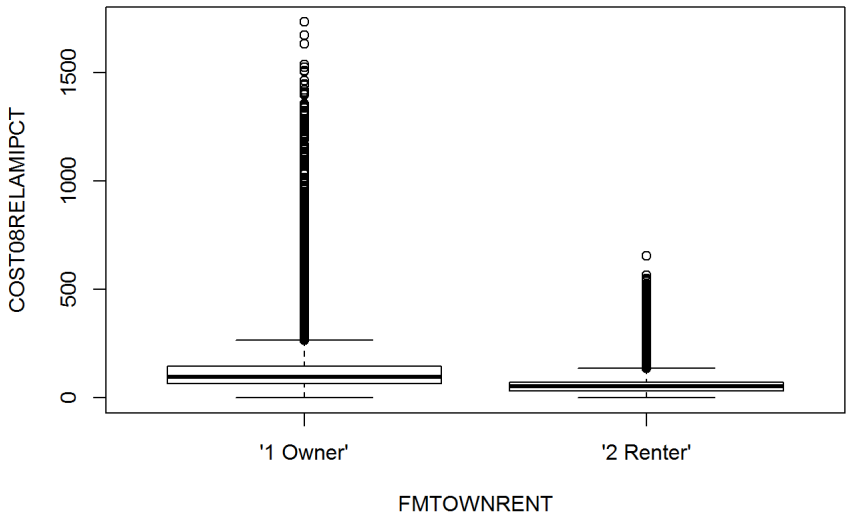

```
hist(hads2013n_c$COST08RELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost08 Relative to Median Income (Perce
nt)', xlab='COST08RELAMIPCT', ylab='Count',col ='blue')
```



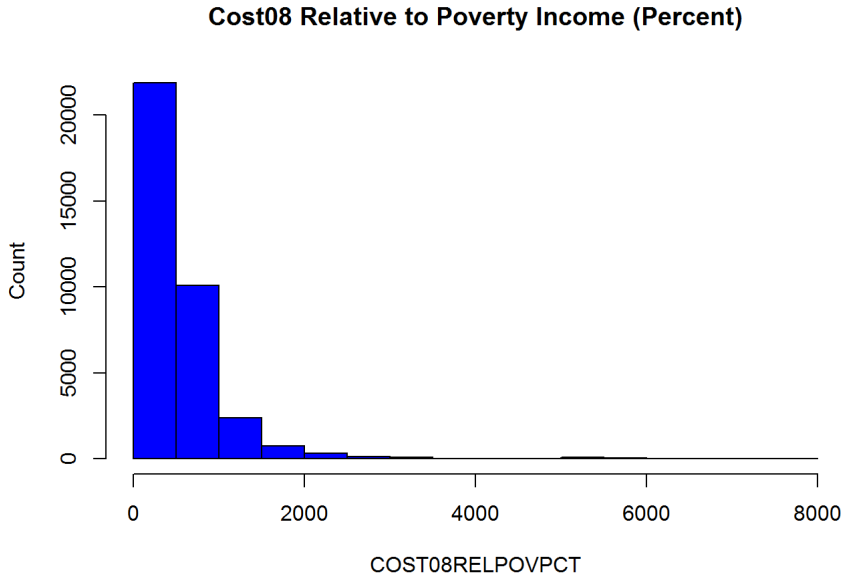

```
hist(hads2013n_c$COST08RELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost08 Relative to Median Income (Perc
ent)', xlab='COST08RELAMIPCT', ylab='Count',col ='red')
```



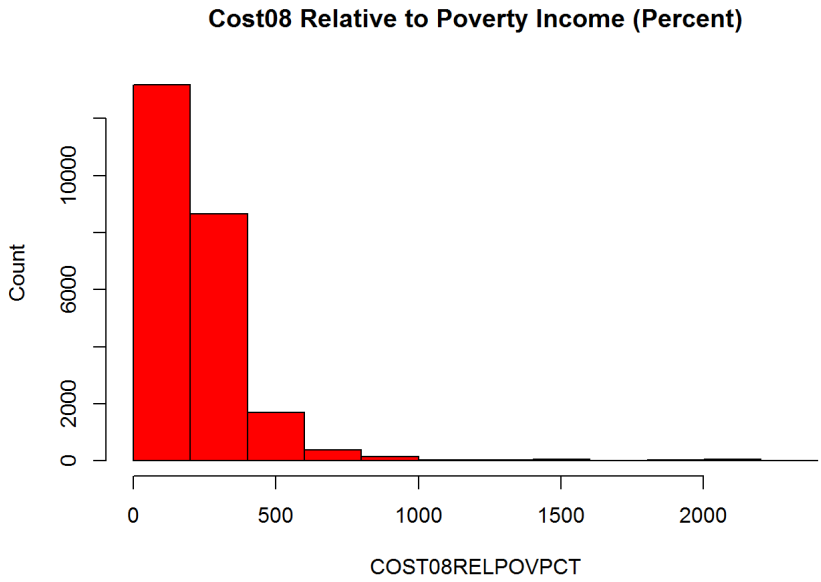

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST08RELAMIPCT,xlab='FMTOWNRENT',ylab='COST08RELAMIPCT')
```



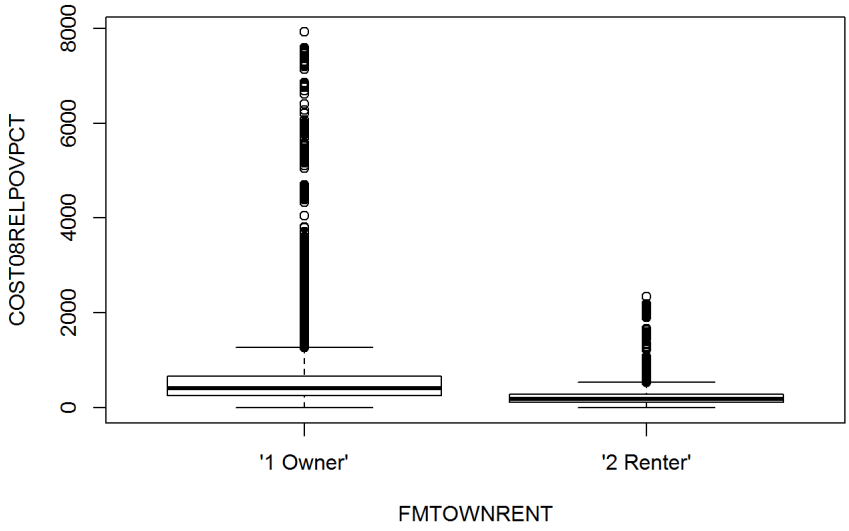

```
hist(hads2013n_c$COST08RELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost08 Relative to Poverty Income (Perc
ent)', xlab='COST08RELPOVPCT', ylab='Count',col ='blue')
```



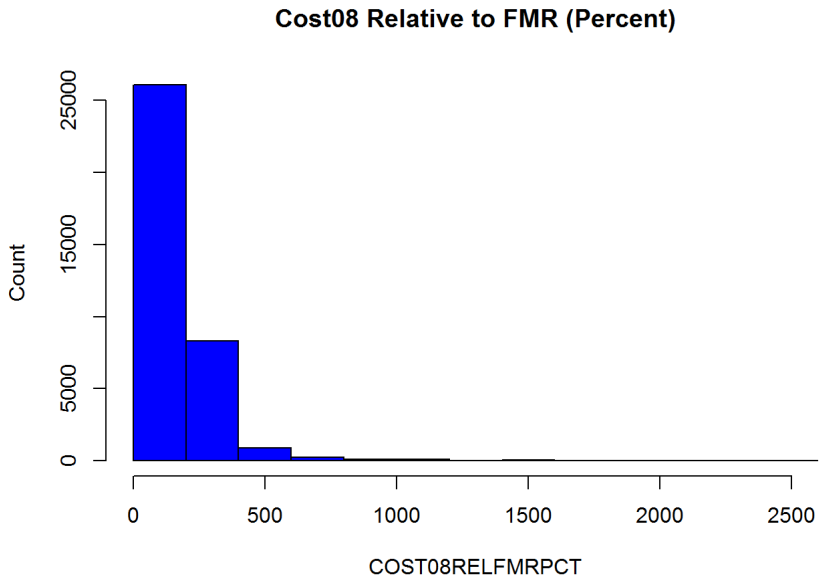

```
hist(hads2013n_c$COST08RELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost08 Relative to Poverty Income (Per
cent)', xlab='COST08RELPOVPCT', ylab='Count',col ='red')
```



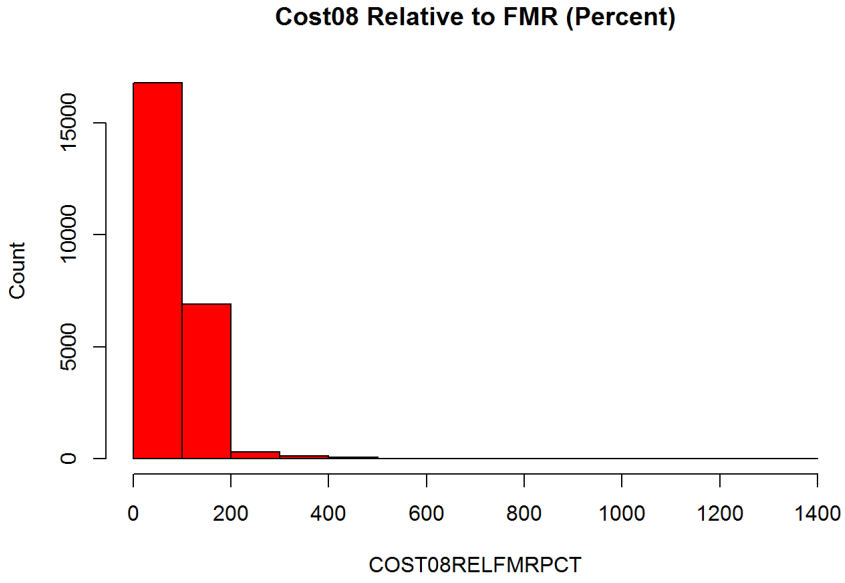

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST08RELPOVPCT,xlab='FMTOWNRENT',ylab='COST08RELPOVPCT')
```



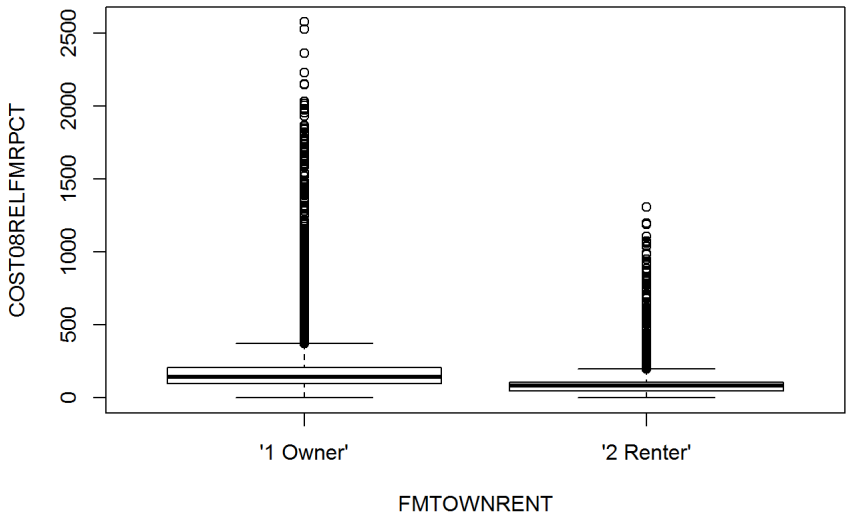

```
hist(hads2013n_c$COST08RELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost08 Relative to FMR (Percent)',
xlab='COST08RELFMRPCT', ylab='Count',col ='blue')
```



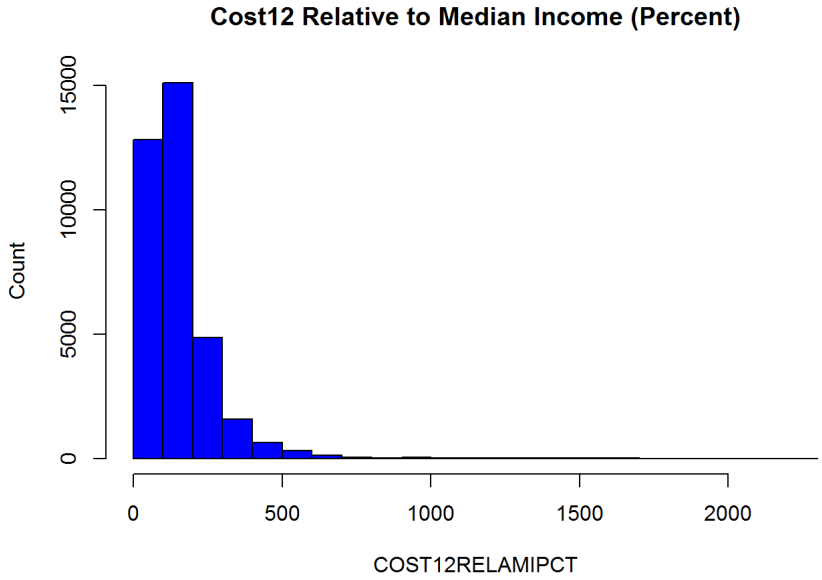

```
hist(hads2013n_c$COST08RELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost08 Relative to FMR (Percent)', xla
b='COST08RELFMRPCT', ylab='Count',col ='red')
```



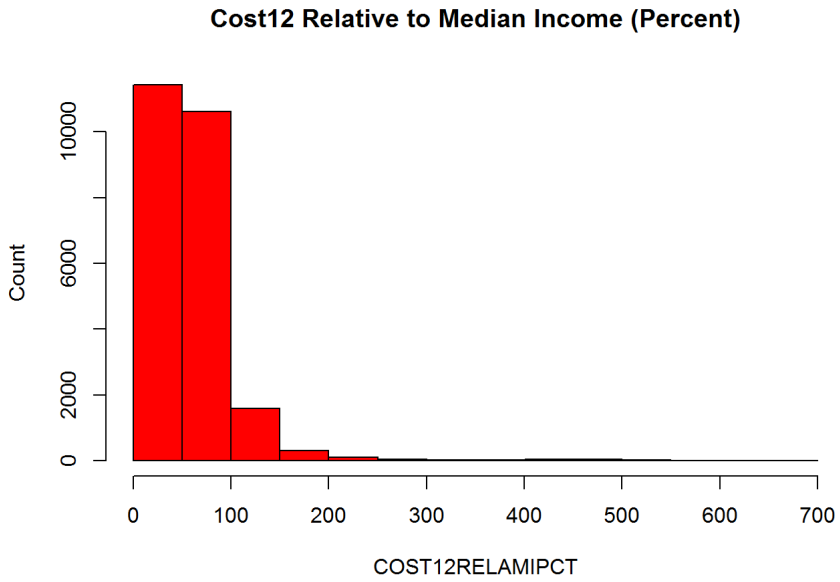

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST08RELFMRPCT,xlab='FMTOWNRENT',ylab='COST08RELFMRPCT')
```



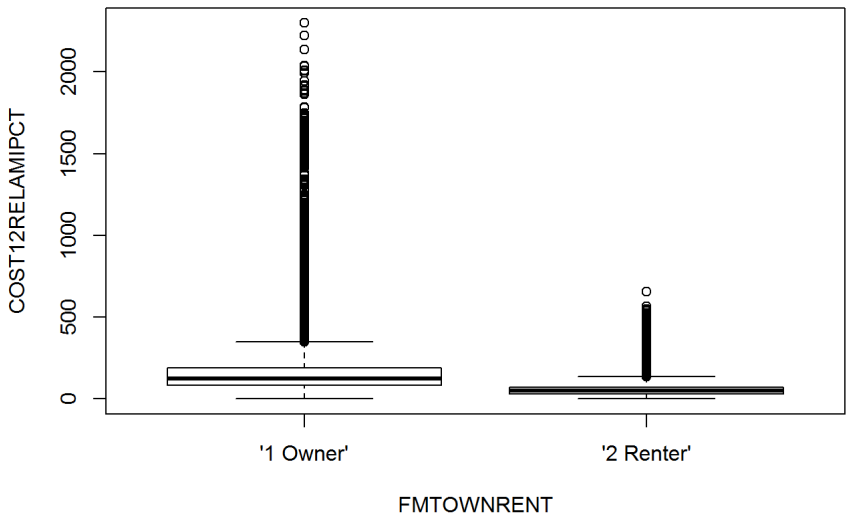

```
hist(hads2013n_c$COST12RELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost12 Relative to Median Income (Perce
nt)', xlab='COST12RELAMIPCT', ylab='Count',col ='blue')
```



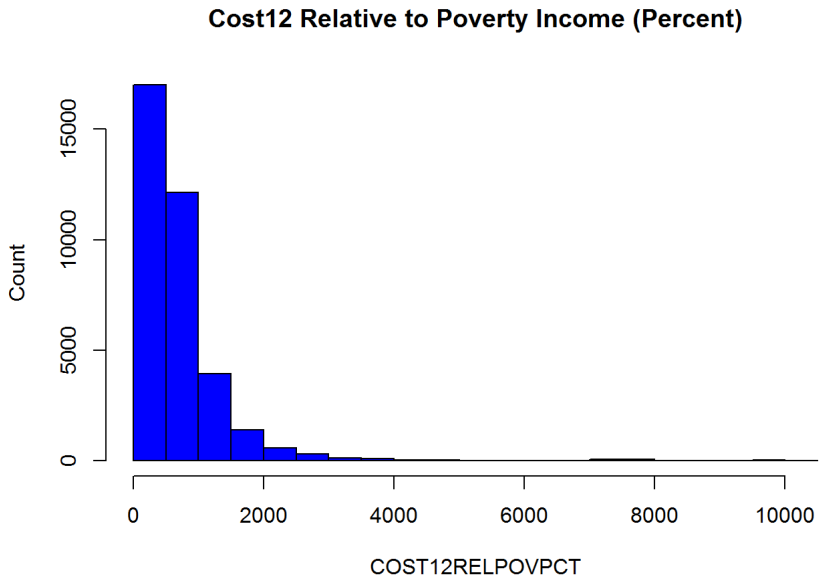

```
hist(hads2013n_c$COST12RELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost12 Relative to Median Income (Perc
ent)', xlab='COST12RELAMIPCT', ylab='Count',col ='red')
```



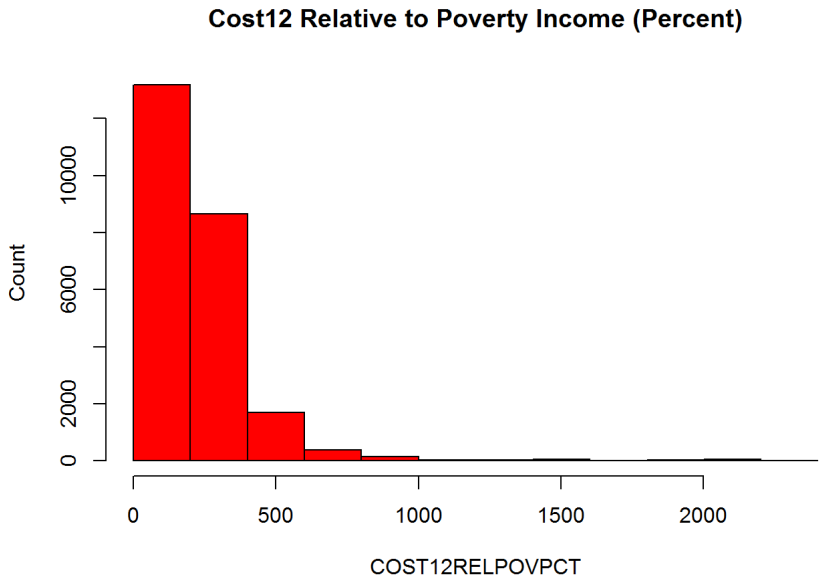

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST12RELAMIPCT,xlab='FMTOWNRENT',ylab='COST12RELAMIPCT')
```



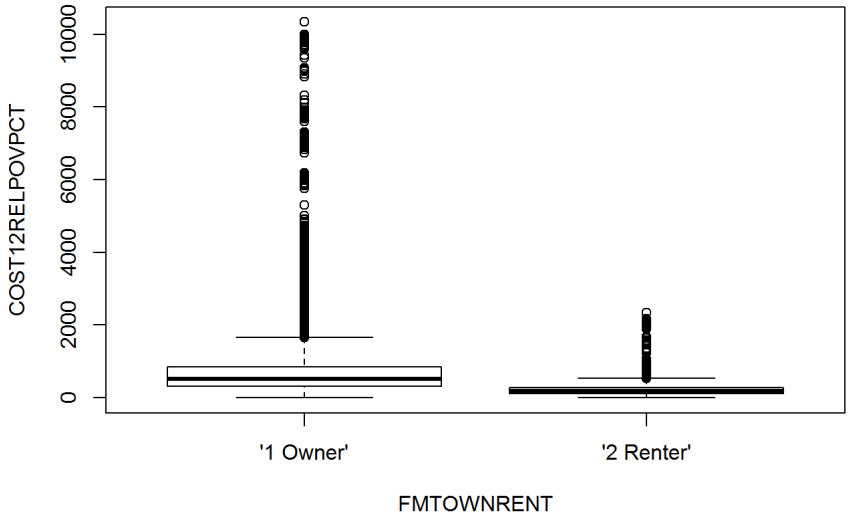

```
hist(hads2013n_c$COST12RELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost12 Relative to Poverty Income (Perc
ent)', xlab='COST12RELPOVPCT', ylab='Count',col ='blue')
```



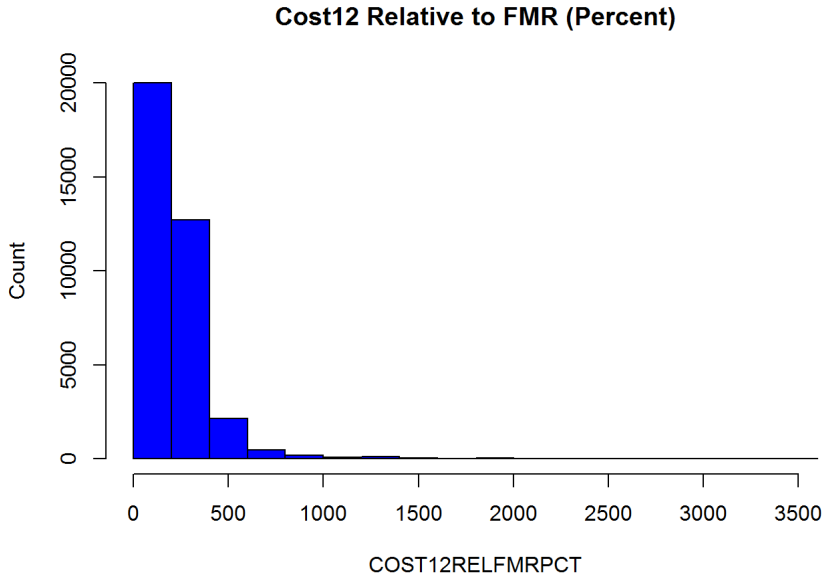

```
hist(hads2013n_c$COST12RELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost12 Relative to Poverty Income (Per
cent)', xlab='COST12RELPOVPCT', ylab='Count',col ='red')
```



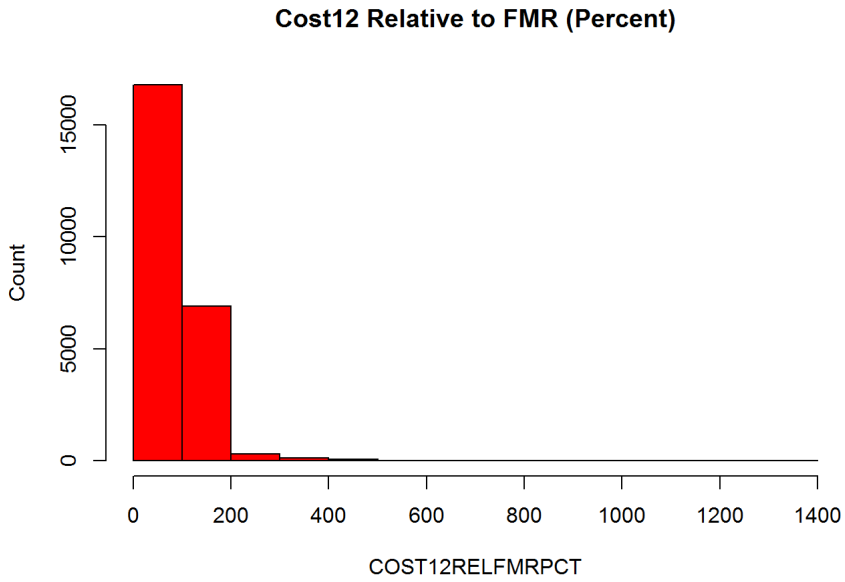

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST12RELPOVPCT,xlab='FMTOWNRENT',ylab='COST12RELPOVPCT')
```



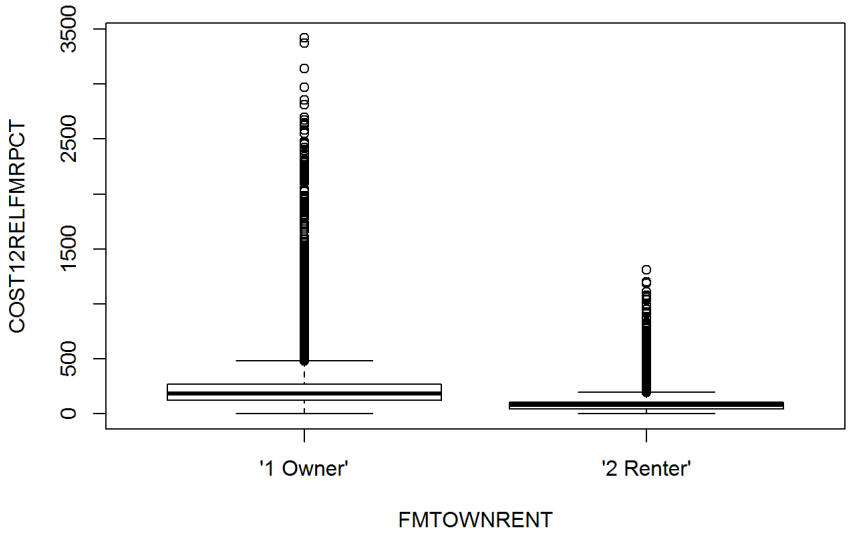

```
hist(hads2013n_c$COST12RELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'Cost12 Relative to FMR (Percent)',
xlab='COST12RELFMRPCT', ylab='Count',col ='blue')
```



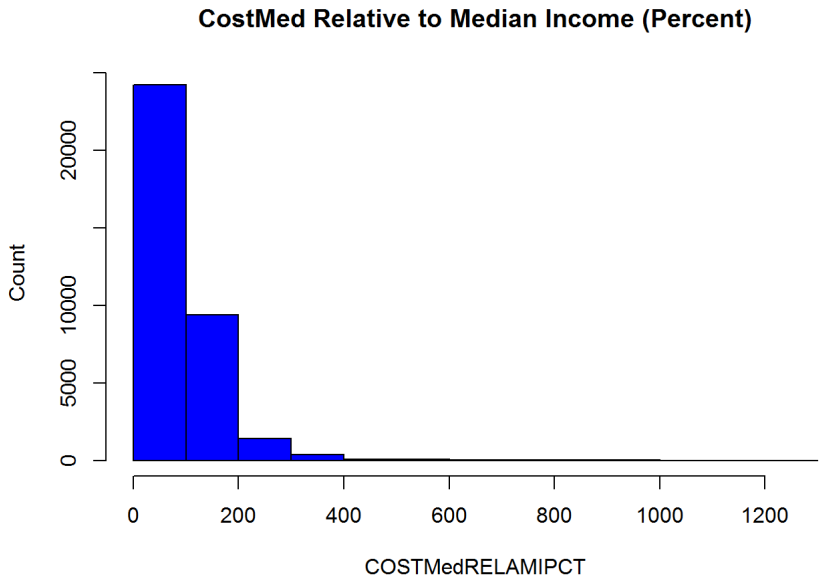

```
hist(hads2013n_c$COST12RELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'Cost12 Relative to FMR (Percent)', xla
b='COST12RELFMRPCT', ylab='Count',col ='red')
```



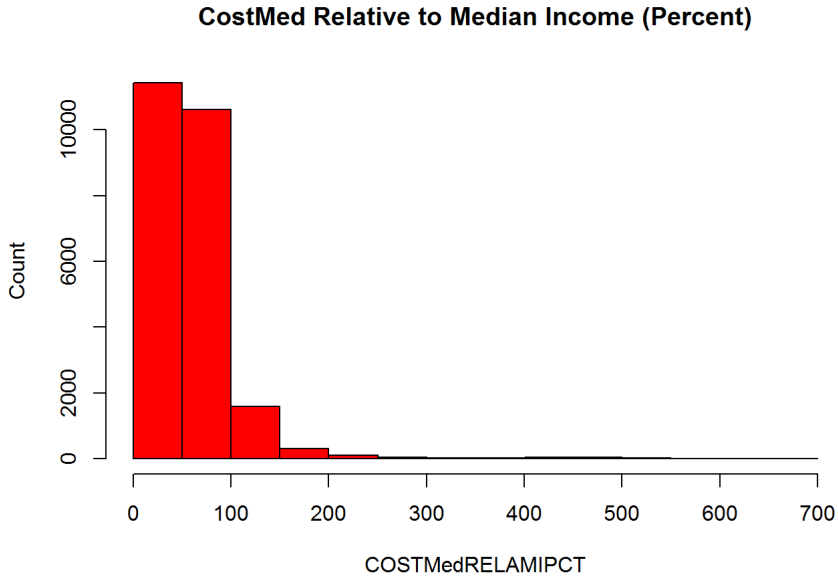

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COST12RELFMRPCT,xlab='FMTOWNRENT',ylab='COST12RELFMRPCT')
```



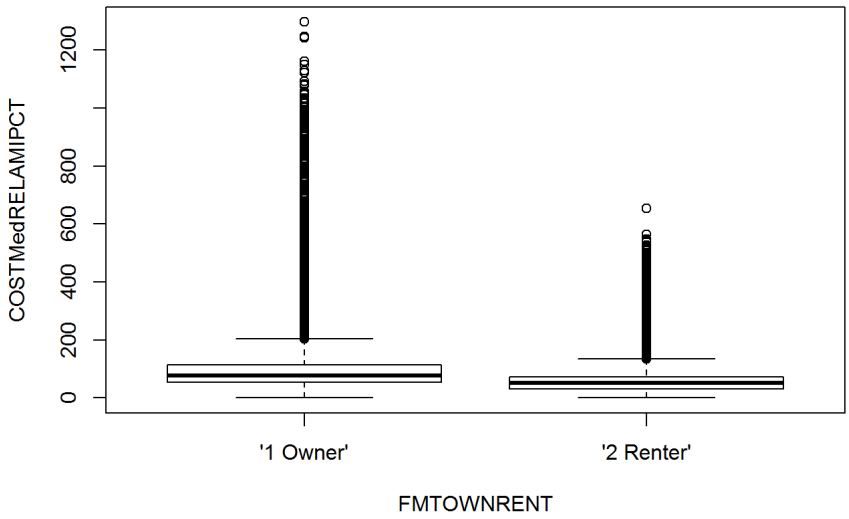

```
hist(hads2013n_c$COSTMedRELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'CostMed Relative to Median Income (Per
cent)', xlab='COSTMedRELAMIPCT', ylab='Count',col ='blue')
```



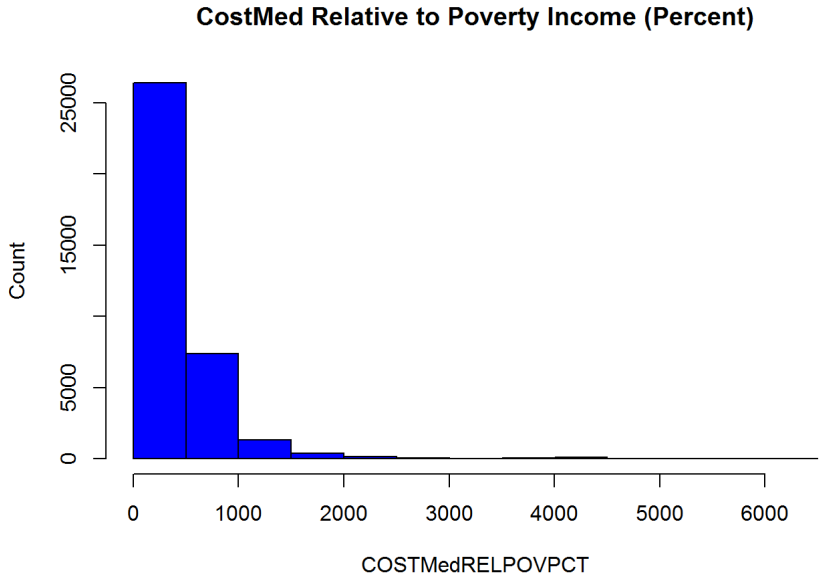

```
hist(hads2013n_c$COSTMedRELAMIPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'CostMed Relative to Median Income (Pe
rcent)', xlab='COSTMedRELAMIPCT', ylab='Count',col ='red')
```



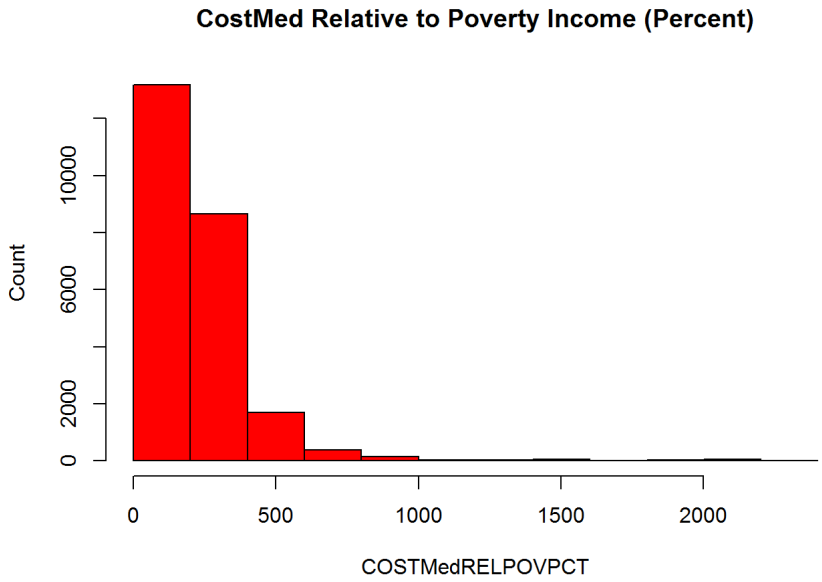

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COSTMedRELAMIPCT,xlab='FMTOWNRENT',ylab='COSTMedRELAMIPCT')
```



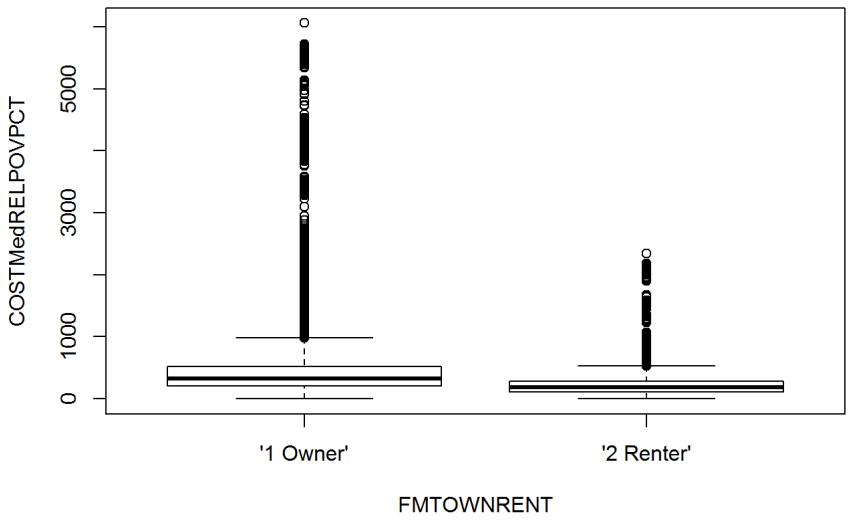

```
hist(hads2013n_c$COSTMedRELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'CostMed Relative to Poverty Income (Pe
rcent)', xlab='COSTMedRELPOVPCT', ylab='Count',col ='blue')
```



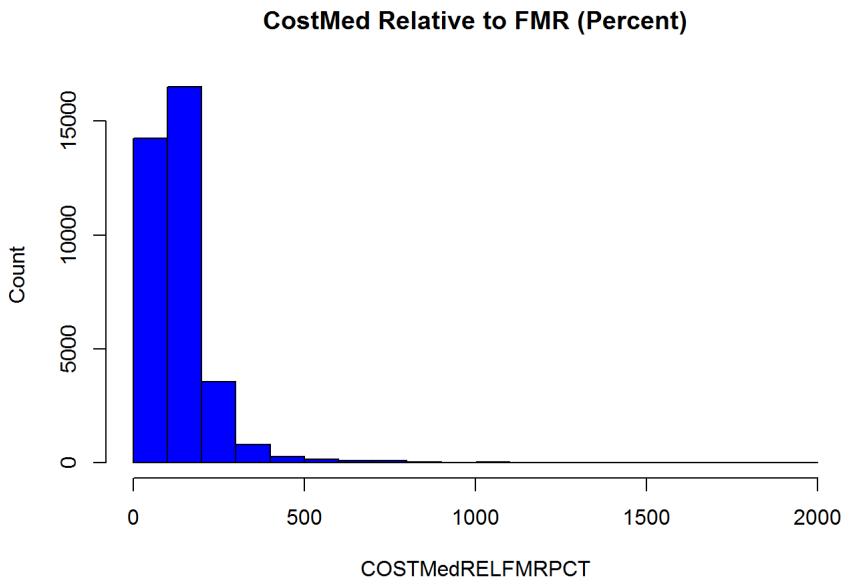

```
hist(hads2013n_c$COSTMedRELPOVPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'CostMed Relative to Poverty Income (P
ercent)', xlab='COSTMedRELPOVPCT', ylab='Count',col ='red')
```



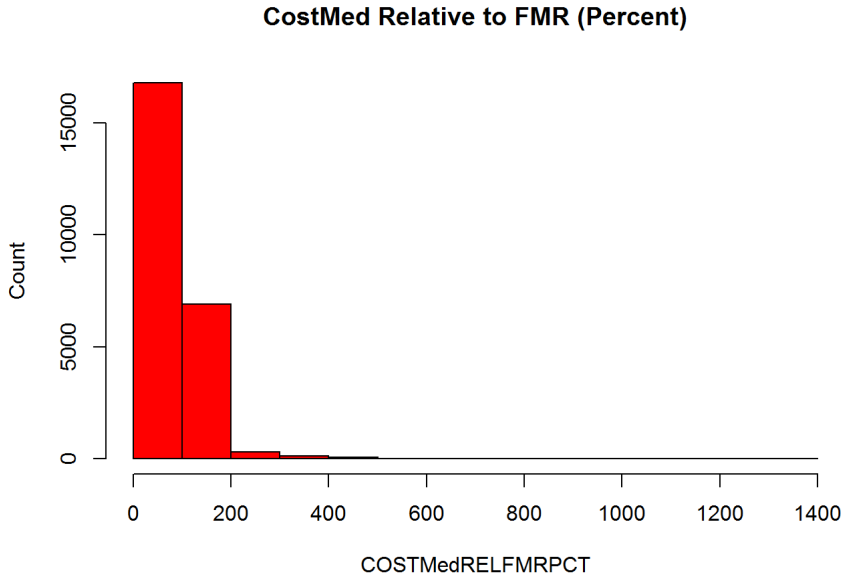

```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COSTMedRELPOVPCT,xlab='FMTOWNRENT',ylab='COSTMedRELPOVPCT')
```



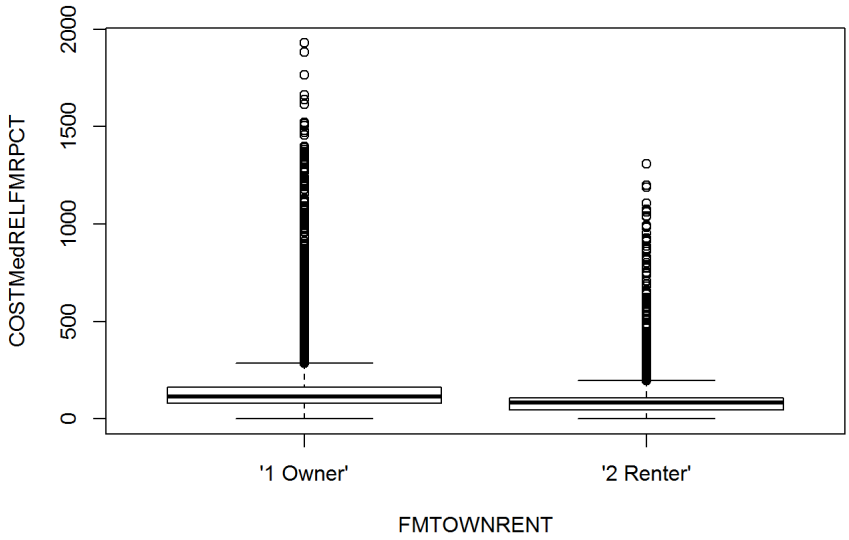

```
hist(hads2013n_c$COSTMedRELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'1 Owner'")],main= 'CostMed Relative to FMR (Percent)', xl
ab='COSTMedRELFMRPCT', ylab='Count',col ='blue')
```




```
hist(hads2013n_c$COSTMedRELFMRPCT[which(hads2013n_c$FMTOWNRENT =="'2 Renter'")],main= 'CostMed Relative to FMR (Percent)', x
lab='COSTMedRELFMRPCT', ylab='Count',col ='red')
```




```
plot(hads2013n_c$FMTOWNRENT,hads2013n_c$COSTMedRELFMRPCT,xlab='FMTOWNRENT',ylab='COSTMedRELFMRPCT')
```



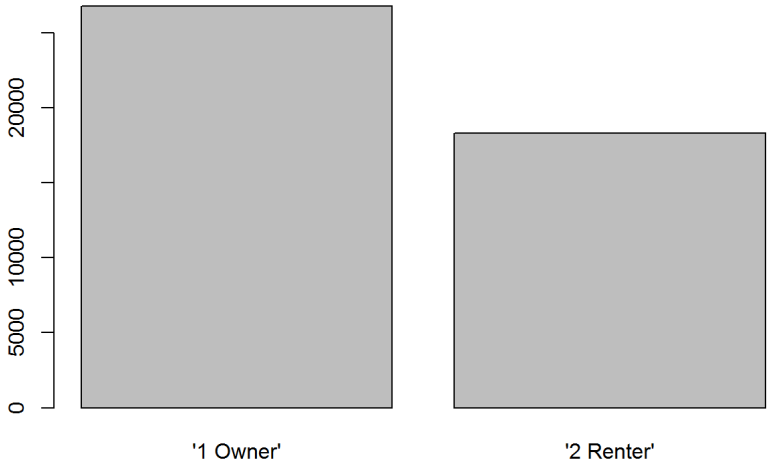
##from all the graphs above, remove

low significant attributes, ## atributes that contains excessive outlier

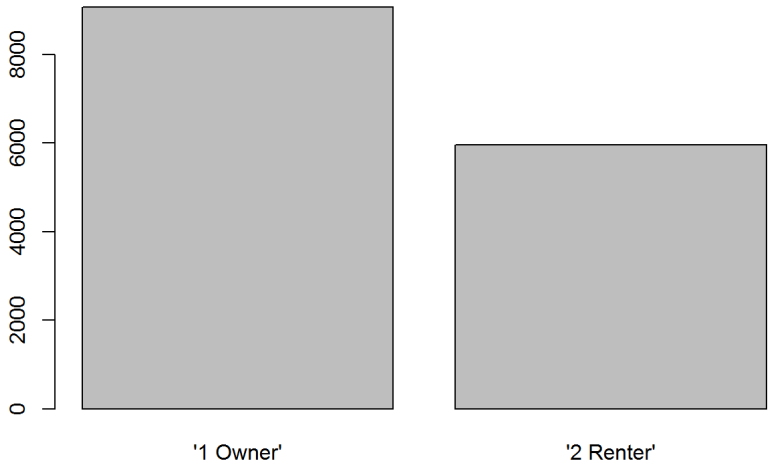
```
hads2013n_c <- subset(hads2013n_c,select = -c(REGION,FMTZADEQ,LMED, L30,L50,L80,IPOV,TYPE,NUNITS,ZINC2,OTHERCOST,COST06,COST
12,COST08,COSTMED,GL30,GL50,GL80,APLMED,
ABL50,BURDEN,INCRELAMIPCT,INCRELPOVPCT,INCRELFMRPCT,COST06RELAMIPCT,COST06RELPOVPCT,COST06RELFMRPCT,COST08RELAMIPCT,COST08RE
LPOVPCT,COST08RELFMRPCT,COST12RELAMIPCT,COST12RELPOVPCT,COST12RELFMRPCT,COSTMedRELAMIPCT,COSTMedRELPOVPCT,COSTMedRELFMRPCT))
```

Separate the dataset into 75% of training and 25%of testing

```
set.seed(888)
sample <- sample.int(n = nrow(hads2013n_c), size = floor(.75*nrow(hads2013n_c)), replace = F)
train <- hads2013n_c[sample, ]
test  <- hads2013n_c[-sample, ]
plot(train$FMTOWNRENT)
```




```
plot(test$FMTOWNRENT)
```



Start to do the logistic regression on the training dataset

run the glm

```
fullmod = glm(FMTOWNRENT ~ .,data=train,family=binomial(link = "logit"))
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
summary(fullmod)
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ ., family = binomial(link = "logit"),
##     data = train)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -4.1506   0.0000   0.0000   0.0464   3.7001
##
## Coefficients: (1 not defined because of singularities)
##                                          Estimate Std. Error z value
## (Intercept)                              9.604e+00  6.669e-01  14.401
## AGE1                                    -3.861e-02  2.358e-03 -16.375
## METRO3'2'                               -2.924e-03  9.481e-02  -0.031
## METRO3'3'                                1.174e-01  1.407e-01   0.834
## METRO3'4'                               -9.494e-02  1.698e-01  -0.559
## METRO3'5'                                1.363e-01  1.439e-01   0.947
## FMR                                      1.182e-03  2.667e-04   4.433
## ROOMS                                   -3.560e-01  4.106e-02  -8.670
## WEIGHT                                  -9.996e-05  3.105e-05  -3.219
## PER                                      2.163e-01  3.339e-02   6.476
## ZSMHC                                    3.184e-04  3.690e-05   8.629
## UTILITY                                 -5.940e-03  3.710e-04 -16.009
## TOTSAL                                  -2.418e-06  6.501e-07  -3.720
## GLMED                                   -6.353e-05  1.351e-05  -4.702
## ABL30                                   -2.435e-05  5.774e-05  -0.422
## ABL80                                   -3.543e-05  1.884e-05  -1.880
## ABLMED                                   5.240e-05  1.573e-05   3.332
## INCRELAMICAT                            -5.771e-02  4.999e-02  -1.154
## FMTBUILT'1940-1959'                     -2.656e-01  1.213e-01  -2.189
## FMTBUILT'1960-1979'                      4.990e-02  1.147e-01   0.435
## FMTBUILT'1980-1989'                      6.038e-02  1.375e-01   0.439
## FMTBUILT'1990-1999'                      1.680e-01  1.392e-01   1.207
## FMTBUILT'2000-2009'                      3.297e-01  1.398e-01   2.359
## FMTBUILT'After 2010'                    -1.101e-01  3.044e-01  -0.362
## FMTSTRUCTURETYPE'2 2-4 units'            1.576e+00  1.515e-01  10.403
## FMTSTRUCTURETYPE'3 5-19 units'           1.834e+00  1.646e-01  11.148
## FMTSTRUCTURETYPE'4 20-49 units'          1.845e+00  2.016e-01   9.149
## FMTSTRUCTURETYPE'5 50+ units'            1.628e+00  1.530e-01  10.643
## FMTSTRUCTURETYPE'6 Mobile Home'         -3.500e+00  1.356e-01 -25.812
## FMTBEDRMS'1 1BR'                        -8.758e-03  4.140e-01  -0.021
## FMTBEDRMS'2 2BR'                        -9.425e-01  4.487e-01  -2.101
## FMTBEDRMS'3 3BR'                        -1.572e+00  5.156e-01  -3.050
## FMTBEDRMS'4 4BR+'                       -1.600e+00  6.161e-01  -2.596
## FMTCOST06RELPOVCAT'2 100-150% Poverty'   1.323e+00  5.939e+03   0.000
## FMTCOST06RELPOVCAT'3 150-200% Poverty'   8.906e-01  6.625e+03   0.000
## FMTCOST06RELPOVCAT'4 200%+ Poverty'      2.810e+00  7.002e+03   0.000
## FMTCOST08RELPOVCAT'2 100-150% Poverty'   1.634e-01  5.750e+03   0.000
## FMTCOST08RELPOVCAT'3 150-200% Poverty'   1.224e+00  6.442e+03   0.000
## FMTCOST08RELPOVCAT'4 200%+ Poverty'      1.215e+00  6.764e+03   0.000
## FMTCOST12RELPOVCAT'2 100-150% Poverty'  -2.400e+01  3.919e+03  -0.006
## FMTCOST12RELPOVCAT'3 150-200% Poverty'  -4.768e+01  4.430e+03  -0.011
## FMTCOST12RELPOVCAT'4 200%+ Poverty'     -7.114e+01  4.621e+03  -0.015
## FMTCOSTMEDRELPOVCAT'2 100-150% Poverty'  2.327e+01  4.192e+03   0.006
## FMTCOSTMEDRELPOVCAT'3 150-200% Poverty'  4.717e+01  4.691e+03   0.010
## FMTCOSTMEDRELPOVCAT'4 200%+ Poverty'     6.822e+01  4.963e+03   0.014
## FMTINCRELPOVCAT'2 100-150% Poverty'     -1.296e-01  1.708e-01  -0.759
## FMTINCRELPOVCAT'3 150-200% Poverty'     -4.443e-02  2.150e-01  -0.207
## FMTINCRELPOVCAT'4 200%+ Poverty'        -1.057e-01  2.428e-01  -0.435
## FMTCOST06RELFMRCAT'2 50.1 - 100% FMR'    3.317e+00  4.060e+03   0.001
## FMTCOST06RELFMRCAT'3 GT FMR'             4.089e+00  4.321e+03   0.001
## FMTCOST08RELFMRCAT'2 50.1 - 100% FMR'   -1.961e+00  3.961e+03   0.000
## FMTCOST08RELFMRCAT'3 GT FMR'            -2.062e+00  4.190e+03   0.000
## FMTCOST12RELFMRCAT'2 50.1 - 100% FMR'   -2.268e+01  2.515e+03  -0.009
## FMTCOST12RELFMRCAT'3 GT FMR'            -3.991e+01  2.672e+03  -0.015
## FMTCOSTMEDRELFMRCAT'2 50.1 - 100% FMR'   2.137e+01  2.669e+03   0.008
## FMTCOSTMEDRELFMRCAT'3 GT FMR'            3.846e+01  2.873e+03   0.013
## FMTINCRELFMRCAT'2 50.1 - 100% FMR'      -1.008e-01  1.654e-01  -0.609
## FMTINCRELFMRCAT'3 GT FMR'               -4.723e-01  2.323e-01  -2.033
## FMTCOST06RELAMICAT'2 30 - 50% AMI'       1.464e+00  4.564e+03   0.000
## FMTCOST06RELAMICAT'3 50 - 60% AMI'       5.671e+00  4.985e+03   0.001
## FMTCOST06RELAMICAT'4 60 - 80% AMI'       7.861e+00  5.271e+03   0.001
## FMTCOST06RELAMICAT'5 80 - 100% AMI'      1.224e+01  5.505e+03   0.002
## FMTCOST06RELAMICAT'6 100 - 120% AMI'     4.619e+01  5.984e+03   0.008
## FMTCOST06RELAMICAT'7 120% AMI +'         4.523e+01  6.404e+03   0.007
## FMTCOST08RELAMICAT'2 30 - 50% AMI'       8.348e-03  4.365e+03   0.000
## FMTCOST08RELAMICAT'3 50 - 60% AMI'       2.287e+00  4.827e+03   0.000
## FMTCOST08RELAMICAT'4 60 - 80% AMI'       3.719e-01  5.073e+03   0.000
## FMTCOST08RELAMICAT'5 80 - 100% AMI'      1.797e+00  5.279e+03   0.000
## FMTCOST08RELAMICAT'6 100 - 120% AMI'     2.910e+00  5.464e+03   0.001
## FMTCOST08RELAMICAT'7 120% AMI +'        -2.078e+00  5.755e+03   0.000
## FMTCOST12RELAMICAT'2 30 - 50% AMI'      -2.301e+01  2.800e+03  -0.008
## FMTCOST12RELAMICAT'3 50 - 60% AMI'      -4.715e+01  3.156e+03  -0.015
## FMTCOST12RELAMICAT'4 60 - 80% AMI'      -6.984e+01  3.310e+03  -0.021
## FMTCOST12RELAMICAT'5 80 - 100% AMI'     -9.563e+01  3.436e+03  -0.028
## FMTCOST12RELAMICAT'6 100 - 120% AMI'    -1.206e+02  3.528e+03  -0.034
```

```
## FMTCOST12RELAMICAT'7 120% AMI +'        -1.590e+02  3.796e+03  -0.042
## FMTCOSTMEDRELAMICAT'2 30 - 50% AMI'      2.201e+01  3.101e+03   0.007
## FMTCOSTMEDRELAMICAT'3 50 - 60% AMI'      4.221e+01  3.393e+03   0.012
## FMTCOSTMEDRELAMICAT'4 60 - 80% AMI'      6.396e+01  3.606e+03   0.018
## FMTCOSTMEDRELAMICAT'5 80 - 100% AMI'     8.458e+01  3.774e+03   0.022
## FMTCOSTMEDRELAMICAT'6 100 - 120% AMI'    8.932e+01  4.213e+03   0.021
## FMTCOSTMEDRELAMICAT'7 120% AMI +'        1.101e+02  4.573e+03   0.024
## FMTINCRELAMICAT'2 30 - 50% AMI'         -2.807e-01  1.600e-01  -1.755
## FMTINCRELAMICAT'3 50 - 60% AMI'         -6.720e-02  2.089e-01  -0.322
## FMTINCRELAMICAT'4 60 - 80% AMI'         -1.558e-01  1.686e-01  -0.924
## FMTINCRELAMICAT'5 80 - 100% AMI'         1.337e-01  1.713e-01   0.780
## FMTINCRELAMICAT'6 100 - 120% AMI'       -5.471e-02  1.462e-01  -0.374
## FMTINCRELAMICAT'7 120% AMI +'                   NA         NA      NA
## FMTBURDEN'2 30% to 50%'                 -1.344e-01  1.082e-01  -1.242
## FMTBURDEN'3 50% or More'                 5.949e-02  1.329e-01   0.448
## FMTBURDEN'4 No Income'                  -6.130e-01  2.367e-01  -2.590
##                                         Pr(>|z|)
## (Intercept)                              < 2e-16 ***
## AGE1                                     < 2e-16 ***
## METRO3'2'                               0.975398
## METRO3'3'                               0.404093
## METRO3'4'                               0.576160
## METRO3'5'                               0.343403
## FMR                                     9.31e-06 ***
## ROOMS                                    < 2e-16 ***
## WEIGHT                                  0.001287 **
## PER                                     9.40e-11 ***
## ZSMHC                                    < 2e-16 ***
## UTILITY                                  < 2e-16 ***
## TOTSAL                                  0.000200 ***
## GLMED                                   2.58e-06 ***
## ABL30                                   0.673249
## ABL80                                   0.060059 .
## ABLMED                                  0.000862 ***
## INCRELAMICAT                            0.248323
## FMTBUILT'1940-1959'                     0.028565 *
## FMTBUILT'1960-1979'                     0.663515
## FMTBUILT'1980-1989'                     0.660606
## FMTBUILT'1990-1999'                     0.227270
## FMTBUILT'2000-2009'                     0.018348 *
## FMTBUILT'After 2010'                    0.717527
## FMTSTRUCTURETYPE'2 2-4 units'            < 2e-16 ***
## FMTSTRUCTURETYPE'3 5-19 units'           < 2e-16 ***
## FMTSTRUCTURETYPE'4 20-49 units'          < 2e-16 ***
## FMTSTRUCTURETYPE'5 50+ units'            < 2e-16 ***
## FMTSTRUCTURETYPE'6 Mobile Home'          < 2e-16 ***
## FMTBEDRMS'1 1BR'                        0.983120
## FMTBEDRMS'2 2BR'                        0.035660 *
## FMTBEDRMS'3 3BR'                        0.002291 **
## FMTBEDRMS'4 4BR+'                       0.009419 **
## FMTCOST06RELPOVCAT'2 100-150% Poverty'  0.999822
## FMTCOST06RELPOVCAT'3 150-200% Poverty'  0.999893
## FMTCOST06RELPOVCAT'4 200%+ Poverty'     0.999680
## FMTCOST08RELPOVCAT'2 100-150% Poverty'  0.999977
## FMTCOST08RELPOVCAT'3 150-200% Poverty'  0.999848
## FMTCOST08RELPOVCAT'4 200%+ Poverty'     0.999857
## FMTCOST12RELPOVCAT'2 100-150% Poverty'  0.995114
## FMTCOST12RELPOVCAT'3 150-200% Poverty'  0.991412
## FMTCOST12RELPOVCAT'4 200%+ Poverty'     0.987718
## FMTCOSTMEDRELPOVCAT'2 100-150% Poverty' 0.995571
## FMTCOSTMEDRELPOVCAT'3 150-200% Poverty' 0.991978
## FMTCOSTMEDRELPOVCAT'4 200%+ Poverty'    0.989034
## FMTINCRELPOVCAT'2 100-150% Poverty'     0.447855
## FMTINCRELPOVCAT'3 150-200% Poverty'     0.836328
## FMTINCRELPOVCAT'4 200%+ Poverty'        0.663220
## FMTCOST06RELFMRCAT'2 50.1 - 100% FMR'   0.999348
## FMTCOST06RELFMRCAT'3 GT FMR'            0.999245
## FMTCOST08RELFMRCAT'2 50.1 - 100% FMR'   0.999605
## FMTCOST08RELFMRCAT'3 GT FMR'            0.999607
## FMTCOST12RELFMRCAT'2 50.1 - 100% FMR'   0.992804
## FMTCOST12RELFMRCAT'3 GT FMR'            0.988082
## FMTCOSTMEDRELFMRCAT'2 50.1 - 100% FMR'  0.993612
## FMTCOSTMEDRELFMRCAT'3 GT FMR'           0.989322
## FMTINCRELFMRCAT'2 50.1 - 100% FMR'      0.542235
## FMTINCRELFMRCAT'3 GT FMR'               0.042010 *
## FMTCOST06RELAMICAT'2 30 - 50% AMI'      0.999744
## FMTCOST06RELAMICAT'3 50 - 60% AMI'      0.999092
## FMTCOST06RELAMICAT'4 60 - 80% AMI'      0.998810
## FMTCOST06RELAMICAT'5 80 - 100% AMI'     0.998225
## FMTCOST06RELAMICAT'6 100 - 120% AMI'    0.993842
## FMTCOST06RELAMICAT'7 120% AMI +'        0.994365
## FMTCOST08RELAMICAT'2 30 - 50% AMI'      0.999998
## FMTCOST08RELAMICAT'3 50 - 60% AMI'      0.999622
## FMTCOST08RELAMICAT'4 60 - 80% AMI'      0.999942
## FMTCOST08RELAMICAT'5 80 - 100% AMI'     0.999728
## FMTCOST08RELAMICAT'6 100 - 120% AMI'    0.999575
## FMTCOST08RELAMICAT'7 120% AMI +'        0.999712
```

```
## FMTCOST12RELAMICAT'2 30 - 50% AMI'      0.993443
## FMTCOST12RELAMICAT'3 50 - 60% AMI'      0.988078
## FMTCOST12RELAMICAT'4 60 - 80% AMI'      0.983170
## FMTCOST12RELAMICAT'5 80 - 100% AMI'     0.977797
## FMTCOST12RELAMICAT'6 100 - 120% AMI'    0.972736
## FMTCOST12RELAMICAT'7 120% AMI +'        0.966590
## FMTCOSTMEDRELAMICAT'2 30 - 50% AMI'     0.994336
## FMTCOSTMEDRELAMICAT'3 50 - 60% AMI'     0.990074
## FMTCOSTMEDRELAMICAT'4 60 - 80% AMI'     0.985848
## FMTCOSTMEDRELAMICAT'5 80 - 100% AMI'    0.982118
## FMTCOSTMEDRELAMICAT'6 100 - 120% AMI'   0.983086
## FMTCOSTMEDRELAMICAT'7 120% AMI +'       0.980786
## FMTINCRELAMICAT'2 30 - 50% AMI'         0.079332 .
## FMTINCRELAMICAT'3 50 - 60% AMI'         0.747708
## FMTINCRELAMICAT'4 60 - 80% AMI'         0.355447
## FMTINCRELAMICAT'5 80 - 100% AMI'        0.435234
## FMTINCRELAMICAT'6 100 - 120% AMI'       0.708215
## FMTINCRELAMICAT'7 120% AMI +'                 NA
## FMTBURDEN'2 30% to 50%'                 0.214195
## FMTBURDEN'3 50% or More'                0.654380
## FMTBURDEN'4 No Income'                  0.009611 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 60874.2  on 45071  degrees of freedom
## Residual deviance:  5917.5  on 44982  degrees of freedom
## AIC: 6097.5
##
## Number of Fisher Scoring iterations: 22
```

```
#AIC 6097.5

## check the summary and notice lots of variance are significant
## and create reduce model by remove all non-significant variables
redmod = glm(FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
    UTILITY + TOTSAL + GLMED + ABL80 + ABLMED + FMTINCRELAMICAT + FMTBURDEN,family=binomial(link = "logit"),data=train)
summary(redmod)
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER +
##     ZSMHC + UTILITY + TOTSAL + GLMED + ABL80 + ABLMED + FMTINCRELAMICAT +
##     FMTBURDEN, family = binomial(link = "logit"), data = train)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -3.3290  -0.5621  -0.1848   0.4922   4.5650
##
## Coefficients:
##                                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)                       6.621e+00  1.730e-01  38.275  < 2e-16
## AGE1                             -4.962e-02  9.477e-04 -52.358  < 2e-16
## FMR                               7.564e-04  8.910e-05   8.489  < 2e-16
## ROOMS                            -4.311e-01  1.752e-02 -24.604  < 2e-16
## WEIGHT                           -2.853e-04  1.291e-05 -22.090  < 2e-16
## PER                               2.488e-01  1.156e-02  21.525  < 2e-16
## ZSMHC                            -4.896e-05  2.419e-05  -2.024    0.043
## UTILITY                          -7.143e-03  1.717e-04 -41.602  < 2e-16
## TOTSAL                           -1.984e-06  4.150e-07  -4.782 1.74e-06
## GLMED                             5.729e-05  3.144e-06  18.220  < 2e-16
## ABL80                            -3.141e-06  4.706e-06  -0.667    0.504
## ABLMED                           -7.067e-05  3.916e-06 -18.047  < 2e-16
## FMTINCRELAMICAT'2 30 - 50% AMI'  -5.212e-01  5.157e-02 -10.107  < 2e-16
## FMTINCRELAMICAT'3 50 - 60% AMI'  -6.985e-01  6.714e-02 -10.404  < 2e-16
## FMTINCRELAMICAT'4 60 - 80% AMI'  -8.216e-01  6.277e-02 -13.088  < 2e-16
## FMTINCRELAMICAT'5 80 - 100% AMI' -9.562e-01  6.870e-02 -13.917  < 2e-16
## FMTINCRELAMICAT'6 100 - 120% AMI' -1.146e+00  7.178e-02 -15.962  < 2e-16
## FMTINCRELAMICAT'7 120% AMI +'    -1.467e+00  7.107e-02 -20.636  < 2e-16
## FMTBURDEN'2 30% to 50%'           3.066e-01  4.276e-02   7.170 7.49e-13
## FMTBURDEN'3 50% or More'          2.243e-01  5.704e-02   3.932 8.43e-05
## FMTBURDEN'4 No Income'           -5.139e-01  1.056e-01  -4.866 1.14e-06
##
## (Intercept)                      ***
## AGE1                             ***
## FMR                              ***
## ROOMS                            ***
## WEIGHT                           ***
## PER                              ***
## ZSMHC                            *
## UTILITY                          ***
## TOTSAL                           ***
## GLMED                            ***
## ABL80
## ABLMED                           ***
## FMTINCRELAMICAT'2 30 - 50% AMI'  ***
## FMTINCRELAMICAT'3 50 - 60% AMI'  ***
## FMTINCRELAMICAT'4 60 - 80% AMI'  ***
## FMTINCRELAMICAT'5 80 - 100% AMI' ***
## FMTINCRELAMICAT'6 100 - 120% AMI' ***
## FMTINCRELAMICAT'7 120% AMI +'    ***
## FMTBURDEN'2 30% to 50%'          ***
## FMTBURDEN'3 50% or More'         ***
## FMTBURDEN'4 No Income'           ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 60874  on 45071  degrees of freedom
## Residual deviance: 33444  on 45051  degrees of freedom
## AIC: 33486
##
## Number of Fisher Scoring iterations: 6
```

```
#AIC 33486

## go back and use backstep on fullmod
## #stepwise selection method is applying in next step.
backwards = step(fullmod) #backwards stepwise selection
```

```
## Start:  AIC=6097.53
## FMTOWNRENT ~ AGE1 + METRO3 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
##     UTILITY + TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + INCRELAMICAT +
##     FMTBUILT + FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST06RELPOVCAT +
##     FMTCOST08RELPOVCAT + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT +
##     FMTINCRELPOVCAT + FMTCOST06RELFMRCAT + FMTCOST08RELFMRCAT +
##     FMTCOST12RELFMRCAT + FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT +
##     FMTCOST06RELAMICAT + FMTCOST08RELAMICAT + FMTCOST12RELAMICAT +
##     FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6097.53
## FMTOWNRENT ~ AGE1 + METRO3 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
##     UTILITY + TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT +
##     FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST06RELPOVCAT + FMTCOST08RELPOVCAT +
##     FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTINCRELPOVCAT +
##     FMTCOST06RELFMRCAT + FMTCOST08RELFMRCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST06RELAMICAT +
##     FMTCOST08RELAMICAT + FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT +
##     FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance    AIC
## - FMTCOST08RELAMICAT   6   5917.5 6085.5
## - FMTCOST06RELAMICAT   6   5917.5 6085.5
## - FMTCOST08RELPOVCAT   3   5917.5 6091.5
## - FMTCOST06RELPOVCAT   3   5917.5 6091.5
## - METRO3               4   5920.1 6092.1
## - FMTINCRELPOVCAT      3   5918.3 6092.3
## - FMTINCRELAMICAT      6   5924.3 6092.3
## - FMTCOST06RELFMRCAT   2   5917.5 6093.5
## - FMTCOST08RELFMRCAT   2   5917.5 6093.5
## - ABL30                1   5917.7 6095.7
## <none>                     5917.5 6097.5
## - ABL80                1   5921.1 6099.1
## - FMTINCRELFMRCAT      2   5923.5 6099.5
## - FMTBURDEN            3   5928.1 6102.1
## - FMTBUILT             6   5937.5 6105.5
## - WEIGHT               1   5928.1 6106.1
## - ABLMED               1   5928.6 6106.6
## - TOTSAL               1   5931.8 6109.8
## - FMR                  1   5937.0 6115.0
## - GLMED                1   5939.5 6117.5
## - PER                  1   5959.8 6137.8
## - FMTBEDRMS            4   5968.7 6140.7
## - FMTCOSTMEDRELFMRCAT  2   5971.0 6147.0
## - ZSMHC                1   5990.2 6168.2
## - ROOMS                1   5995.3 6173.3
## - FMTCOST12RELFMRCAT   2   6022.0 6198.0
## - FMTCOSTMEDRELPOVCAT  3   6160.3 6334.3
## - AGE1                 1   6202.7 6380.7
## - UTILITY              1   6205.5 6383.5
## - FMTCOSTMEDRELAMICAT  6   6238.3 6406.3
## - FMTCOST12RELPOVCAT   3   6648.9 6822.9
## - FMTSTRUCTURETYPE     5   7194.3 7364.3
## - FMTCOST12RELAMICAT   6   8517.2 8685.2
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6085.53
## FMTOWNRENT ~ AGE1 + METRO3 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
##     UTILITY + TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT +
##     FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST06RELPOVCAT + FMTCOST08RELPOVCAT +
##     FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTINCRELPOVCAT +
##     FMTCOST06RELFMRCAT + FMTCOST08RELFMRCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST06RELAMICAT +
##     FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT +
##     FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - FMTCOST06RELAMICAT   6   5917.5  6073.5
## - FMTCOST08RELPOVCAT   3   5917.5  6079.5
## - FMTCOST06RELPOVCAT   3   5917.5  6079.5
## - METRO3               4   5920.1  6080.1
## - FMTINCRELPOVCAT      3   5918.3  6080.3
## - FMTINCRELAMICAT      6   5924.3  6080.3
## - FMTCOST06RELFMRCAT   2   5917.5  6081.5
## - FMTCOST08RELFMRCAT   2   5917.5  6081.5
## - ABL30                1   5917.7  6083.7
## <none>                     5917.5  6085.5
## - ABL80                1   5921.1  6087.1
## - FMTINCRELFMRCAT      2   5923.5  6087.5
## - FMTBURDEN            3   5928.1  6090.1
## - FMTBUILT             6   5937.5  6093.5
## - WEIGHT               1   5928.1  6094.1
## - ABLMED               1   5928.6  6094.6
## - TOTSAL               1   5931.8  6097.8
## - FMR                  1   5937.0  6103.0
## - GLMED                1   5939.5  6105.5
## - PER                  1   5959.8  6125.8
## - FMTBEDRMS            4   5968.7  6128.7
## - FMTCOSTMEDRELFMRCAT  2   5971.0  6135.0
## - ZSMHC                1   5990.2  6156.2
## - ROOMS                1   5995.3  6161.3
## - FMTCOST12RELFMRCAT   2   6022.0  6186.0
## - FMTCOSTMEDRELPOVCAT  3   6160.3  6322.3
## - AGE1                 1   6202.7  6368.7
## - UTILITY              1   6205.5  6371.5
## - FMTCOSTMEDRELAMICAT  6   6238.3  6394.3
## - FMTCOST12RELPOVCAT   3   6648.9  6810.9
## - FMTSTRUCTURETYPE     5   7194.3  7352.3
## - FMTCOST12RELAMICAT   6  13494.6 13650.6
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6073.53
## FMTOWNRENT ~ AGE1 + METRO3 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
##     UTILITY + TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT +
##     FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST06RELPOVCAT + FMTCOST08RELPOVCAT +
##     FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTINCRELPOVCAT +
##     FMTCOST06RELFMRCAT + FMTCOST08RELFMRCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST12RELAMICAT +
##     FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - FMTCOST08RELPOVCAT   3   5917.5  6067.5
## - FMTCOST06RELPOVCAT   3   5917.5  6067.5
## - METRO3               4   5920.1  6068.1
## - FMTINCRELPOVCAT      3   5918.3  6068.3
## - FMTINCRELAMICAT      6   5924.3  6068.3
## - FMTCOST06RELFMRCAT   2   5917.5  6069.5
## - FMTCOST08RELFMRCAT   2   5917.5  6069.5
## - ABL30                1   5917.7  6071.7
## <none>                     5917.5  6073.5
## - ABL80                1   5921.1  6075.1
## - FMTINCRELFMRCAT      2   5923.5  6075.5
## - FMTBURDEN            3   5928.1  6078.1
## - FMTBUILT             6   5937.5  6081.5
## - WEIGHT               1   5928.1  6082.1
## - ABLMED               1   5928.6  6082.6
## - TOTSAL               1   5931.8  6085.8
## - FMR                  1   5937.0  6091.0
## - GLMED                1   5939.5  6093.5
## - PER                  1   5959.8  6113.8
## - FMTBEDRMS            4   5968.7  6116.7
## - FMTCOSTMEDRELFMRCAT  2   5971.0  6123.0
## - ZSMHC                1   5990.2  6144.2
## - ROOMS                1   5995.3  6149.3
## - FMTCOST12RELFMRCAT   2   6022.0  6174.0
## - FMTCOSTMEDRELPOVCAT  3   6160.3  6310.3
## - AGE1                 1   6202.7  6356.7
## - UTILITY              1   6205.5  6359.5
## - FMTCOST12RELPOVCAT   3   6648.9  6798.9
## - FMTSTRUCTURETYPE     5   7194.3  7340.3
## - FMTCOSTMEDRELAMICAT  6  10830.8 10974.8
## - FMTCOST12RELAMICAT   6  15920.6 16064.6
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6067.53
## FMTOWNRENT ~ AGE1 + METRO3 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
##     UTILITY + TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT +
##     FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST06RELPOVCAT + FMTCOST12RELPOVCAT +
##     FMTCOSTMEDRELPOVCAT + FMTINCRELPOVCAT + FMTCOST06RELFMRCAT +
##     FMTCOST08RELFMRCAT + FMTCOST12RELFMRCAT + FMTCOSTMEDRELFMRCAT +
##     FMTINCRELFMRCAT + FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT +
##     FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - FMTCOST06RELPOVCAT   3   5917.5  6061.5
## - METRO3               4   5920.1  6062.1
## - FMTINCRELPOVCAT      3   5918.3  6062.3
## - FMTINCRELAMICAT      6   5924.3  6062.3
## - FMTCOST06RELFMRCAT   2   5917.5  6063.5
## - FMTCOST08RELFMRCAT   2   5917.5  6063.5
## - ABL30                1   5917.7  6065.7
## <none>                     5917.5  6067.5
## - ABL80                1   5921.1  6069.1
## - FMTINCRELFMRCAT      2   5923.5  6069.5
## - FMTBURDEN            3   5928.1  6072.1
## - FMTBUILT             6   5937.5  6075.5
## - WEIGHT               1   5928.1  6076.1
## - ABLMED               1   5928.6  6076.6
## - TOTSAL               1   5931.8  6079.8
## - FMR                  1   5937.0  6085.0
## - GLMED                1   5939.5  6087.5
## - PER                  1   5959.8  6107.8
## - FMTBEDRMS            4   5968.7  6110.7
## - FMTCOSTMEDRELFMRCAT  2   5971.0  6117.0
## - ZSMHC                1   5990.2  6138.2
## - ROOMS                1   5995.3  6143.3
## - FMTCOST12RELFMRCAT   2   6022.0  6168.0
## - FMTCOSTMEDRELPOVCAT  3   6160.3  6304.3
## - AGE1                 1   6202.7  6350.7
## - UTILITY              1   6205.5  6353.5
## - FMTCOST12RELPOVCAT   3   6987.3  7131.3
## - FMTSTRUCTURETYPE     5   7194.3  7334.3
## - FMTCOSTMEDRELAMICAT  6  10830.8 10968.8
## - FMTCOST12RELAMICAT   6  15920.6 16058.6
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6061.53
## FMTOWNRENT ~ AGE1 + METRO3 + FMR + ROOMS + WEIGHT + PER + ZSMHC +
##     UTILITY + TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT +
##     FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT +
##     FMTINCRELPOVCAT + FMTCOST06RELFMRCAT + FMTCOST08RELFMRCAT +
##     FMTCOST12RELFMRCAT + FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT +
##     FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT +
##     FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - METRO3               4   5920.1  6056.1
## - FMTINCRELPOVCAT      3   5918.3  6056.3
## - FMTINCRELAMICAT      6   5924.3  6056.3
## - FMTCOST06RELFMRCAT   2   5917.5  6057.5
## - FMTCOST08RELFMRCAT   2   5917.5  6057.5
## - ABL30                1   5917.7  6059.7
## <none>                     5917.5  6061.5
## - ABL80                1   5921.1  6063.1
## - FMTINCRELFMRCAT      2   5923.5  6063.5
## - FMTBURDEN            3   5928.1  6066.1
## - FMTBUILT             6   5937.5  6069.5
## - WEIGHT               1   5928.1  6070.1
## - ABLMED               1   5928.6  6070.6
## - TOTSAL               1   5931.8  6073.8
## - FMR                  1   5937.0  6079.0
## - GLMED                1   5939.5  6081.5
## - PER                  1   5959.8  6101.8
## - FMTBEDRMS            4   5968.7  6104.7
## - FMTCOSTMEDRELFMRCAT  2   5971.0  6111.0
## - ZSMHC                1   5990.2  6132.2
## - ROOMS                1   5995.3  6137.3
## - FMTCOST12RELFMRCAT   2   6022.0  6162.0
## - AGE1                 1   6202.7  6344.7
## - UTILITY              1   6205.5  6347.5
## - FMTCOST12RELPOVCAT   3   7167.6  7305.6
## - FMTSTRUCTURETYPE     5   7194.3  7328.3
## - FMTCOSTMEDRELPOVCAT  3   7338.9  7476.9
## - FMTCOSTMEDRELAMICAT  6  10830.8 10962.8
## - FMTCOST12RELAMICAT   6  15920.6 16052.6
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6056.11
## FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC + UTILITY +
##     TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT + FMTSTRUCTURETYPE +
##     FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTINCRELPOVCAT +
##     FMTCOST06RELFMRCAT + FMTCOST08RELFMRCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST12RELAMICAT +
##     FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - FMTINCRELPOVCAT      3   5920.9  6050.9
## - FMTINCRELAMICAT      6   5926.9  6050.9
## - FMTCOST06RELFMRCAT   2   5920.1  6052.1
## - FMTCOST08RELFMRCAT   2   5920.1  6052.1
## - ABL30                1   5920.2  6054.2
## <none>                     5920.1  6056.1
## - FMTINCRELFMRCAT      2   5926.2  6058.2
## - ABL80                1   5924.4  6058.4
## - FMTBURDEN            3   5930.6  6060.6
## - WEIGHT               1   5929.4  6063.4
## - FMTBUILT             6   5940.9  6064.9
## - ABLMED               1   5930.9  6064.9
## - TOTSAL               1   5934.4  6068.4
## - FMR                  1   5938.8  6072.8
## - GLMED                1   5942.5  6076.5
## - PER                  1   5962.6  6096.6
## - FMTBEDRMS            4   5970.7  6098.7
## - FMTCOSTMEDRELFMRCAT  2   5973.6  6105.6
## - ZSMHC                1   5992.8  6126.8
## - ROOMS                1   5997.6  6131.6
## - FMTCOST12RELFMRCAT   2   6024.4  6156.4
## - AGE1                 1   6206.1  6340.1
## - UTILITY              1   6209.9  6343.9
## - FMTCOST12RELPOVCAT   3   7173.9  7303.9
## - FMTSTRUCTURETYPE     5   7284.7  7410.7
## - FMTCOSTMEDRELPOVCAT  3   7343.3  7473.3
## - FMTCOSTMEDRELAMICAT  6  10848.4 10972.4
## - FMTCOST12RELAMICAT   6  15973.0 16097.0
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6050.87
## FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC + UTILITY +
##     TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT + FMTSTRUCTURETYPE +
##     FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTCOST06RELFMRCAT +
##     FMTCOST08RELFMRCAT + FMTCOST12RELFMRCAT + FMTCOSTMEDRELFMRCAT +
##     FMTINCRELFMRCAT + FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT +
##     FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - FMTCOST06RELFMRCAT   2   5920.9  6046.9
## - FMTCOST08RELFMRCAT   2   5920.9  6046.9
## - FMTINCRELAMICAT      6   5930.2  6048.2
## - ABL30                1   5921.0  6049.0
## <none>                     5920.9  6050.9
## - ABL80                1   5925.2  6053.2
## - FMTINCRELFMRCAT      2   5928.1  6054.1
## - FMTBURDEN            3   5931.2  6055.2
## - WEIGHT               1   5930.2  6058.2
## - FMTBUILT             6   5941.5  6059.5
## - ABLMED               1   5931.8  6059.8
## - TOTSAL               1   5935.1  6063.1
## - FMR                  1   5939.5  6067.5
## - GLMED                1   5943.4  6071.4
## - FMTBEDRMS            4   5971.4  6093.4
## - PER                  1   5968.0  6096.0
## - FMTCOSTMEDRELFMRCAT  2   5974.5  6100.5
## - ZSMHC                1   5993.9  6121.9
## - ROOMS                1   5998.3  6126.3
## - FMTCOST12RELFMRCAT   2   6025.3  6151.3
## - UTILITY              1   6211.0  6339.0
## - AGE1                 1   6212.3  6340.3
## - FMTCOST12RELPOVCAT   3   7182.5  7306.5
## - FMTSTRUCTURETYPE     5   7287.0  7407.0
## - FMTCOSTMEDRELPOVCAT  3   7347.0  7471.0
## - FMTCOSTMEDRELAMICAT  6  10855.5 10973.5
## - FMTCOST12RELAMICAT   6  15986.7 16104.7
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6046.87
## FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC + UTILITY +
##     TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT + FMTSTRUCTURETYPE +
##     FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTCOST08RELFMRCAT +
##     FMTCOST12RELFMRCAT + FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT +
##     FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT +
##     FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                        Df Deviance     AIC
## - FMTCOST08RELFMRCAT   2   5920.9  6042.9
## - FMTINCRELAMICAT      6   5930.2  6044.2
## - ABL30                1   5921.0  6045.0
## <none>                     5920.9  6046.9
## - ABL80                1   5925.2  6049.2
## - FMTINCRELFMRCAT      2   5928.1  6050.1
## - FMTBURDEN            3   5931.2  6051.2
## - WEIGHT               1   5930.2  6054.2
## - FMTBUILT             6   5941.5  6055.5
## - ABLMED               1   5931.8  6055.8
## - TOTSAL               1   5935.1  6059.1
## - FMR                  1   5939.5  6063.5
## - GLMED                1   5943.4  6067.4
## - FMTBEDRMS            4   5971.4  6089.4
## - PER                  1   5968.0  6092.0
## - ZSMHC                1   5993.9  6117.9
## - ROOMS                1   5998.3  6122.3
## - FMTCOST12RELFMRCAT   2   6025.3  6147.3
## - FMTCOSTMEDRELFMRCAT  2   6070.1  6192.1
## - UTILITY              1   6211.0  6335.0
## - AGE1                 1   6212.3  6336.3
## - FMTCOST12RELPOVCAT   3   7182.5  7302.5
## - FMTSTRUCTURETYPE     5   7287.0  7403.0
## - FMTCOSTMEDRELPOVCAT  3   7347.0  7467.0
## - FMTCOSTMEDRELAMICAT  6  10855.5 10969.5
## - FMTCOST12RELAMICAT   6  15986.7 16100.7
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6042.87
## FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC + UTILITY +
##     TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT + FMTSTRUCTURETYPE +
##     FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST12RELAMICAT +
##     FMTCOSTMEDRELAMICAT + FMTINCRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## - FMTINCRELAMICAT      6   5930.2  6040.2
## - ABL30                1   5921.0  6041.0
## <none>                     5920.9  6042.9
## - ABL80                1   5925.2  6045.2
## - FMTINCRELFMRCAT      2   5928.1  6046.1
## - FMTBURDEN            3   5931.2  6047.2
## - WEIGHT               1   5930.2  6050.2
## - FMTBUILT             6   5941.5  6051.5
## - ABLMED               1   5931.8  6051.8
## - TOTSAL               1   5935.1  6055.1
## - FMR                  1   5939.5  6059.5
## - GLMED                1   5943.4  6063.4
## - FMTBEDRMS            4   5971.4  6085.4
## - PER                  1   5968.0  6088.0
## - ZSMHC                1   5993.9  6113.9
## - ROOMS                1   5998.3  6118.3
## - FMTCOST12RELFMRCAT   2   6134.6  6252.6
## - FMTCOSTMEDRELFMRCAT  2   6169.4  6287.4
## - UTILITY              1   6211.0  6331.0
## - AGE1                 1   6212.3  6332.3
## - FMTCOST12RELPOVCAT   3   7182.5  7298.5
## - FMTSTRUCTURETYPE     5   7287.0  7399.0
## - FMTCOSTMEDRELPOVCAT  3   7347.0  7463.0
## - FMTCOSTMEDRELAMICAT  6  10855.5 10965.5
## - FMTCOST12RELAMICAT   6  15986.7 16096.7
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6040.2
## FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC + UTILITY +
##     TOTSAL + GLMED + ABL30 + ABL80 + ABLMED + FMTBUILT + FMTSTRUCTURETYPE +
##     FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST12RELAMICAT +
##     FMTCOSTMEDRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                        Df Deviance     AIC
## - ABL30                 1   5930.4  6038.4
## <none>                      5930.2  6040.2
## - ABL80                 1   5934.3  6042.3
## - FMTBURDEN             3   5940.2  6044.2
## - WEIGHT                1   5940.0  6048.0
## - FMTBUILT              6   5951.2  6049.2
## - ABLMED                1   5941.7  6049.7
## - TOTSAL                1   5945.3  6053.3
## - FMR                   1   5948.6  6056.6
## - GLMED                 1   5952.7  6060.7
## - FMTINCRELFMRCAT       2   5962.4  6068.4
## - FMTBEDRMS             4   5983.0  6085.0
## - PER                   1   5982.9  6090.9
## - ZSMHC                 1   5999.7  6107.7
## - ROOMS                 1   6009.5  6117.5
## - FMTCOST12RELFMRCAT    2   6143.8  6249.8
## - FMTCOSTMEDRELFMRCAT   2   6180.4  6286.4
## - UTILITY               1   6222.1  6330.1
## - AGE1                  1   6223.6  6331.6
## - FMTCOST12RELPOVCAT    3   7202.0  7306.0
## - FMTSTRUCTURETYPE      5   7301.9  7401.9
## - FMTCOSTMEDRELPOVCAT   3   7360.2  7464.2
## - FMTCOSTMEDRELAMICAT   6  10863.2 10961.2
## - FMTCOST12RELAMICAT    6  16010.3 16108.3
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##
## Step:  AIC=6038.35
## FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER + ZSMHC + UTILITY +
##     TOTSAL + GLMED + ABL80 + ABLMED + FMTBUILT + FMTSTRUCTURETYPE +
##     FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT + FMTCOST12RELFMRCAT +
##     FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT + FMTCOST12RELAMICAT +
##     FMTCOSTMEDRELAMICAT + FMTBURDEN
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred

## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
##                       Df Deviance     AIC
## <none>                     5930.4  6038.4
## - FMTBURDEN            3   5940.3  6042.3
## - WEIGHT               1   5940.1  6046.1
## - FMTBUILT             6   5951.8  6047.8
## - ABLMED               1   5942.9  6048.9
## - ABL80                1   5943.0  6049.0
## - TOTSAL               1   5945.5  6051.5
## - FMR                  1   5950.8  6056.8
## - GLMED                1   5952.8  6058.8
## - FMTINCRELFMRCAT      2   5962.5  6066.5
## - FMTBEDRMS            4   5983.1  6083.1
## - PER                  1   5983.2  6089.2
## - ZSMHC                1   5999.9  6105.9
## - ROOMS                1   6009.7  6115.7
## - FMTCOST12RELFMRCAT   2   6144.1  6248.1
## - FMTCOSTMEDRELFMRCAT  2   6180.4  6284.4
## - UTILITY              1   6223.4  6329.4
## - AGE1                 1   6223.6  6329.6
## - FMTCOST12RELPOVCAT   3   7202.1  7304.1
## - FMTSTRUCTURETYPE     5   7302.0  7400.0
## - FMTCOSTMEDRELPOVCAT  3   7360.2  7462.2
## - FMTCOSTMEDRELAMICAT  6  10863.2 10959.2
## - FMTCOST12RELAMICAT   6  16012.8 16108.8
```

```
summary(backwards)
```

```
##
## Call:
## glm(formula = FMTOWNRENT ~ AGE1 + FMR + ROOMS + WEIGHT + PER +
##     ZSMHC + UTILITY + TOTSAL + GLMED + ABL80 + ABLMED + FMTBUILT +
##     FMTSTRUCTURETYPE + FMTBEDRMS + FMTCOST12RELPOVCAT + FMTCOSTMEDRELPOVCAT +
##     FMTCOST12RELFMRCAT + FMTCOSTMEDRELFMRCAT + FMTINCRELFMRCAT +
##     FMTCOST12RELAMICAT + FMTCOSTMEDRELAMICAT + FMTBURDEN, family = binomial(link = "logit"),
##     data = train)
##
## Deviance Residuals:
##    Min      1Q  Median      3Q     Max
## -4.147   0.000   0.000   0.047   3.713
##
## Coefficients:
##                                          Estimate Std. Error z value
## (Intercept)                              9.449e+00  6.285e-01  15.034
## AGE1                                    -3.845e-02  2.317e-03 -16.595
## FMR                                      1.075e-03  2.377e-04   4.522
## ROOMS                                   -3.576e-01  4.086e-02  -8.752
## WEIGHT                                  -9.366e-05  3.031e-05  -3.090
## PER                                      2.232e-01  3.086e-02   7.233
## ZSMHC                                    3.066e-04  3.633e-05   8.439
## UTILITY                                 -5.969e-03  3.696e-04 -16.150
## TOTSAL                                  -2.397e-06  6.270e-07  -3.823
## GLMED                                   -6.339e-05  1.334e-05  -4.752
## ABL80                                   -4.174e-05  1.175e-05  -3.554
## ABLMED                                   5.068e-05  1.426e-05   3.553
## FMTBUILT'1940-1959'                     -2.781e-01  1.201e-01  -2.316
## FMTBUILT'1960-1979'                      5.018e-02  1.125e-01   0.446
## FMTBUILT'1980-1989'                      6.123e-02  1.346e-01   0.455
## FMTBUILT'1990-1999'                      1.753e-01  1.366e-01   1.284
## FMTBUILT'2000-2009'                      3.289e-01  1.378e-01   2.386
## FMTBUILT'After 2010'                    -1.150e-01  3.027e-01  -0.380
## FMTSTRUCTURETYPE'2 2-4 units'            1.552e+00  1.490e-01  10.417
## FMTSTRUCTURETYPE'3 5-19 units'           1.808e+00  1.616e-01  11.191
## FMTSTRUCTURETYPE'4 20-49 units'          1.802e+00  1.977e-01   9.117
## FMTSTRUCTURETYPE'5 50+ units'            1.597e+00  1.478e-01  10.803
## FMTSTRUCTURETYPE'6 Mobile Home'         -3.467e+00  1.324e-01 -26.193
## FMTBEDRMS'1 1BR'                         8.353e-03  4.115e-01   0.020
## FMTBEDRMS'2 2BR'                        -9.277e-01  4.454e-01  -2.083
## FMTBEDRMS'3 3BR'                        -1.543e+00  5.093e-01  -3.030
## FMTBEDRMS'4 4BR+'                       -1.559e+00  6.068e-01  -2.569
## FMTCOST12RELPOVCAT'2 100-150% Poverty'  -2.368e+01  2.369e+03  -0.010
## FMTCOST12RELPOVCAT'3 150-200% Poverty'  -4.688e+01  2.643e+03  -0.018
## FMTCOST12RELPOVCAT'4 200%+ Poverty'     -6.996e+01  2.772e+03  -0.025
## FMTCOSTMEDRELPOVCAT'2 100-150% Poverty'  2.442e+01  2.369e+03   0.010
## FMTCOSTMEDRELPOVCAT'3 150-200% Poverty'  4.847e+01  2.643e+03   0.018
## FMTCOSTMEDRELPOVCAT'4 200%+ Poverty'     7.103e+01  2.772e+03   0.026
## FMTCOST12RELFMRCAT'2 50.1 - 100% FMR'   -2.350e+01  1.598e+03  -0.015
## FMTCOST12RELFMRCAT'3 GT FMR'            -4.061e+01  1.690e+03  -0.024
## FMTCOSTMEDRELFMRCAT'2 50.1 - 100% FMR'   2.356e+01  1.598e+03   0.015
## FMTCOSTMEDRELFMRCAT'3 GT FMR'            4.119e+01  1.690e+03   0.024
## FMTINCRELFMRCAT'2 50.1 - 100% FMR'      -2.948e-01  1.074e-01  -2.746
## FMTINCRELFMRCAT'3 GT FMR'               -6.916e-01  1.236e-01  -5.594
## FMTCOST12RELAMICAT'2 30 - 50% AMI'      -2.275e+01  1.786e+03  -0.013
## FMTCOST12RELAMICAT'3 50 - 60% AMI'      -4.591e+01  1.975e+03  -0.023
## FMTCOST12RELAMICAT'4 60 - 80% AMI'      -6.954e+01  2.082e+03  -0.033
## FMTCOST12RELAMICAT'5 80 - 100% AMI'     -9.451e+01  2.160e+03  -0.044
## FMTCOST12RELAMICAT'6 100 - 120% AMI'    -1.189e+02  2.235e+03  -0.053
## FMTCOST12RELAMICAT'7 120% AMI +'        -1.614e+02  2.428e+03  -0.066
## FMTCOSTMEDRELAMICAT'2 30 - 50% AMI'      2.317e+01  1.786e+03   0.013
## FMTCOSTMEDRELAMICAT'3 50 - 60% AMI'      4.887e+01  1.975e+03   0.025
## FMTCOSTMEDRELAMICAT'4 60 - 80% AMI'      7.185e+01  2.082e+03   0.035
## FMTCOSTMEDRELAMICAT'5 80 - 100% AMI'     9.745e+01  2.160e+03   0.045
## FMTCOSTMEDRELAMICAT'6 100 - 120% AMI'    1.364e+02  2.342e+03   0.058
## FMTCOSTMEDRELAMICAT'7 120% AMI +'        1.556e+02  2.428e+03   0.064
## FMTBURDEN'2 30% to 50%'                 -1.085e-01  1.067e-01  -1.017
## FMTBURDEN'3 50% or More'                 1.534e-01  1.255e-01   1.222
## FMTBURDEN'4 No Income'                  -4.489e-01  2.275e-01  -1.973
##                                         Pr(>|z|)
## (Intercept)                              < 2e-16 ***
## AGE1                                     < 2e-16 ***
## FMR                                     6.14e-06 ***
## ROOMS                                    < 2e-16 ***
## WEIGHT                                  0.002004 **
## PER                                     4.74e-13 ***
## ZSMHC                                    < 2e-16 ***
## UTILITY                                  < 2e-16 ***
## TOTSAL                                  0.000132 ***
## GLMED                                   2.01e-06 ***
## ABL80                                   0.000380 ***
## ABLMED                                  0.000380 ***
## FMTBUILT'1940-1959'                     0.020558 *
## FMTBUILT'1960-1979'                     0.655596
## FMTBUILT'1980-1989'                     0.649068
## FMTBUILT'1990-1999'                     0.199204
```

```
## FMTBUILT'2000-2009'                     0.017026 *
## FMTBUILT'After 2010'                    0.703965
## FMTSTRUCTURETYPE'2 2-4 units'            < 2e-16 ***
## FMTSTRUCTURETYPE'3 5-19 units'           < 2e-16 ***
## FMTSTRUCTURETYPE'4 20-49 units'          < 2e-16 ***
## FMTSTRUCTURETYPE'5 50+ units'            < 2e-16 ***
## FMTSTRUCTURETYPE'6 Mobile Home'          < 2e-16 ***
## FMTBEDRMS'1 1BR'                        0.983803
## FMTBEDRMS'2 2BR'                        0.037296 *
## FMTBEDRMS'3 3BR'                        0.002442 **
## FMTBEDRMS'4 4BR+'                       0.010212 *
## FMTCOST12RELPOVCAT'2 100-150% Poverty'  0.992025
## FMTCOST12RELPOVCAT'3 150-200% Poverty'  0.985845
## FMTCOST12RELPOVCAT'4 200%+ Poverty'     0.979861
## FMTCOSTMEDRELPOVCAT'2 100-150% Poverty' 0.991775
## FMTCOSTMEDRELPOVCAT'3 150-200% Poverty' 0.985366
## FMTCOSTMEDRELPOVCAT'4 200%+ Poverty'    0.979553
## FMTCOST12RELFMRCAT'2 50.1 - 100% FMR'   0.988269
## FMTCOST12RELFMRCAT'3 GT FMR'            0.980827
## FMTCOSTMEDRELFMRCAT'2 50.1 - 100% FMR'  0.988239
## FMTCOSTMEDRELFMRCAT'3 GT FMR'           0.980553
## FMTINCRELFMRCAT'2 50.1 - 100% FMR'      0.006040 **
## FMTINCRELFMRCAT'3 GT FMR'               2.22e-08 ***
## FMTCOST12RELAMICAT'2 30 - 50% AMI'      0.989838
## FMTCOST12RELAMICAT'3 50 - 60% AMI'      0.981452
## FMTCOST12RELAMICAT'4 60 - 80% AMI'      0.973357
## FMTCOST12RELAMICAT'5 80 - 100% AMI'     0.965102
## FMTCOST12RELAMICAT'6 100 - 120% AMI'    0.957587
## FMTCOST12RELAMICAT'7 120% AMI +'        0.947012
## FMTCOSTMEDRELAMICAT'2 30 - 50% AMI'     0.989647
## FMTCOSTMEDRELAMICAT'3 50 - 60% AMI'     0.980256
## FMTCOSTMEDRELAMICAT'4 60 - 80% AMI'     0.972474
## FMTCOSTMEDRELAMICAT'5 80 - 100% AMI'    0.964016
## FMTCOSTMEDRELAMICAT'6 100 - 120% AMI'   0.953564
## FMTCOSTMEDRELAMICAT'7 120% AMI +'       0.948897
## FMTBURDEN'2 30% to 50%'                 0.308950
## FMTBURDEN'3 50% or More'                0.221566
## FMTBURDEN'4 No Income'                  0.048496 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 60874.2  on 45071  degrees of freedom
## Residual deviance:  5930.4  on 45018  degrees of freedom
## AIC: 6038.4
##
## Number of Fisher Scoring iterations: 22
```

After the Logistic is created, compare it with the test data

```
predTst <- predict(backwards, test, type="response")
thresh  <- 0.5            # threshold for categorizing predicted probabilities
predFac <- cut(predTst, breaks=c(-Inf, thresh, Inf), labels=c("'1 Owner'", "'2 Renter'"))
cTab    <- table(test$FMTOWNRENT,predFac, dnn=c("actual", "predicted"))
addmargins(cTab)
```

```
##             predicted
## actual       '1 Owner' '2 Renter'   Sum
##   '1 Owner'       8838        233  9071
##   '2 Renter'       154       5799  5953
##   Sum             8992       6032 15024
```

```
addmargins(prop.table(cTab))
```

```
##             predicted
## actual        '1 Owner' '2 Renter'        Sum
##   '1 Owner'  0.58825879 0.01550852 0.60376731
##   '2 Renter' 0.01025027 0.38598243 0.39623269
##   Sum        0.59850905 0.40149095 1.00000000
```

```
##Predictive rate
spt <- prop.table(cTab)
sp = spt[1,1]+spt[2,2]
sp*100
```

```
## [1] 97.42412
```