##Syntax

```
> BRFSS2013_Data <- read.csv("C:/Users/James/Desktop/BRFSS2013_Data.csv")
>   View(BRFSS2013_Data)
> names(BRFSS2013_Data)
 [1] "X"          "X_STATE"    "NUMADULT"   "MENTHLTH"   "ADDEPEV2"
 [6] "MARITAL"    "CHILDREN"   "EDUCA"      "EMPLOY1"    "INCOME2"
[11] "RENTHOM1"   "SEX"        "QLMENTL2"   "X_STSTR"    "X_STRWT"
[16] "X_RAWRAKE"  "X_WT2RAKE"  "X_IMPRACE"  "X_LLCPWT2"  "X_LLCPWT"
[21] "X_PRACE1"   "X_HISPANC"  "X_RACE"     "X_RACEG21"  "X_RACEGR3"
[26] "X_RACE_G1"  "X_AGEG5YR"  "X_AGE_G"    "X_CHLDCNT"  "X_EDUCAG"
[31] "X_INCOMG"   "X_AGE80"    "X_IMPEDUC"  "X_IMPMRTL"  "X_IMPHOME"
```

##CLEANING UP DATA OBSERVATIONS

CLEANING OUTCOME (MENTHLTH):

```
> BRFSS2013_Data$MENTHLTH[BRFSS2013_Data$MENTHLTH==88] <- 0
> BRFSS2013_Data$MENTHLTH[BRFSS2013_Data$MENTHLTH==77] <- NA
> BRFSS2013_Data$MENTHLTH[BRFSS2013_Data$MENTHLTH==99] <- NA
> summary(BRFSS2013_Data$MENTHLTH)
    Min. 1st Qu.  Median    Mean   3rd Qu.  Max.    NA's
  0.000   0.000   0.000   3.371   2.000  30.000    8635
```

CLEANING EXPOSURE(RENTHOM1):

```
> BRFSS2013_Data$RENTHOM1[BRFSS2013_Data$RENTHOM1==7] <- NA
> BRFSS2013_Data$RENTHOM1[BRFSS2013_Data$RENTHOM1==9] <- NA
```

CLEANING HOUSEHOLD SIZE:

```
> BRFSS2013_Data$CHILDREN[BRFSS2013_Data$CHILDREN==88] <- 0
> summary(BRFSS2013_Data$CHILDREN)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
 0.0000  0.0000  0.0000  0.8823  1.0000 99.0000     437
> BRFSS2013_Data$CHILDREN[BRFSS2013_Data$CHILDREN==99] <- NA
> summary(BRFSS2013_Data$CHILDREN)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
 0.0000  0.0000  0.0000  0.5163  1.0000 24.0000    2263
 > summary(BRFSS2013_Data$NUMADULT)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
   1.00    1.00    2.00    1.81    2.00   45.00  131709

> BRFSS2013_Data["HOUSEHOLDSIZE"] <- NA

> BRFSS2013_Data$HOUSEHOLDSIZE <-
BRFSS2013_Data$NUMADULT+BRFSS2013_Data$CHILDREN
```

CLEANING HOUSEHOLD INCOME

```
> BRFSS2013_Data$INCOME2[BRFSS2013_Data$INCOME2==77] <- 99
> BRFSS2013_Data$INCOME2[is.na(BRFSS2013_Data$INCOME2)] <- 99
```

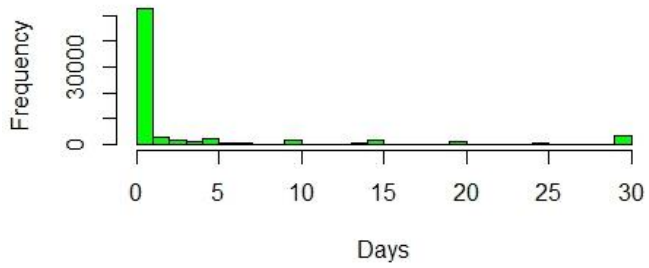
CLEANING EDUCATION

```
> BRFSS2013_Data$EDUCA[BRFSS2013_Data$EDUCA==3] <- NA

> BRFSS2013_Data$EDUCA[BRFSS2013_Data$EDUCA==9] <- NA


## CLEANING UP EMPLOYMENT

> BRFSS2013_Data$EMPLOY1[BRFSS2013_Data$EMPLOY1==6] <- NA

> BRFSS2013_Data$EMPLOY1[BRFSS2013_Data$EMPLOY1==9] <- NA


## CLEANING UP MARITAL STATUS


> BRFSS2013_Data$MARITAL[BRFSS2013_Data$MARITAL==6] <- NA
> BRFSS2013_Data$MARITAL[BRFSS2013_Data$MARITAL==9] <- NA
```

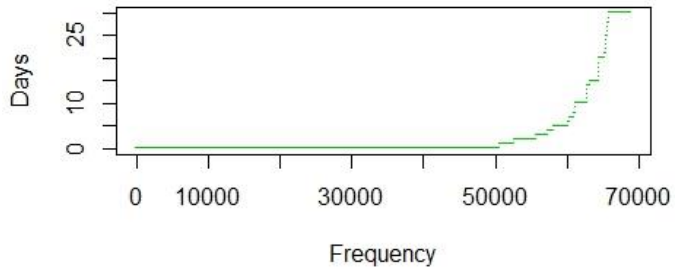
##SINGLING OUT STATES WE NEED AND AGES

```
> ELIGIBLE <-
BRFSS2013_Data[which(BRFSS2013_Data$X_STATE==1|BRFSS2013_Data$X_STATE==5|BRFS
S2013_Data$X_STATE==6|BRFSS2013_Data$X_STATE==15|BRFSS2013_Data$X_STATE==17|B
RFSS2013_Data$X_STATE==20|BRFSS2013_Data$X_STATE==22|BRFSS2013_Data$X_STATE==
31|BRFSS2013_Data$X_STATE==35|BRFSS2013_Data$X_STATE==40|BRFSS2013_Data$X_STA
TE==45|BRFSS2013_Data$X_STATE==55),]
> ELIGIBLE1 <-subset(ELIGIBLE, X_AGE80 >=35)


##CREATE NEW DATASET.


>write.csv(ELIGIBLE1, "C:/Users/James/Desktop/ELIGIBLE1.csv")



##IMPORT ELIGIBLE1 DATASET INTO R

> ELIGIBLE1 <- read.csv("C:/Users/James/Desktop/ELIGIBLE1.csv")
>   View(ELIGIBLE1)


##SELECTING DATA:


> cleanobservations <- ELIGIBLE1[c(2,3,5,7,9:13,26,29,33,37)]

> names(cleanobservations)
 [1] "X"              "X_STATE"        "MENTHLTH"
 [4] "MARITAL"        "EDUCA"          "EMPLOY1"
 [7] "INCOME2"        "RENTHOM1"       "SEX"
[10] "X_RACEGR3"      "X_AGE_G"        "X_AGE80"
[13] "HOUSEHOLDSIZE"
```

```
##EXCLUDING MISSING CASES FOR EDUCA, MARITAL, HOUSEHOLDSIZE, EMPLOY1

final <-
cleanobservations[complete.cases(cleanobservations[c("EDUCA","MARITAL","HOUSE
HOLDSIZE","EMPLOY1")]),]


##CREATING A NEW AND SMALLER DATASET.

> write.csv(final, "C:/Users/James/Desktop/NEWDATA.csv")



##IMPORT FINALDATA DATASET INTO R.


## BEFORE MAKING VARIABLES INTO CATEGORIES, CREATE HISTOGRAM TO SHOW HOW WE
CANNOT USE LINEAR REGRESSION. THERE ARE TOO MANY ZEROS.


> hist(NEWDATA$MENTHLTH,  col="green", main="", xlab="Days",
ylab="Frequency", breaks=30)
```




```
> plot(sort(NEWDATA$MENTHLTH), xlab="Days", ylab="Frequency", col="green3",
pch=".")
```




```
##Finding the frequencies for the outcome.

> MENTHLTH2 <-cut(NEWDATA$MENTHLTH, br=c(-1,0,13,30))
> summary(MENTHLTH2)
 (-1,0]  (0,13] (13,30]    NA's
  50666   12164    6099    1041


## RECODING for REGRESSION MODELS:


##CATEGORICAL OUTCOME:

> MENTHLTH5 <-cut(NEWDATA$MENTHLTH, br=c(-1,13,30))
> is.factor(MENTHLTH5)
[1] TRUE
> table(MENTHLTH5)
MENTHLTH5
(-1,13] (13,30]
  62830    6099
> summary(MENTHLTH5)
(-1,13] (13,30]    NA's
  62830    6099    1041
> levels(MENTHLTH5)<- c("0-13 unhealthy days", "14-30 unhealthy days")
> levels(MENTHLTH5)
[1] "0-13 unhealthy days"  "14-30 unhealthy days"
> MENTHLTH1=factor(MENTHLTH5, c("14-30 unhealthy days","0-13 unhealthy
days"))
> levels(MENTHLTH1)
[1] "14-30 unhealthy days" "0-13 unhealthy days"
> summary(MENTHLTH1)
14-30 unhealthy days  0-13 unhealthy days                  NA's
                6099                62830                  1041

## CATEGORICAL EXPOSURE:
> RENTHOM12 <- factor(NEWDATA$RENTHOM1 , labels=c("1", "2",
"3"), levels=1:3)
> levels(RENTHOM12)
[1] "1" "2" "3"
> RENTHOM1Summary <- RENTHOM12
> levels(RENTHOM1Summary)<- c("own home", "non-homeownership", "non-
homeownership")
> levels(RENTHOM1Summary)
[1] "own home"          "non-homeownership"
> RENTHOM1Summary1= factor(RENTHOM1Summary, c("non-homeownership", "own
home"))
```

```
> summary(RENTHOM1Summary1)
non-homeownership          own home              NA's
            10942             58350               678
```

##Covariates

##CATEGORICAL SEX

```
> SEX2 <- factor(NEWDATA$SEX , labels=c("1", "2"), levels=1:2)
> levels(SEX2) <- c("Male","Female")
> levels(SEX2)
[1] "Male"   "Female"
> summary(SEX2)
  Male Female
 25877  44093
> SEXNEW <-SEX2
> summary(SEXNEW)
  Male Female
 25877  44093
```

##CATEGORICAL HOUSEHOLDSIZE

```
> is.factor(NEWDATA$HOUSEHOLDSIZE)
[1] FALSE
> HOUSEHOLDSIZE23 <-cut(NEWDATA$HOUSEHOLDSIZE, br=c(0,2,4,6,16))
> summary(HOUSEHOLDSIZE23)
 (0,2]  (2,4]  (4,6] (6,16]
 54088  12080   3296    506
> levels(HOUSEHOLDSIZE23) <- c("1 or 2", "3 or 4", "5 or 6", "7 and more")
> summary(HOUSEHOLDSIZE23)
    1 or 2     3 or 4     5 or 6 7 and more
     54088      12080       3296        506
> levels(HOUSEHOLDSIZE23) <- c("1 or 2", "3 or 4", "5 or 6", "7 and more")
> HOUSEHOLDSIZENEW <- HOUSEHOLDSIZE23
> summary(HOUSEHOLDSIZENEW)
    1 or 2     3 or 4     5 or 6 7 and more
     54088      12080       3296        506
> levels(HOUSEHOLDSIZENEW)
[1] "1 or 2"     "3 or 4"     "5 or 6"     "7 and more"
```

##CATEGORICAL AGE

##CLEANING UP AGE GROUPS (Deleting categories(or levels) within a variable)

```
> is.factor(NEWDATA$X_AGE_G)
[1] FALSE
> AGEGR <-cut(NEWDATA$X_AGE_G, br=c(0,1,2,3,4,5,6))
> summary(AGEGR)
(0,1] (1,2] (2,3] (3,4] (4,5] (5,6]
    0     0  6792 11583 18892 32703
> AGEGROUPNEW <- AGEGR[AGEGR != "1"]
```

```
> AGEGROUPNEW <- factor(AGEGROUPNEW)
> levels(AGEGROUPNEW)
[1] "(2,3]" "(3,4]" "(4,5]" "(5,6]"
> summary(AGEGROUPNEW)
(2,3] (3,4] (4,5] (5,6]
 6792 11583 18892 32703
> levels(AGEGROUPNEW) <- c("35-44", "45-54", "55-64", "65-80")
> summary(AGEGROUPNEW)
35-44 45-54 55-64 65-80
 6792 11583 18892 32703
```

```
##CATEGORICAL HOUSEHOLD INCOME
```

```
> INCOME21 <-cut(NEWDATA$INCOME2, br=c(0,1,2,3,4,5,6,7,8,99))
> is.factor(INCOME21)
[1] TRUE
> summary(INCOME21)
 (0,1]  (1,2]  (2,3]  (3,4]  (4,5]  (5,6]  (6,7]  (7,8] (8,99]
  2754   3661   4742   5993   7523   9699   9925  16625   9048
> levels(INCOME21) <- c("<25000", "<25000", "<25000", "<25000", "25000 to <
50000", "25000 to < 50000", ">=50000", ">=50000", "Unknown")
> summary(INCOME21)
          <25000 25000 to < 50000          >=50000          Unknown
           17150            17222            26550             9048
> INCOMENEW <-INCOME21
> summary(INCOMENEW)
          <25000 25000 to < 50000          >=50000          Unknown
           17150            17222            26550             9048
> levels(INCOMENEW)
[1] "<25000"           "25000 to < 50000" ">=50000"          "Unknown"
```

```
##CATEGORICAL RACE
```

```
> is.factor(NEWDATA$X_RACEGR3)
[1] FALSE
> RACEGR <-cut(NEWDATA$X_RACEGR3, br=c(0,1,2,3,4,5,9))
> levels(RACEGR) <- c("Non-Hispanic White", "Non-Hispanic black", "Others",
"Others", "Hispanic", "Others")
> summary(RACEGR)
Non-Hispanic White Non-Hispanic black             Others           Hispanic
             55182                5808               5636               3341
              NA's
                 3
```

```
##CATEGORICAL EDUCATION
```

```
> is.factor(NEWDATA$EDUCA)
[1] FALSE
> EDUCA1 <-cut(NEWDATA$EDUCA, br=c(0,1,2,4,5,6))
> is.factor(EDUCA1)
[1] TRUE
> summary(EDUCA1)
(0,1] (1,2] (2,4] (4,5] (5,6]
   89  2201 22560 20126 24994
> levels(EDUCA1)
[1] "(0,1]" "(1,2]" "(2,4]" "(4,5]" "(5,6]"
> levels(EDUCA1) <- c("Less than High School", "Less than High School", "High
School Graduate to < 4 years of college", "High School Graduate to < 4 years
of college", ">= 4 years of college")
> summary(EDUCA1)
                        Less than High School
                                         2290
High School Graduate to < 4 years of college
                                        42686
                        >= 4 years of college
                                        24994
> EDUCANEW <- EDUCA1
> summary(EDUCANEW)
                        Less than High School
                                         2290
High School Graduate to < 4 years of college
                                        42686
                        >= 4 years of college
                                        24994
> levels(EDUCANEW)
[1] "Less than High School"
[2] "High School Graduate to < 4 years of college"
[3] ">= 4 years of college"
```

CATEGORICAL EMPLOYMENT

```
> EMPLOY13 <- factor(NEWDATA$EMPLOY1, labels=c("1", "2", "3", "4", "5", "6",
"7", "8", "9"), levels=1:9)
> summary(EMPLOY13)
    1     2     3     4     5     6     7     8     9
23525  6114  1413  1026  4583     0 27963  5346     0
> EMPLOY1NEW <- EMPLOY13[EMPLOY13 != "6"]
> EMPLOY1NEW <- factor(EMPLOY1NEW)
> levels(EMPLOY1NEW)
[1] "1" "2" "3" "4" "5" "7" "8"
> levels(EMPLOY1NEW)
```

```
[1] "1" "2" "3" "4" "5" "7" "8"
> summary(EMPLOY1NEW)
    1     2     3     4     5     7     8
23525  6114  1413  1026  4583 27963  5346
> levels(EMPLOY1NEW) <- c("Employed", "Employed", "Unemployed", "Unemployed",
"Homemaker", "Retired", "Unable to Work")
> summary(EMPLOY1NEW)
      Employed     Unemployed      Homemaker        Retired
         29639           2439           4583          27963
Unable to Work
          5346
```

```
## CATEGORICAL MARITAL STATUS
```

```
> MARITAL0 <- factor(NEWDATA$MARITAL, labels=c("1", "2", "3", "4", "5", "6",
"9"), levels=1:7)
> summary(MARITAL0)
    1     2     3     4     5     6     9
40312 10053 13135  1071  5399     0     0
> MARITALNEW <- MARITAL0[MARITAL0 != "6"]
> MARITALNEW <- factor(MARITALNEW)
> levels(MARITALNEW)
[1] "1" "2" "3" "4" "5"
> levels(MARITALNEW) <- c("Married", "Divorced/Widowed/Separated",
"Divorced/Widowed/Separated", "Divorced/Widowed/Separated", "Never married")
> summary(MARITALNEW)
                  Married Divorced/Widowed/Separated
                    40312                      24259
            Never married
                     5399
```

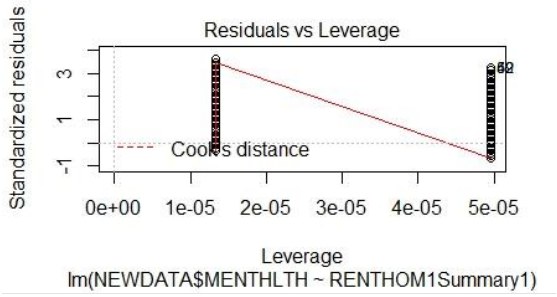
```
##LINEAR REGRESSION RESULTS
```

```
##UNADJUSTED LINEAR REGRESSION
```

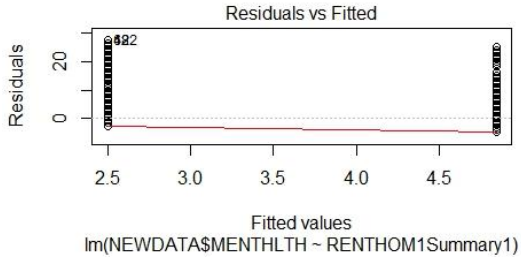
```
> LINEARunadjusted <- lm(NEWDATA$MENTHLTH ~ RENTHOM1Summary1, data=NEWDATA)
> summary(LINEARunadjusted)

Call:
lm(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1, data = NEWDATA)

Residuals:
   Min     1Q Median     3Q    Max
-4.843 -2.502 -2.502 -1.502 27.498

Coefficients:
                          Estimate Std. Error t value Pr(>|t|)
(Intercept)                4.84295    0.06900   70.19   <2e-16 ***
RENTHOM1Summary1own home -2.34130    0.07515  -31.16   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 7.143 on 68273 degrees of freedom
  (1695 observations deleted due to missingness)
Multiple R-squared:  0.01402,  Adjusted R-squared:  0.014
F-statistic: 970.6 on 1 and 68273 DF,  p-value: < 2.2e-16
```

Unadjusted Linear Regression

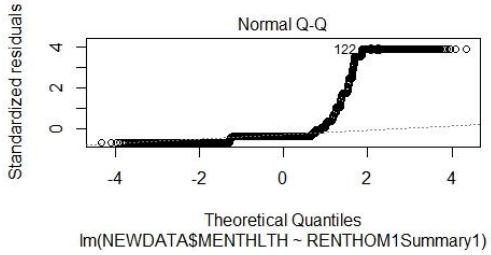
Residuals vs Leverage



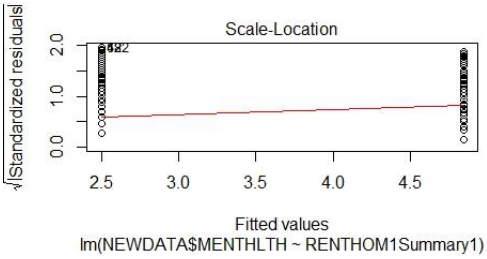
Residuals vs Fitted



QQ-Plot



Scale-Location

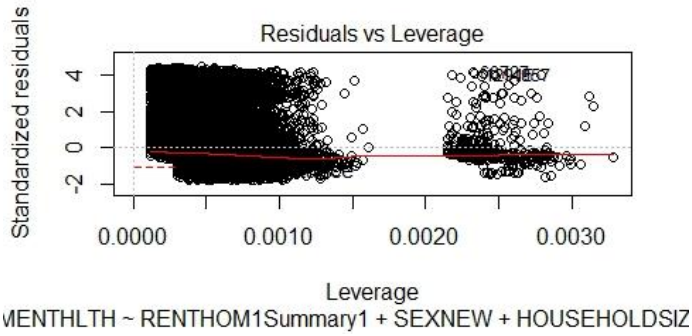


ADJUSTED LINEAR REGRESSION

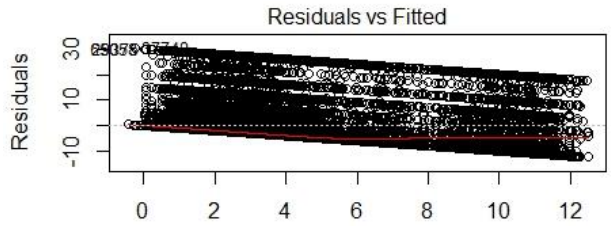
```
> LINEAR <- lm(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW, data=NEWDATA)
> summary(LINEAR)

Call:
lm(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOLDSIZENEW
+
    AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
    MARITALNEW, data = NEWDATA)

Residuals:
     Min       1Q   Median       3Q      Max
-12.4947  -2.6391  -1.7973  -0.6391  30.2418

Coefficients:
                                                    Estimate Std. Error
(Intercept)                                          3.98022    0.20987
RENTHOM1Summary1own home                            -0.52694    0.07810
SEXNEWFemale                                         0.70342    0.05633
HOUSEHOLDSIZENEW3 or 4                               0.20485    0.08089
HOUSEHOLDSIZENEW5 or 6                              -0.01004    0.13875
HOUSEHOLDSIZENEW7 and more                          -0.14821    0.31302
AGEGROUPNEW45-54                                     0.01464    0.10946
AGEGROUPNEW55-64                                    -0.61036    0.11170
AGEGROUPNEW65-80                                    -1.68083    0.12212
INCOMENEW25000 to < 50000                           -0.84188    0.07967
INCOMENEW>=50000                                    -1.24836    0.08514
INCOMENEWUnknown                                    -1.08262    0.09483
RACEGRNon-Hispanic black                            -0.49936    0.09831
RACEGROthers                                         0.15761    0.09780
RACEGRHispanic                                       0.04569    0.12914
EDUCANEWHigh School Graduate to < 4 years of college -0.29761    0.15822
EDUCANEW>= 4 years of college                       -0.47143    0.16505
EMPLOY1NEWUnemployed                                 2.79866    0.14826
EMPLOY1NEWHomemaker                                  0.20677    0.11558
EMPLOY1NEWRetired                                    0.46089    0.07616
EMPLOY1NEWUnable to Work                             7.09242    0.11211
MARITALNEWDivorced/Widowed/Separated                 0.49909    0.06482
MARITALNEWNever married                              0.06960    0.10749
                                                    t value Pr(>|t|)
(Intercept)                                          18.965  < 2e-16 ***
RENTHOM1Summary1own home                             -6.747 1.52e-11 ***
SEXNEWFemale                                         12.487  < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                2.533  0.01132 *
```

```
HOUSEHOLDSIZENEW5 or 6                                    -0.072  0.94231
HOUSEHOLDSIZENEW7 and more                                -0.473  0.63587
AGEGROUPNEW45-54                                           0.134  0.89357
AGEGROUPNEW55-64                                          -5.464 4.66e-08 ***
AGEGROUPNEW65-80                                         -13.764  < 2e-16 ***
INCOMENEW25000 to < 50000                                -10.568  < 2e-16 ***
INCOMENEW>=50000                                         -14.662  < 2e-16 ***
INCOMENEWUnknown                                         -11.416  < 2e-16 ***
RACEGRNon-Hispanic black                                  -5.080 3.79e-07 ***
RACEGROthers                                               1.611  0.10708
RACEGRHispanic                                             0.354  0.72350
EDUCANEWHigh School Graduate to < 4 years of college      -1.881  0.05998 .
EDUCANEW>= 4 years of college                             -2.856  0.00429 **
EMPLOY1NEWUnemployed                                      18.876  < 2e-16 ***
EMPLOY1NEWHomemaker                                        1.789  0.07362 .
EMPLOY1NEWRetired                                          6.052 1.44e-09 ***
EMPLOY1NEWUnable to Work                                  63.263  < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                       7.700 1.38e-14 ***
MARITALNEWNever married                                    0.648  0.51728
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 6.803 on 68250 degrees of freedom
  (1697 observations deleted due to missingness)
Multiple R-squared:  0.1058,   Adjusted R-squared:  0.1056
F-statistic: 367.2 on 22 and 68250 DF,  p-value: < 2.2e-16
```

##Residuals vs. Leverage

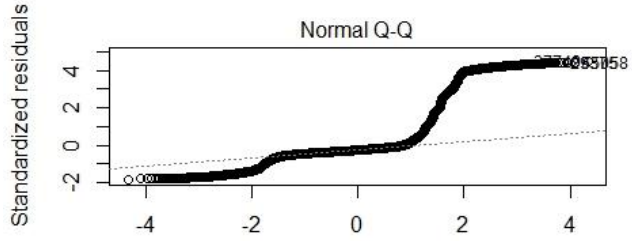


##Residuals vs. Fitted



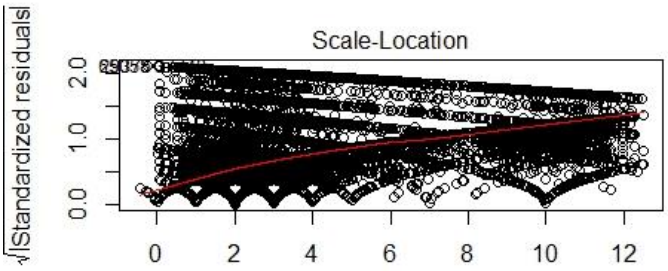
MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOLDSIZ

Normal Q-Q Plot



MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOLDSIZ

Scale-Location



MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOLDSIZ

##LOGISTIC REGRESSION RESULTS

```
> logistic <- glm(MENTHLTH1 ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOLDSIZENEW +
AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW + MARITALNEW, data =
NEWDATA, family = "binomial")
> summary(logistic)

Call:
glm(formula = MENTHLTH1 ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOLDSIZENEW +
    AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
    MARITALNEW, family = "binomial", data = NEWDATA)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.8209   0.2878   0.3429   0.4038   1.3493

Coefficients:
                                                    Estimate
(Intercept)                                          2.02322
RENTHOM1Summary1own home                             0.15001
SEXNEWFemale                                        -0.30950
HOUSEHOLDSIZENEW3 or 4                              -0.09150
HOUSEHOLDSIZENEW5 or 6                               0.03047
HOUSEHOLDSIZENEW7 and more                           0.03426
AGEGROUPNEW45-54                                     0.02780
AGEGROUPNEW55-64                                     0.29392
AGEGROUPNEW65-80                                     0.76668
INCOMENEW25000 to < 50000                            0.29811
INCOMENEW>=50000                                     0.58566
INCOMENEWUnknown                                     0.37532
RACEGRNon-Hispanic black                             0.22042
RACEGROthers                                        -0.07359
RACEGRHispanic                                      -0.08808
EDUCANEWHigh School Graduate to < 4 years of college 0.14235
EDUCANEW>= 4 years of college                        0.30530
EMPLOY1NEWUnemployed                                -0.95791
EMPLOY1NEWHomemaker                                 -0.14086
EMPLOY1NEWRetired                                   -0.21061
EMPLOY1NEWUnable to Work                            -1.76203
MARITALNEWDivorced/Widowed/Separated                -0.25570
MARITALNEWNever married                             -0.07348
                                                    Std. Error
(Intercept)                                            0.09895
RENTHOM1Summary1own home                               0.03631
SEXNEWFemale                                           0.03179
HOUSEHOLDSIZENEW3 or 4                                 0.04174
HOUSEHOLDSIZENEW5 or 6                                 0.07284
HOUSEHOLDSIZENEW7 and more                             0.15264
AGEGROUPNEW45-54                                       0.05426
AGEGROUPNEW55-64                                       0.05600
AGEGROUPNEW65-80                                       0.06334
INCOMENEW25000 to < 50000                              0.04040
INCOMENEW>=50000                                       0.04614
INCOMENEWUnknown                                       0.04886
RACEGRNon-Hispanic black                               0.04829
RACEGROthers                                           0.05069
RACEGRHispanic                                         0.06177
EDUCANEWHigh School Graduate to < 4 years of college   0.06883
EDUCANEW>= 4 years of college                          0.07479
EMPLOY1NEWUnemployed                                   0.06037
EMPLOY1NEWHomemaker                                    0.06463
EMPLOY1NEWRetired                                      0.04571
EMPLOY1NEWUnable to Work                               0.04410
MARITALNEWDivorced/Widowed/Separated                   0.03509
```

```
MARITALNEWNever married                                    0.05421
                                                        z value
(Intercept)                                              20.446
RENTHOM1Summary1own home                                  4.131
SEXNEWFemale                                            -9.736
HOUSEHOLDSIZENEW3 or 4                                  -2.192
HOUSEHOLDSIZENEW5 or 6                                   0.418
HOUSEHOLDSIZENEW7 and more                               0.224
AGEGROUPNEW45-54                                         0.512
AGEGROUPNEW55-64                                         5.248
AGEGROUPNEW65-80                                        12.105
INCOMENEW25000 to < 50000                                7.380
INCOMENEW>=50000                                        12.694
INCOMENEWUnknown                                         7.682
RACEGRNon-Hispanic black                                 4.565
RACEGROthers                                            -1.452
RACEGRHispanic                                          -1.426
EDUCANEWHigh School Graduate to < 4 years of college     2.068
EDUCANEW>= 4 years of college                            4.082
EMPLOY1NEWUnemployed                                   -15.867
EMPLOY1NEWHomemaker                                     -2.180
EMPLOY1NEWRetired                                       -4.607
EMPLOY1NEWUnable to Work                               -39.955
MARITALNEWDivorced/Widowed/Separated                    -7.288
MARITALNEWNever married                                 -1.355
                                                        Pr(>|z|)
(Intercept)                                              < 2e-16 ***
RENTHOM1Summary1own home                                3.60e-05 ***
SEXNEWFemale                                             < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                    0.0284 *
HOUSEHOLDSIZENEW5 or 6                                    0.6757
HOUSEHOLDSIZENEW7 and more                                0.8224
AGEGROUPNEW45-54                                          0.6084
AGEGROUPNEW55-64                                        1.54e-07 ***
AGEGROUPNEW65-80                                         < 2e-16 ***
INCOMENEW25000 to < 50000                               1.59e-13 ***
INCOMENEW>=50000                                         < 2e-16 ***
INCOMENEWUnknown                                        1.57e-14 ***
RACEGRNon-Hispanic black                                5.00e-06 ***
RACEGROthers                                              0.1466
RACEGRHispanic                                            0.1539
EDUCANEWHigh School Graduate to < 4 years of college      0.0386 *
EDUCANEW>= 4 years of college                           4.46e-05 ***
EMPLOY1NEWUnemployed                                     < 2e-16 ***
EMPLOY1NEWHomemaker                                       0.0293 *
EMPLOY1NEWRetired                                       4.08e-06 ***
EMPLOY1NEWUnable to Work                                 < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                    3.16e-13 ***
MARITALNEWNever married                                   0.1753
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 40843  on 68272  degrees of freedom
Residual deviance: 36478  on 68250  degrees of freedom
  (1697 observations deleted due to missingness)
AIC: 36524

Number of Fisher Scoring iterations: 5


## Verifying over-dispersion
```

```
> qchisq(0.95,68250)
[1] 68863.86
> with(logistic, null deviance - deviance)
Error: unexpected symbol in "with(logistic, null deviance"
> with(logistic, null.deviance - deviance)
[1] 4365.181
> with(logistic, df.null - df.residual)
[1] 17
> with(logistic, pchisq(null.deviance - deviance, df.null - df.residual,
lower.tail = FALSE))
[1] 0
> logLik(logistic)
'log Lik.' -18238.98 (df=23)
```

```
## Find odds ratios, 95% CIs, and p-values. Then, make it into a table.
```

```
> cbind(OR=exp(coef(logistic)), exp(confint(logistic)),
p=summary(logistic)$coef[, 4])
Waiting for profiling to be done...
                                                          OR
(Intercept)                                        7.5626206
RENTHOM1Summary1own home                           1.1618511
SEXNEWFemale                                       0.7338163
HOUSEHOLDSIZENEW3 or 4                             0.9125578
HOUSEHOLDSIZENEW5 or 6                             1.0309361
HOUSEHOLDSIZENEW7 and more                         1.0348500
AGEGROUPNEW45-54                                   1.0281898
AGEGROUPNEW55-64                                   1.3416767
AGEGROUPNEW65-80                                   2.1526125
INCOMENEW25000 to < 50000                          1.3473129
INCOMENEW>=50000                                   1.7961810
INCOMENEWUnknown                                   1.4554512
RACEGRNon-Hispanic black                           1.2466004
RACEGROthers                                       0.9290542
RACEGRHispanic                                     0.9156860
EDUCANEWHigh School Graduate to < 4 years of college 1.1529795
EDUCANEW>= 4 years of college                      1.3570288
EMPLOY1NEWUnemployed                               0.3836957
EMPLOY1NEWHomemaker                                0.8686134
EMPLOY1NEWRetired                                  0.8100910
EMPLOY1NEWUnable to Work                           0.1716955
MARITALNEWDivorced/Widowed/Separated               0.7743718
MARITALNEWNever married                            0.9291536
                                                       2.5 %
(Intercept)                                        6.2345150
RENTHOM1Summary1own home                           1.0818093
SEXNEWFemale                                       0.6893760
HOUSEHOLDSIZENEW3 or 4                             0.8410894
HOUSEHOLDSIZENEW5 or 6                             0.8950361
HOUSEHOLDSIZENEW7 and more                         0.7737515
AGEGROUPNEW45-54                                   0.9241766
AGEGROUPNEW55-64                                   1.2018292
AGEGROUPNEW65-80                                   1.9009454
INCOMENEW25000 to < 50000                          1.2448940
INCOMENEW>=50000                                   1.6410103
INCOMENEWUnknown                                   1.3232089
RACEGRNon-Hispanic black                           1.1347510
```

```
RACEGROthers                                              0.8418971
RACEGRHispanic                                            0.8121636
EDUCANEWHigh School Graduate to < 4 years of college      1.0062789
EDUCANEW>= 4 years of college                             1.1708477
EMPLOY1NEWUnemployed                                      0.3411362
EMPLOY1NEWHomemaker                                       0.7662269
EMPLOY1NEWRetired                                         0.7406277
EMPLOY1NEWUnable to Work                                  0.1574674
MARITALNEWDivorced/Widowed/Separated                      0.7229128
MARITALNEWNever married                                   0.8359695
                                                             97.5 %
(Intercept)                                               9.1892303
RENTHOM1Summary1own home                                  1.2472962
SEXNEWFemale                                              0.7808706
HOUSEHOLDSIZENEW3 or 4                                    0.9906377
HOUSEHOLDSIZENEW5 or 6                                    1.1909158
HOUSEHOLDSIZENEW7 and more                                1.4089047
AGEGROUPNEW45-54                                          1.1432554
AGEGROUPNEW55-64                                          1.4969068
AGEGROUPNEW65-80                                          2.4367329
INCOMENEW25000 to < 50000                                 1.4585053
INCOMENEW>=50000                                          1.9663508
INCOMENEWUnknown                                          1.6025599
RACEGRNon-Hispanic black                                  1.3712476
RACEGROthers                                              1.0269851
RACEGRHispanic                                            1.0347040
EDUCANEWHigh School Graduate to < 4 years of college      1.3180244
EDUCANEW>= 4 years of college                             1.5698073
EMPLOY1NEWUnemployed                                      0.4322406
EMPLOY1NEWHomemaker                                       0.9872087
EMPLOY1NEWRetired                                         0.8859837
EMPLOY1NEWUnable to Work                                  0.1871853
MARITALNEWDivorced/Widowed/Separated                      0.8295129
MARITALNEWNever married                                   1.0339434
                                                                  p
(Intercept)                                               6.506957e-93
RENTHOM1Summary1own home                                  3.604993e-05
SEXNEWFemale                                              2.115975e-22
HOUSEHOLDSIZENEW3 or 4                                    2.838053e-02
HOUSEHOLDSIZENEW5 or 6                                    6.757459e-01
HOUSEHOLDSIZENEW7 and more                                8.224212e-01
AGEGROUPNEW45-54                                          6.084197e-01
AGEGROUPNEW55-64                                          1.535243e-07
AGEGROUPNEW65-80                                          9.988067e-34
INCOMENEW25000 to < 50000                                 1.585066e-13
INCOMENEW>=50000                                          6.371018e-37
INCOMENEWUnknown                                          1.565470e-14
RACEGRNon-Hispanic black                                  5.001362e-06
RACEGROthers                                              1.465504e-01
RACEGRHispanic                                            1.538543e-01
EDUCANEWHigh School Graduate to < 4 years of college      3.862902e-02
EDUCANEW>= 4 years of college                             4.461760e-05
EMPLOY1NEWUnemployed                                      1.075737e-56
EMPLOY1NEWHomemaker                                       2.928803e-02
EMPLOY1NEWRetired                                         4.078797e-06
EMPLOY1NEWUnable to Work                                  0.000000e+00
MARITALNEWDivorced/Widowed/Separated                      3.155503e-13
MARITALNEWNever married                                   1.752946e-01
> logistictable <- cbind(OR=exp(coef(logistic)), exp(confint(logistic)),
p=summary(logistic)$coef[, 4])
Waiting for profiling to be done...
> write.csv(logistictable, "C:/Users/James/Desktop/logittable.csv")
```

```
## Verifying fit of logistic regression (with predictors vs. without
predictors)
> qchisq(0.95,68250)
[1] 68863.86
> with(logistic, null deviance - deviance)
Error: unexpected symbol in "with(logistic, null deviance"
> with(logistic, null.deviance - deviance)
[1] 4180.224
> with(logistic, df.null - df.residual)
[1] 17
> with(logistic, pchisq(null.deviance - deviance, df.null - df.residual,
lower.tail = FALSE))
[1] 0


## Log-Likelihood

> logLik(logistic)
'log Lik.' -18238.98 (df=23)



## POISSON REGRESSION:


> POISSON <- glm(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW, family=poisson(link="log"))
> summary(POISSON)

Call:
glm(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
    HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW +
    EMPLOY1NEW + MARITALNEW, family = poisson(link = "log"))

Deviance Residuals:
   Min      1Q  Median      3Q     Max
-6.433  -2.191  -1.893  -1.369  12.330

Coefficients:
                                                        Estimate
(Intercept)                                             1.225527
RENTHOM1Summary1own home                               -0.109092
SEXNEWFemale                                            0.281583
HOUSEHOLDSIZENEW3 or 4                                  0.094658
HOUSEHOLDSIZENEW5 or 6                                  0.042891
HOUSEHOLDSIZENEW7 and more                             -0.001799
AGEGROUPNEW45-54                                       -0.005941
AGEGROUPNEW55-64                                       -0.170818
AGEGROUPNEW65-80                                       -0.558701
INCOMENEW25000 to < 50000                              -0.222877
INCOMENEW>=50000                                       -0.424066
INCOMENEWUnknown                                       -0.300508
RACEGRNon-Hispanic black                               -0.137655
RACEGROthers                                            0.051453
RACEGRHispanic                                          0.018781
EDUCANEWHigh School Graduate to < 4 years of college   -0.106373
EDUCANEW>= 4 years of college                          -0.193155
EMPLOY1NEWUnemployed                                    0.709654
EMPLOY1NEWHomemaker                                     0.075313
EMPLOY1NEWRetired                                       0.123635
EMPLOY1NEWUnable to Work                                1.252717
```

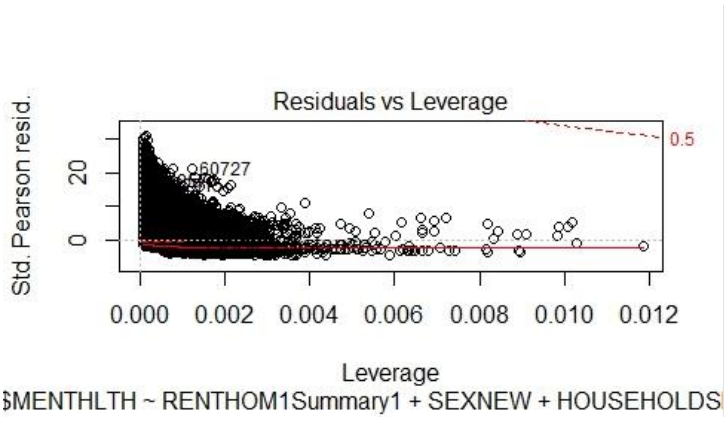
```
MARITALNEWDivorced/Widowed/Separated                  0.181248
MARITALNEWNever married                               0.053332
                                                     Std. Error
(Intercept)                                            0.015769
RENTHOM1Summary1own home                               0.005775
SEXNEWFemale                                           0.005119
HOUSEHOLDSIZENEW3 or 4                                 0.006569
HOUSEHOLDSIZENEW5 or 6                                 0.011451
HOUSEHOLDSIZENEW7 and more                             0.024516
AGEGROUPNEW45-54                                       0.008573
AGEGROUPNEW55-64                                       0.008808
AGEGROUPNEW65-80                                       0.010060
INCOMENEW25000 to < 50000                              0.006607
INCOMENEW>=50000                                       0.007486
INCOMENEWUnknown                                       0.007992
RACEGRNon-Hispanic black                               0.007553
RACEGROthers                                           0.008053
RACEGRHispanic                                         0.009982
EDUCANEWHigh School Graduate to < 4 years of college   0.010848
EDUCANEW>= 4 years of college                          0.011823
EMPLOY1NEWUnemployed                                   0.009838
EMPLOY1NEWHomemaker                                    0.010660
EMPLOY1NEWRetired                                      0.007427
EMPLOY1NEWUnable to Work                               0.006944
MARITALNEWDivorced/Widowed/Separated                   0.005652
MARITALNEWNever married                                0.008621
                                                      z value
(Intercept)                                            77.715
RENTHOM1Summary1own home                              -18.891
SEXNEWFemale                                           55.002
HOUSEHOLDSIZENEW3 or 4                                 14.409
HOUSEHOLDSIZENEW5 or 6                                  3.746
HOUSEHOLDSIZENEW7 and more                             -0.073
AGEGROUPNEW45-54                                       -0.693
AGEGROUPNEW55-64                                      -19.395
AGEGROUPNEW65-80                                      -55.535
INCOMENEW25000 to < 50000                             -33.736
INCOMENEW>=50000                                      -56.646
INCOMENEWUnknown                                      -37.603
RACEGRNon-Hispanic black                              -18.225
RACEGROthers                                            6.389
RACEGRHispanic                                          1.882
EDUCANEWHigh School Graduate to < 4 years of college  -9.806
EDUCANEW>= 4 years of college                         -16.338
EMPLOY1NEWUnemployed                                   72.133
EMPLOY1NEWHomemaker                                     7.065
EMPLOY1NEWRetired                                      16.647
EMPLOY1NEWUnable to Work                              180.398
MARITALNEWDivorced/Widowed/Separated                   32.069
MARITALNEWNever married                                 6.186
                                                     Pr(>|z|)
(Intercept)                                           < 2e-16 ***
RENTHOM1Summary1own home                              < 2e-16 ***
SEXNEWFemale                                          < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                < 2e-16 ***
HOUSEHOLDSIZENEW5 or 6                                0.00018 ***
HOUSEHOLDSIZENEW7 and more                            0.94149
AGEGROUPNEW45-54                                      0.48832
AGEGROUPNEW55-64                                      < 2e-16 ***
AGEGROUPNEW65-80                                      < 2e-16 ***
INCOMENEW25000 to < 50000                             < 2e-16 ***
INCOMENEW>=50000                                      < 2e-16 ***
INCOMENEWUnknown                                      < 2e-16 ***
RACEGRNon-Hispanic black                              < 2e-16 ***
```

```
RACEGROthers                                                1.67e-10 ***
RACEGRHispanic                                               0.05990 .
EDUCANEWHigh School Graduate to < 4 years of college        < 2e-16 ***
EDUCANEW>= 4 years of college                               < 2e-16 ***
EMPLOY1NEWUnemployed                                        < 2e-16 ***
EMPLOY1NEWHomemaker                                         1.61e-12 ***
EMPLOY1NEWRetired                                           < 2e-16 ***
EMPLOY1NEWUnable to Work                                    < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                        < 2e-16 ***
MARITALNEWNever married                                     6.16e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for poisson family taken to be 1)

    Null deviance: 692950  on 68272  degrees of freedom
Residual deviance: 600314  on 68250  degrees of freedom
  (1697 observations deleted due to missingness)
AIC: 667567

Number of Fisher Scoring iterations: 7
```

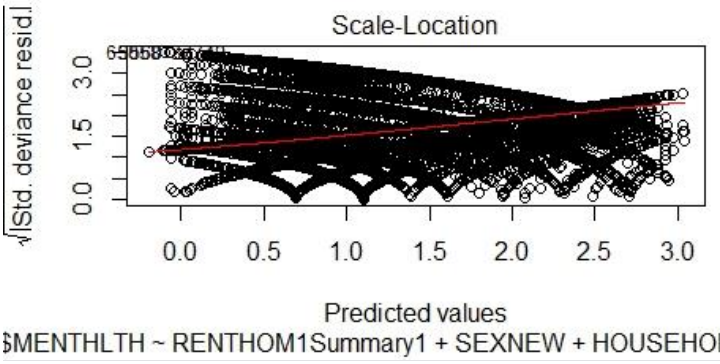
```
## Log- likelihood

> logLik(POISSON)
'log Lik.' -333760.5 (df=23)
```

```
## RESIDUALS vs LEVERAGE: POISSON
```

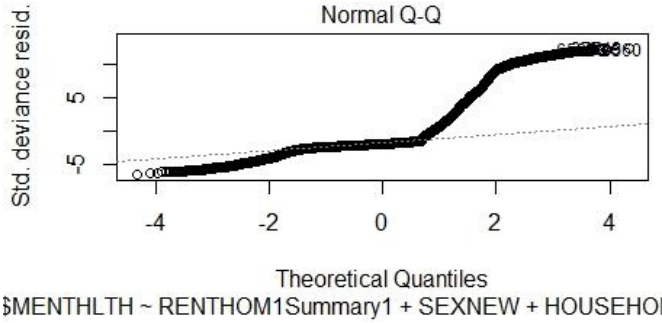
```
> plot(POISSON)
```



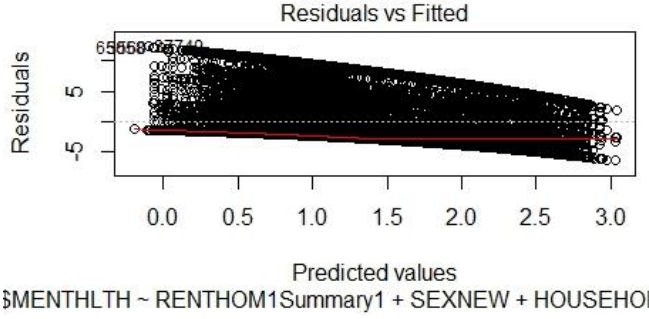

```
## SCALE LOCATION: POISSON
```



QQ Plot: Poisson Regression



RESIDUALS VS. FITTED: Poisson Regression



QUASI POISSON

```
> QPOISSON <- glm(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW, family=quasipoisson(link="log"))
> summary(QPOISSON)

Call:
glm(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
    HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW +
    EMPLOY1NEW + MARITALNEW, family = quasipoisson(link = "log"))

Deviance Residuals:
   Min      1Q  Median      3Q     Max
-6.433  -2.191  -1.893  -1.369  12.330

Coefficients:
                                                      Estimate
(Intercept)                                           1.225527
RENTHOM1Summary1own home                             -0.109092
SEXNEWFemale                                          0.281583
HOUSEHOLDSIZENEW3 or 4                                0.094658
HOUSEHOLDSIZENEW5 or 6                                0.042891
HOUSEHOLDSIZENEW7 and more                           -0.001799
AGEGROUPNEW45-54                                     -0.005941
AGEGROUPNEW55-64                                     -0.170818
AGEGROUPNEW65-80                                     -0.558701
INCOMENEW25000 to < 50000                            -0.222877
INCOMENEW>=50000                                     -0.424066
INCOMENEWUnknown                                     -0.300508
RACEGRNon-Hispanic black                             -0.137655
RACEGROthers                                          0.051453
RACEGRHispanic                                        0.018781
EDUCANEWHigh School Graduate to < 4 years of college -0.106373
EDUCANEW>= 4 years of college                        -0.193155
EMPLOY1NEWUnemployed                                  0.709654
EMPLOY1NEWHomemaker                                   0.075313
EMPLOY1NEWRetired                                     0.123635
EMPLOY1NEWUnable to Work                              1.252717
MARITALNEWDivorced/Widowed/Separated                  0.181248
MARITALNEWNever married                               0.053332
                                                     Std. Error
(Intercept)                                            0.064534
RENTHOM1Summary1own home                               0.023632
SEXNEWFemale                                           0.020951
HOUSEHOLDSIZENEW3 or 4                                 0.026884
HOUSEHOLDSIZENEW5 or 6                                 0.046861
HOUSEHOLDSIZENEW7 and more                             0.100328
AGEGROUPNEW45-54                                       0.035084
AGEGROUPNEW55-64                                       0.036044
AGEGROUPNEW65-80                                       0.041171
INCOMENEW25000 to < 50000                              0.027036
INCOMENEW>=50000                                       0.030637
INCOMENEWUnknown                                       0.032704
RACEGRNon-Hispanic black                               0.030910
RACEGROthers                                           0.032956
RACEGRHispanic                                         0.040849
EDUCANEWHigh School Graduate to < 4 years of college   0.044394
```

```
EDUCANEW>= 4 years of college                              0.048383
EMPLOY1NEWUnemployed                                       0.040261
EMPLOY1NEWHomemaker                                        0.043626
EMPLOY1NEWRetired                                          0.030394
EMPLOY1NEWUnable to Work                                   0.028418
MARITALNEWDivorced/Widowed/Separated                       0.023129
MARITALNEWNever married                                    0.035280
                                                          t value
(Intercept)                                                18.990
RENTHOM1Summary1own home                                   -4.616
SEXNEWFemale                                               13.440
HOUSEHOLDSIZENEW3 or 4                                      3.521
HOUSEHOLDSIZENEW5 or 6                                      0.915
HOUSEHOLDSIZENEW7 and more                                 -0.018
AGEGROUPNEW45-54                                           -0.169
AGEGROUPNEW55-64                                           -4.739
AGEGROUPNEW65-80                                          -13.570
INCOMENEW25000 to < 50000                                  -8.244
INCOMENEW>=50000                                          -13.842
INCOMENEWUnknown                                           -9.189
RACEGRNon-Hispanic black                                   -4.453
RACEGROthers                                                1.561
RACEGRHispanic                                              0.460
EDUCANEWHigh School Graduate to < 4 years of college       -2.396
EDUCANEW>= 4 years of college                              -3.992
EMPLOY1NEWUnemployed                                       17.626
EMPLOY1NEWHomemaker                                         1.726
EMPLOY1NEWRetired                                           4.068
EMPLOY1NEWUnable to Work                                   44.082
MARITALNEWDivorced/Widowed/Separated                        7.836
MARITALNEWNever married                                     1.512
                                                          Pr(>|t|)
(Intercept)                                                < 2e-16 ***
RENTHOM1Summary1own home                                  3.91e-06 ***
SEXNEWFemale                                               < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                     0.00043 ***
HOUSEHOLDSIZENEW5 or 6                                     0.36004
HOUSEHOLDSIZENEW7 and more                                 0.98569
AGEGROUPNEW45-54                                           0.86553
AGEGROUPNEW55-64                                          2.15e-06 ***
AGEGROUPNEW65-80                                           < 2e-16 ***
INCOMENEW25000 to < 50000                                  < 2e-16 ***
INCOMENEW>=50000                                           < 2e-16 ***
INCOMENEWUnknown                                           < 2e-16 ***
RACEGRNon-Hispanic black                                  8.47e-06 ***
RACEGROthers                                               0.11846
RACEGRHispanic                                             0.64569
EDUCANEWHigh School Graduate to < 4 years of college       0.01657 *
EDUCANEW>= 4 years of college                             6.55e-05 ***
EMPLOY1NEWUnemployed                                       < 2e-16 ***
EMPLOY1NEWHomemaker                                        0.08429 .
EMPLOY1NEWRetired                                         4.75e-05 ***
EMPLOY1NEWUnable to Work                                   < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                      4.71e-15 ***
MARITALNEWNever married                                    0.13062
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasipoisson family taken to be 16.74745)

    Null deviance: 692950  on 68272  degrees of freedom
Residual deviance: 600314  on 68250  degrees of freedom
  (1697 observations deleted due to missingness)
AIC: NA
```

```
Number of Fisher Scoring iterations: 7
```

Negative binomial regression

```
> library(MASS)
> NEGBIN <- glm.nb(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW)
> summary(NEGBIN)

Call:
glm.nb(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
    HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW +
    EMPLOY1NEW + MARITALNEW, init.theta = 0.1008499705, link = log)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.0501  -0.8016  -0.7620  -0.2568   2.3387

Coefficients:
                                                    Estimate
(Intercept)                                          1.22937
RENTHOM1Summary1own home                            -0.13509
SEXNEWFemale                                         0.31974
HOUSEHOLDSIZENEW3 or 4                               0.14724
HOUSEHOLDSIZENEW5 or 6                               0.10050
HOUSEHOLDSIZENEW7 and more                           0.06929
AGEGROUPNEW45-54                                    -0.01664
AGEGROUPNEW55-64                                    -0.14374
AGEGROUPNEW65-80                                    -0.48265
INCOMENEW25000 to < 50000                           -0.25275
INCOMENEW>=50000                                    -0.43374
INCOMENEWUnknown                                    -0.35167
RACEGRNon-Hispanic black                            -0.03777
RACEGROthers                                         0.09323
RACEGRHispanic                                       0.10627
EDUCANEWHigh School Graduate to < 4 years of college -0.17815
EDUCANEW>= 4 years of college                       -0.28065
EMPLOY1NEWUnemployed                                 0.70483
EMPLOY1NEWHomemaker                                  0.04898
EMPLOY1NEWRetired                                    0.10268
EMPLOY1NEWUnable to Work                             1.26914
MARITALNEWDivorced/Widowed/Separated                 0.21986
MARITALNEWNever married                              0.10793
                                                    Std. Error
(Intercept)                                            0.09882
RENTHOM1Summary1own home                               0.03677
SEXNEWFemale                                           0.02674
HOUSEHOLDSIZENEW3 or 4                                 0.03823
HOUSEHOLDSIZENEW5 or 6                                 0.06554
HOUSEHOLDSIZENEW7 and more                             0.14759
AGEGROUPNEW45-54                                       0.05163
```

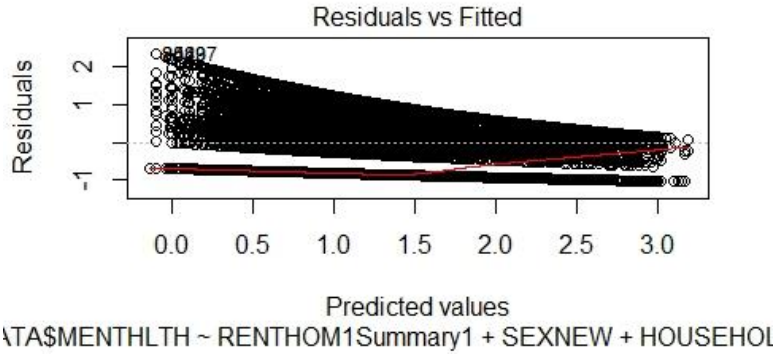
```
AGEGROUPNEW55-64                                        0.05273
AGEGROUPNEW65-80                                        0.05775
INCOMENEW25000 to < 50000                               0.03759
INCOMENEW>=50000                                        0.04026
INCOMENEWUnknown                                        0.04483
RACEGRNon-Hispanic black                                0.04638
RACEGROthers                                            0.04624
RACEGRHispanic                                          0.06086
EDUCANEWHigh School Graduate to < 4 years of college    0.07433
EDUCANEW>= 4 years of college                           0.07762
EMPLOY1NEWUnemployed                                    0.06941
EMPLOY1NEWHomemaker                                     0.05469
EMPLOY1NEWRetired                                       0.03620
EMPLOY1NEWUnable to Work                                0.05240
MARITALNEWDivorced/Widowed/Separated                    0.03069
MARITALNEWNever married                                 0.05079
                                                       z value
(Intercept)                                             12.440
RENTHOM1Summary1own home                                -3.674
SEXNEWFemale                                            11.956
HOUSEHOLDSIZENEW3 or 4                                   3.851
HOUSEHOLDSIZENEW5 or 6                                   1.533
HOUSEHOLDSIZENEW7 and more                               0.469
AGEGROUPNEW45-54                                        -0.322
AGEGROUPNEW55-64                                        -2.726
AGEGROUPNEW65-80                                        -8.358
INCOMENEW25000 to < 50000                               -6.724
INCOMENEW>=50000                                       -10.773
INCOMENEWUnknown                                        -7.845
RACEGRNon-Hispanic black                                -0.814
RACEGROthers                                             2.016
RACEGRHispanic                                           1.746
EDUCANEWHigh School Graduate to < 4 years of college    -2.397
EDUCANEW>= 4 years of college                           -3.615
EMPLOY1NEWUnemployed                                    10.155
EMPLOY1NEWHomemaker                                      0.896
EMPLOY1NEWRetired                                        2.836
EMPLOY1NEWUnable to Work                                24.220
MARITALNEWDivorced/Widowed/Separated                     7.163
MARITALNEWNever married                                  2.125
                                                       Pr(>|z|)
(Intercept)                                             < 2e-16 ***
RENTHOM1Summary1own home                               0.000239 ***
SEXNEWFemale                                            < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                 0.000117 ***
HOUSEHOLDSIZENEW5 or 6                                 0.125204
HOUSEHOLDSIZENEW7 and more                             0.638723
AGEGROUPNEW45-54                                       0.747301
AGEGROUPNEW55-64                                       0.006409 **
AGEGROUPNEW65-80                                        < 2e-16 ***
INCOMENEW25000 to < 50000                              1.77e-11 ***
INCOMENEW>=50000                                        < 2e-16 ***
INCOMENEWUnknown                                       4.34e-15 ***
RACEGRNon-Hispanic black                               0.415484
RACEGROthers                                           0.043789 *
RACEGRHispanic                                         0.080773 .
EDUCANEWHigh School Graduate to < 4 years of college   0.016545 *
EDUCANEW>= 4 years of college                          0.000300 ***
EMPLOY1NEWUnemployed                                    < 2e-16 ***
EMPLOY1NEWHomemaker                                    0.370489
EMPLOY1NEWRetired                                      0.004567 **
EMPLOY1NEWUnable to Work                                < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                   7.91e-13 ***
MARITALNEWNever married                                0.033573 *
```

```
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for Negative Binomial(0.1008) family taken to be 1)

    Null deviance: 41357  on 68272  degrees of freedom
Residual deviance: 38712  on 68250  degrees of freedom
  (1697 observations deleted due to missingness)
AIC: 198784

Number of Fisher Scoring iterations: 1


              Theta:  0.100850
          Std. Err.:  0.000930

 2 x log-likelihood:  -198735.522000
```

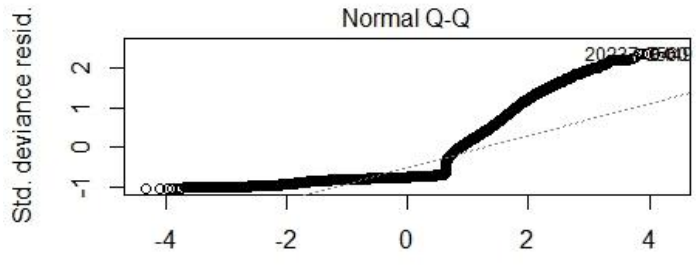
Log-likelihood

```
> logLik(NEGBIN)
'log Lik.' -99367.76 (df=24)
```

RESIDUALS VS FITTED: Negative binomial

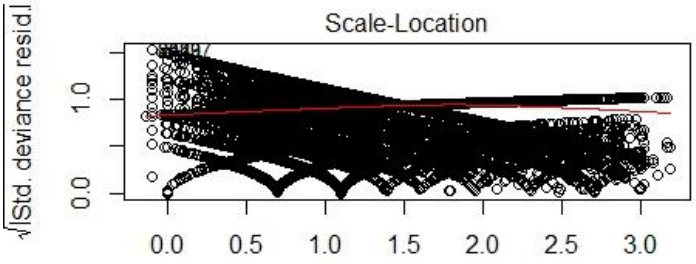


QQ PLOT: Negative binomial



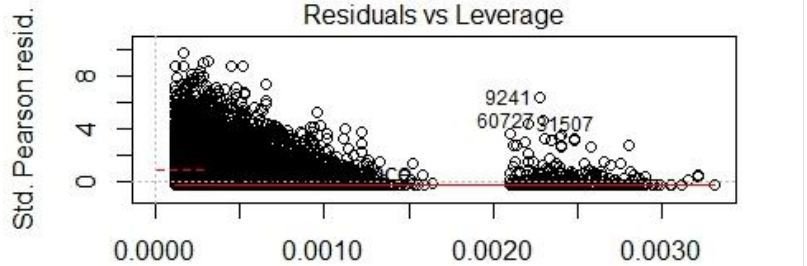
ATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOL

SCALE- LOCATION: Negative binomial



ATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOL

RESIDUALS VS Leverage: Negative binomial



ATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW + HOUSEHOL

Install packages for zero-inflated models

```
> install.packages("ggplot2")
```

```
> install.packages("pscl")
> install.packages("boot")
> library(pscl)
```

Zero-inflated Poisson Model

```
> ZIPoisson <- zeroinfl(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW, dist="poisson")
> summary(ZIPoisson)

Call:
zeroinfl(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
    HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW +
    EMPLOY1NEW + MARITALNEW, dist = "poisson")

Pearson residuals:
    Min      1Q  Median      3Q     Max
-1.6478 -0.5512 -0.4546 -0.3311 12.7064

Count model coefficients (poisson with log link):
                                                    Estimate
(Intercept)                                         2.486550
RENTHOM1Summary1own home                           -0.045803
SEXNEWFemale                                       -0.029553
HOUSEHOLDSIZENEW3 or 4                             -0.030893
HOUSEHOLDSIZENEW5 or 6                             -0.089621
HOUSEHOLDSIZENEW7 and more                         -0.094529
AGEGROUPNEW45-54                                   -0.003706
AGEGROUPNEW55-64                                   -0.039591
AGEGROUPNEW65-80                                   -0.083705
INCOMENEW25000 to < 50000                          -0.112349
INCOMENEW>=50000                                   -0.217196
INCOMENEWUnknown                                   -0.015222
RACEGRNon-Hispanic black                           -0.045536
RACEGROthers                                        0.076977
RACEGRHispanic                                      0.068825
EDUCANEWHigh School Graduate to < 4 years of college -0.082557
EDUCANEW>= 4 years of college                      -0.220436
EMPLOY1NEWUnemployed                                0.297438
EMPLOY1NEWHomemaker                                 0.076263
EMPLOY1NEWRetired                                   0.128586
EMPLOY1NEWUnable to Work                            0.543249
MARITALNEWDivorced/Widowed/Separated                0.095432
MARITALNEWNever married                            -0.001573
                                                   Std. Error
(Intercept)                                          0.015614
RENTHOM1Summary1own home                             0.005733
SEXNEWFemale                                         0.005088
HOUSEHOLDSIZENEW3 or 4                               0.006505
HOUSEHOLDSIZENEW5 or 6                               0.011422
HOUSEHOLDSIZENEW7 and more                           0.024378
AGEGROUPNEW45-54                                     0.008575
AGEGROUPNEW55-64                                     0.008766
AGEGROUPNEW65-80                                     0.010000
INCOMENEW25000 to < 50000                            0.006558
INCOMENEW>=50000                                     0.007381
INCOMENEWUnknown                                     0.007925
RACEGRNon-Hispanic black                             0.007519
RACEGROthers                                         0.008053
RACEGRHispanic                                       0.009890
EDUCANEWHigh School Graduate to < 4 years of college   0.010831
EDUCANEW>= 4 years of college                        0.011824
EMPLOY1NEWUnemployed                                 0.009841
EMPLOY1NEWHomemaker                                  0.010653
```

```
EMPLOY1NEWRetired                                          0.007451
EMPLOY1NEWUnable to Work                                   0.006836
MARITALNEWDivorced/Widowed/Separated                       0.005544
MARITALNEWNever married                                    0.008609
                                                          z value
(Intercept)                                               159.248
RENTHOM1Summary1own home                                   -7.989
SEXNEWFemale                                               -5.809
HOUSEHOLDSIZENEW3 or 4                                     -4.749
HOUSEHOLDSIZENEW5 or 6                                     -7.846
HOUSEHOLDSIZENEW7 and more                                 -3.878
AGEGROUPNEW45-54                                           -0.432
AGEGROUPNEW55-64                                           -4.516
AGEGROUPNEW65-80                                           -8.370
INCOMENEW25000 to < 50000                                 -17.133
INCOMENEW>=50000                                          -29.427
INCOMENEWUnknown                                           -1.921
RACEGRNon-Hispanic black                                   -6.056
RACEGROthers                                                9.559
RACEGRHispanic                                              6.959
EDUCANEWHigh School Graduate to < 4 years of college       -7.622
EDUCANEW>= 4 years of college                             -18.643
EMPLOY1NEWUnemployed                                       30.225
EMPLOY1NEWHomemaker                                         7.159
EMPLOY1NEWRetired                                          17.257
EMPLOY1NEWUnable to Work                                   79.472
MARITALNEWDivorced/Widowed/Separated                       17.212
MARITALNEWNever married                                    -0.183
                                                          Pr(>|z|)
(Intercept)                                                < 2e-16 ***
RENTHOM1Summary1own home                                  1.36e-15 ***
SEXNEWFemale                                              6.29e-09 ***
HOUSEHOLDSIZENEW3 or 4                                    2.05e-06 ***
HOUSEHOLDSIZENEW5 or 6                                    4.29e-15 ***
HOUSEHOLDSIZENEW7 and more                                0.000105 ***
AGEGROUPNEW45-54                                          0.665607
AGEGROUPNEW55-64                                          6.29e-06 ***
AGEGROUPNEW65-80                                           < 2e-16 ***
INCOMENEW25000 to < 50000                                  < 2e-16 ***
INCOMENEW>=50000                                           < 2e-16 ***
INCOMENEWUnknown                                          0.054760 .
RACEGRNon-Hispanic black                                  1.40e-09 ***
RACEGROthers                                               < 2e-16 ***
RACEGRHispanic                                            3.42e-12 ***
EDUCANEWHigh School Graduate to < 4 years of college      2.50e-14 ***
EDUCANEW>= 4 years of college                              < 2e-16 ***
EMPLOY1NEWUnemployed                                       < 2e-16 ***
EMPLOY1NEWHomemaker                                       8.14e-13 ***
EMPLOY1NEWRetired                                          < 2e-16 ***
EMPLOY1NEWUnable to Work                                   < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                       < 2e-16 ***
MARITALNEWNever married                                   0.854992

Zero-inflation model coefficients (binomial with logit link):
                                                           Estimate
(Intercept)                                                0.934557
RENTHOM1Summary1own home                                   0.127629
SEXNEWFemale                                              -0.491124
HOUSEHOLDSIZENEW3 or 4                                    -0.206977
HOUSEHOLDSIZENEW5 or 6                                    -0.211747
HOUSEHOLDSIZENEW7 and more                                -0.130026
AGEGROUPNEW45-54                                           0.013478
AGEGROUPNEW55-64                                           0.228143
AGEGROUPNEW65-80                                           0.711614
```

```
INCOMENEW25000 to < 50000                                  0.179567
INCOMENEW>=50000                                           0.311106
INCOMENEWUnknown                                           0.458008
RACEGRNon-Hispanic black                                   0.127878
RACEGROthers                                               0.051851
RACEGRHispanic                                             0.063804
EDUCANEWHigh School Graduate to < 4 years of college      -0.008404
EDUCANEW>= 4 years of college                             -0.091265
EMPLOY1NEWUnemployed                                      -0.648381
EMPLOY1NEWHomemaker                                        0.005111
EMPLOY1NEWRetired                                         -0.034353
EMPLOY1NEWUnable to Work                                  -1.277703
MARITALNEWDivorced/Widowed/Separated                      -0.146758
MARITALNEWNever married                                   -0.116406
                                                          Std. Error
(Intercept)                                                 0.070600
RENTHOM1Summary1own home                                    0.025771
SEXNEWFemale                                                0.020083
HOUSEHOLDSIZENEW3 or 4                                      0.026839
HOUSEHOLDSIZENEW5 or 6                                      0.044872
HOUSEHOLDSIZENEW7 and more                                  0.100999
AGEGROUPNEW45-54                                            0.034843
AGEGROUPNEW55-64                                            0.036173
AGEGROUPNEW65-80                                            0.040757
INCOMENEW25000 to < 50000                                   0.027030
INCOMENEW>=50000                                            0.029222
INCOMENEWUnknown                                            0.033668
RACEGRNon-Hispanic black                                    0.033095
RACEGROthers                                                0.033828
RACEGRHispanic                                              0.043330
EDUCANEWHigh School Graduate to < 4 years of college        0.053772
EDUCANEW>= 4 years of college                               0.056288
EMPLOY1NEWUnemployed                                        0.045502
EMPLOY1NEWHomemaker                                         0.038993
EMPLOY1NEWRetired                                           0.027362
EMPLOY1NEWUnable to Work                                    0.035172
MARITALNEWDivorced/Widowed/Separated                        0.022686
MARITALNEWNever married                                     0.036014
                                                          z value
(Intercept)                                                13.237
RENTHOM1Summary1own home                                    4.953
SEXNEWFemale                                             -24.454
HOUSEHOLDSIZENEW3 or 4                                     -7.712
HOUSEHOLDSIZENEW5 or 6                                     -4.719
HOUSEHOLDSIZENEW7 and more                                 -1.287
AGEGROUPNEW45-54                                            0.387
AGEGROUPNEW55-64                                            6.307
AGEGROUPNEW65-80                                           17.460
INCOMENEW25000 to < 50000                                   6.643
INCOMENEW>=50000                                           10.646
INCOMENEWUnknown                                           13.604
RACEGRNon-Hispanic black                                    3.864
RACEGROthers                                                1.533
RACEGRHispanic                                              1.473
EDUCANEWHigh School Graduate to < 4 years of college       -0.156
EDUCANEW>= 4 years of college                              -1.621
EMPLOY1NEWUnemployed                                      -14.250
EMPLOY1NEWHomemaker                                         0.131
EMPLOY1NEWRetired                                          -1.255
EMPLOY1NEWUnable to Work                                  -36.327
MARITALNEWDivorced/Widowed/Separated                       -6.469
MARITALNEWNever married                                    -3.232
                                                          Pr(>|z|)
(Intercept)                                                < 2e-16 ***
```

```
RENTHOM1Summary1own home                                    7.33e-07 ***
SEXNEWFemale                                                < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                      1.24e-14 ***
HOUSEHOLDSIZENEW5 or 6                                      2.37e-06 ***
HOUSEHOLDSIZENEW7 and more                                  0.197957
AGEGROUPNEW45-54                                            0.698890
AGEGROUPNEW55-64                                            2.84e-10 ***
AGEGROUPNEW65-80                                            < 2e-16 ***
INCOMENEW25000 to < 50000                                   3.07e-11 ***
INCOMENEW>=50000                                            < 2e-16 ***
INCOMENEWUnknown                                            < 2e-16 ***
RACEGRNon-Hispanic black                                    0.000112 ***
RACEGROthers                                                0.125322
RACEGRHispanic                                              0.140878
EDUCANEWHigh School Graduate to < 4 years of college        0.875799
EDUCANEW>= 4 years of college                               0.104930
EMPLOY1NEWUnemployed                                        < 2e-16 ***
EMPLOY1NEWHomemaker                                         0.895720
EMPLOY1NEWRetired                                           0.209298
EMPLOY1NEWUnable to Work                                    < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                        9.87e-11 ***
MARITALNEWNever married                                     0.001228 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Number of iterations in BFGS optimization: 54
Log-likelihood: -1.475e+05 on 46 Df


> logLik(ZIPoisson)
'log Lik.' -147471.5 (df=46)
```

##Zero-inflated Negative Binomial

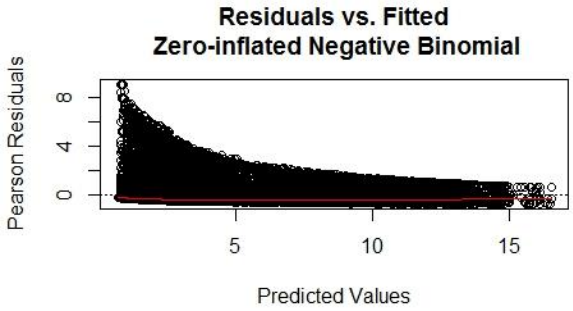
```
> ZIPnegbin <- zeroinfl(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW, dist="negbin")

> summary(ZIPnegbin)

Call:
zeroinfl(formula = NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
    HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW +
    EMPLOY1NEW + MARITALNEW, dist = "negbin")
```

```
Pearson residuals:
    Min      1Q  Median      3Q     Max
-0.7161 -0.3809 -0.3171 -0.2321  9.0174

Count model coefficients (negbin with log link):
                                                    Estimate
(Intercept)                                         2.329364
RENTHOM1Summary1own home                           -0.053358
SEXNEWFemale                                       -0.027457
HOUSEHOLDSIZENEW3 or 4                             -0.032751
HOUSEHOLDSIZENEW5 or 6                             -0.102358
HOUSEHOLDSIZENEW7 and more                         -0.088838
AGEGROUPNEW45-54                                   -0.005365
AGEGROUPNEW55-64                                   -0.020946
AGEGROUPNEW65-80                                   -0.054782
INCOMENEW25000 to < 50000                          -0.125954
INCOMENEW>=50000                                   -0.245994
INCOMENEWUnknown                                   -0.019726
RACEGRNon-Hispanic black                           -0.005849
RACEGROthers                                        0.100953
RACEGRHispanic                                      0.082244
EDUCANEWHigh School Graduate to < 4 years of college -0.116373
EDUCANEW>= 4 years of college                      -0.294891
EMPLOY1NEWUnemployed                                0.331209
EMPLOY1NEWHomemaker                                 0.076288
EMPLOY1NEWRetired                                   0.126415
EMPLOY1NEWUnable to Work                            0.607805
MARITALNEWDivorced/Widowed/Separated                0.125993
MARITALNEWNever married                             0.012431
Log(theta)                                         -0.323101
                                                   Std. Error
(Intercept)                                          0.066010
RENTHOM1Summary1own home                             0.024020
SEXNEWFemale                                         0.020095
HOUSEHOLDSIZENEW3 or 4                               0.025069
HOUSEHOLDSIZENEW5 or 6                               0.042083
HOUSEHOLDSIZENEW7 and more                           0.094499
AGEGROUPNEW45-54                                     0.032691
AGEGROUPNEW55-64                                     0.033516
AGEGROUPNEW65-80                                     0.038635
INCOMENEW25000 to < 50000                            0.026179
INCOMENEW>=50000                                     0.027841
INCOMENEWUnknown                                     0.033329
RACEGRNon-Hispanic black                             0.030893
RACEGROthers                                         0.033041
RACEGRHispanic                                       0.040962
EDUCANEWHigh School Graduate to < 4 years of college 0.050141
EDUCANEW>= 4 years of college                        0.052783
EMPLOY1NEWUnemployed                                 0.040971
EMPLOY1NEWHomemaker                                  0.039489
EMPLOY1NEWRetired                                    0.028138
EMPLOY1NEWUnable to Work                             0.028724
MARITALNEWDivorced/Widowed/Separated                 0.021705
MARITALNEWNever married                              0.034329
Log(theta)                                           0.020033
                                                    z value
(Intercept)                                          35.288
RENTHOM1Summary1own home                             -2.221
SEXNEWFemale                                         -1.366
HOUSEHOLDSIZENEW3 or 4                               -1.306
HOUSEHOLDSIZENEW5 or 6                               -2.432
HOUSEHOLDSIZENEW7 and more                           -0.940
AGEGROUPNEW45-54                                     -0.164
```

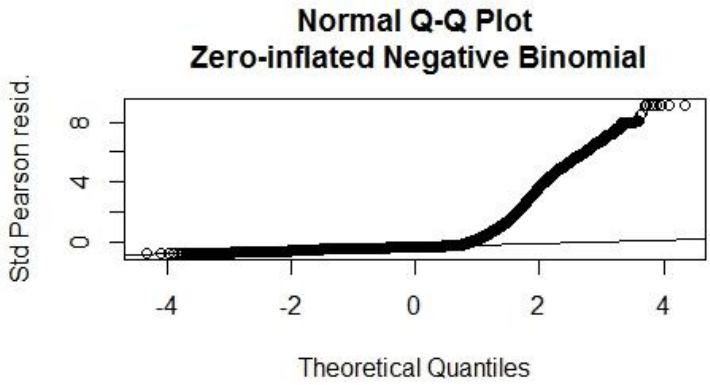
```
AGEGROUPNEW55-64                                          -0.625
AGEGROUPNEW65-80                                          -1.418
INCOMENEW25000 to < 50000                                 -4.811
INCOMENEW>=50000                                          -8.836
INCOMENEWUnknown                                          -0.592
RACEGRNon-Hispanic black                                  -0.189
RACEGROthers                                               3.055
RACEGRHispanic                                             2.008
EDUCANEWHigh School Graduate to < 4 years of college      -2.321
EDUCANEW>= 4 years of college                             -5.587
EMPLOY1NEWUnemployed                                       8.084
EMPLOY1NEWHomemaker                                        1.932
EMPLOY1NEWRetired                                          4.493
EMPLOY1NEWUnable to Work                                  21.160
MARITALNEWDivorced/Widowed/Separated                       5.805
MARITALNEWNever married                                    0.362
Log(theta)                                               -16.129
                                                         Pr(>|z|)
(Intercept)                                               < 2e-16 ***
RENTHOM1Summary1own home                                  0.02632 *
SEXNEWFemale                                              0.17183
HOUSEHOLDSIZENEW3 or 4                                    0.19140
HOUSEHOLDSIZENEW5 or 6                                    0.01500 *
HOUSEHOLDSIZENEW7 and more                                0.34717
AGEGROUPNEW45-54                                          0.86963
AGEGROUPNEW55-64                                          0.53201
AGEGROUPNEW65-80                                          0.15621
INCOMENEW25000 to < 50000                                1.50e-06 ***
INCOMENEW>=50000                                          < 2e-16 ***
INCOMENEWUnknown                                          0.55396
RACEGRNon-Hispanic black                                  0.84982
RACEGROthers                                              0.00225 **
RACEGRHispanic                                            0.04466 *
EDUCANEWHigh School Graduate to < 4 years of college     0.02029 *
EDUCANEW>= 4 years of college                            2.31e-08 ***
EMPLOY1NEWUnemployed                                     6.27e-16 ***
EMPLOY1NEWHomemaker                                       0.05337 .
EMPLOY1NEWRetired                                        7.04e-06 ***
EMPLOY1NEWUnable to Work                                  < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                     6.44e-09 ***
MARITALNEWNever married                                   0.71727
Log(theta)                                                < 2e-16 ***

Zero-inflation model coefficients (binomial with logit link):
                                                         Estimate
(Intercept)                                               0.70678
RENTHOM1Summary1own home                                  0.13373
SEXNEWFemale                                             -0.53574
HOUSEHOLDSIZENEW3 or 4                                   -0.23647
HOUSEHOLDSIZENEW5 or 6                                   -0.26043
HOUSEHOLDSIZENEW7 and more                               -0.16261
AGEGROUPNEW45-54                                          0.01743
AGEGROUPNEW55-64                                          0.25053
AGEGROUPNEW65-80                                          0.76048
INCOMENEW25000 to < 50000                                 0.17404
INCOMENEW>=50000                                          0.29028
INCOMENEWUnknown                                          0.49280
RACEGRNon-Hispanic black                                  0.13000
RACEGROthers                                              0.07391
RACEGRHispanic                                            0.07838
EDUCANEWHigh School Graduate to < 4 years of college     -0.03299
EDUCANEW>= 4 years of college                            -0.16059
EMPLOY1NEWUnemployed                                     -0.65695
EMPLOY1NEWHomemaker                                       0.02023
```

```
EMPLOY1NEWRetired                                          -0.01820
EMPLOY1NEWUnable to Work                                   -1.31637
MARITALNEWDivorced/Widowed/Separated                       -0.13176
MARITALNEWNever married                                    -0.12606
                                                           Std. Error
(Intercept)                                                   0.07859
RENTHOM1Summary1own home                                      0.02887
SEXNEWFemale                                                  0.02214
HOUSEHOLDSIZENEW3 or 4                                        0.03030
HOUSEHOLDSIZENEW5 or 6                                        0.05175
HOUSEHOLDSIZENEW7 and more                                    0.11573
AGEGROUPNEW45-54                                              0.04033
AGEGROUPNEW55-64                                              0.04136
AGEGROUPNEW65-80                                              0.04601
INCOMENEW25000 to < 50000                                     0.02983
INCOMENEW>=50000                                              0.03226
INCOMENEWUnknown                                              0.03657
RACEGRNon-Hispanic black                                      0.03710
RACEGROthers                                                  0.03740
RACEGRHispanic                                                0.04829
EDUCANEWHigh School Graduate to < 4 years of college          0.05903
EDUCANEW>= 4 years of college                                 0.06191
EMPLOY1NEWUnemployed                                          0.05261
EMPLOY1NEWHomemaker                                           0.04344
EMPLOY1NEWRetired                                             0.02990
EMPLOY1NEWUnable to Work                                      0.04135
MARITALNEWDivorced/Widowed/Separated                          0.02488
MARITALNEWNever married                                       0.04057
                                                           z value
(Intercept)                                                  8.994
RENTHOM1Summary1own home                                     4.632
SEXNEWFemale                                               -24.202
HOUSEHOLDSIZENEW3 or 4                                      -7.804
HOUSEHOLDSIZENEW5 or 6                                      -5.032
HOUSEHOLDSIZENEW7 and more                                  -1.405
AGEGROUPNEW45-54                                             0.432
AGEGROUPNEW55-64                                             6.057
AGEGROUPNEW65-80                                            16.528
INCOMENEW25000 to < 50000                                    5.834
INCOMENEW>=50000                                             8.997
INCOMENEWUnknown                                            13.474
RACEGRNon-Hispanic black                                     3.504
RACEGROthers                                                 1.976
RACEGRHispanic                                               1.623
EDUCANEWHigh School Graduate to < 4 years of college        -0.559
EDUCANEW>= 4 years of college                               -2.594
EMPLOY1NEWUnemployed                                       -12.488
EMPLOY1NEWHomemaker                                          0.466
EMPLOY1NEWRetired                                           -0.609
EMPLOY1NEWUnable to Work                                   -31.837
MARITALNEWDivorced/Widowed/Separated                        -5.297
MARITALNEWNever married                                     -3.107
                                                           Pr(>|z|)
(Intercept)                                                 < 2e-16 ***
RENTHOM1Summary1own home                                   3.62e-06 ***
SEXNEWFemale                                                < 2e-16 ***
HOUSEHOLDSIZENEW3 or 4                                     5.99e-15 ***
HOUSEHOLDSIZENEW5 or 6                                     4.84e-07 ***
HOUSEHOLDSIZENEW7 and more                                 0.159994
AGEGROUPNEW45-54                                           0.665603
AGEGROUPNEW55-64                                           1.38e-09 ***
AGEGROUPNEW65-80                                            < 2e-16 ***
INCOMENEW25000 to < 50000                                  5.41e-09 ***
INCOMENEW>=50000                                            < 2e-16 ***
```

```
INCOMENEWUnknown                                          < 2e-16 ***
RACEGRNon-Hispanic black                                 0.000459 ***
RACEGROthers                                             0.048108 *
RACEGRHispanic                                           0.104551
EDUCANEWHigh School Graduate to < 4 years of college     0.576240
EDUCANEW>= 4 years of college                            0.009492 **
EMPLOY1NEWUnemployed                                      < 2e-16 ***
EMPLOY1NEWHomemaker                                      0.641482
EMPLOY1NEWRetired                                        0.542611
EMPLOY1NEWUnable to Work                                  < 2e-16 ***
MARITALNEWDivorced/Widowed/Separated                     1.18e-07 ***
MARITALNEWNever married                                  0.001890 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Theta = 0.7239
Number of iterations in BFGS optimization: 57
Log-likelihood: -9.625e+04 on 47 Df


## Log-likelihood

> logLik(ZIPnegbin)
'log Lik.' -96255 (df=47)


## Vuong Test to see if zero-inflated negative binomial is better than
negative binomial

> vuong(ZIPnegbin, NEGBIN)
Vuong Non-Nested Hypothesis Test-Statistic: -86.54948
(test-statistic is asymptotically distributed N(0,1) under the
 null that the models are indistinguishible)
in this case:
model2 > model1, with p-value < 2.22e-16


## Plotting zero inflated negative binomial diagnostic plots

> plotpanel1 <- function(fit, ...){
+     plot(x=predict(fit), y=residuals(fit, type="pearson"),
+          xlab="Predicted Values", ylab="Pearson Residuals", ...)
+     abline(h=0, lty=3)
+     lines(lowess(x=predict(fit), y=resid(fit, type="pearson")),
+           col="red")
+ }
> plotpanel1(ZIPnegbin, main="Residuals vs. Fitted\n Zero-inflated Negative
Binomial")
```




```
> plotpanel2 <- function(fit, ...){
+     resids <- scale(residuals(fit, type="pearson"))
+     qqnorm(resids, ylab="Std Pearson resid.", ...)
+     qqline(resids)
+ }
> plotpanel2(ZIPnegbin, main="Normal Q-Q Plot\n Zero-inflated Negative
Binomial")
```




```
##Binding the results together.
```

```
Error in summary(LINEAR$RENTHOM1Summary1)$coef :
  $ operator is invalid for atomic vectors
> lineartable <- cbind(coef(LINEAR), summary(LINEAR)$coef[,2],
p=summary(LINEAR)$coef[, 4], summary(LINEAR)$r.squared)

(Intercept)                                            2.02321777 0.09895371
RENTHOM1Summary1own home                               0.15001449 0.03631047
SEXNEWFemale                                          -0.30949662 0.03178869
HOUSEHOLDSIZENEW3 or 4                                -0.09150387 0.04174473
HOUSEHOLDSIZENEW5 or 6                                 0.03046726 0.07284022
HOUSEHOLDSIZENEW7 and more                             0.03425651 0.15263647
AGEGROUPNEW45-54                                       0.02779975 0.05426136
AGEGROUPNEW55-64                                       0.29392008 0.05600310
AGEGROUPNEW65-80                                       0.76668220 0.06333820
INCOMENEW25000 to < 50000                              0.29811218 0.04039560
INCOMENEW>=50000                                       0.58566274 0.04613639
INCOMENEWUnknown                                       0.37531598 0.04885615
RACEGRNon-Hispanic black                               0.22042019 0.04828767
RACEGROthers                                          -0.07358821 0.05068671
RACEGRHispanic                                        -0.08808176 0.06176631
EDUCANEWHigh School Graduate to < 4 years of college   0.14234950 0.06883049
EDUCANEW>= 4 years of college                          0.30529759 0.07478811
EMPLOY1NEWUnemployed                                  -0.95790547 0.06037165
EMPLOY1NEWHomemaker                                   -0.14085710 0.06462557
EMPLOY1NEWRetired                                     -0.21060872 0.04571170
EMPLOY1NEWUnable to Work                              -1.76203243 0.04410016
MARITALNEWDivorced/Widowed/Separated                  -0.25570322 0.03508749
MARITALNEWNever married                               -0.07348124 0.05421425
                                                                 p
(Intercept)                                           6.506957e-93 -18238.98
RENTHOM1Summary1own home                              3.604993e-05 -18238.98
SEXNEWFemale                                          2.115975e-22 -18238.98
HOUSEHOLDSIZENEW3 or 4                                2.838053e-02 -18238.98
HOUSEHOLDSIZENEW5 or 6                                6.757459e-01 -18238.98
HOUSEHOLDSIZENEW7 and more                            8.224212e-01 -18238.98
AGEGROUPNEW45-54                                      6.084197e-01 -18238.98
AGEGROUPNEW55-64                                      1.535243e-07 -18238.98
AGEGROUPNEW65-80                                      9.988067e-34 -18238.98
INCOMENEW25000 to < 50000                             1.585066e-13 -18238.98
INCOMENEW>=50000                                      6.371018e-37 -18238.98
INCOMENEWUnknown                                      1.565470e-14 -18238.98
RACEGRNon-Hispanic black                              5.001362e-06 -18238.98
RACEGROthers                                          1.465504e-01 -18238.98
RACEGRHispanic                                        1.538543e-01 -18238.98
EDUCANEWHigh School Graduate to < 4 years of college 3.862902e-02 -18238.98
EDUCANEW>= 4 years of college                         4.461760e-05 -18238.98
EMPLOY1NEWUnemployed                                  1.075737e-56 -18238.98
EMPLOY1NEWHomemaker                                   2.928803e-02 -18238.98
EMPLOY1NEWRetired                                     4.078797e-06 -18238.98
EMPLOY1NEWUnable to Work                              0.000000e+00 -18238.98
MARITALNEWDivorced/Widowed/Separated                  3.155503e-13 -18238.98
MARITALNEWNever married                               1.752946e-01 -18238.98
> logistictable <- cbind(coef(logistic), summary(logistic)$coef[,2],
p=summary(logistic)$coef[, 4], summary(logistic)$AIC, logLik(logistic))
> cbind(coef(logistic), summary(logistic)$coef[,2],
p=summary(logistic)$coef[, 4], AIC(logistic), logLik(logistic))

(Intercept)                                            2.02321777 0.09895371
RENTHOM1Summary1own home                               0.15001449 0.03631047
SEXNEWFemale                                          -0.30949662 0.03178869
HOUSEHOLDSIZENEW3 or 4                                -0.09150387 0.04174473
HOUSEHOLDSIZENEW5 or 6                                 0.03046726 0.07284022
HOUSEHOLDSIZENEW7 and more                             0.03425651 0.15263647
AGEGROUPNEW45-54                                       0.02779975 0.05426136
```

```
AGEGROUPNEW55-64                                          0.29392008 0.05600310
AGEGROUPNEW65-80                                          0.76668220 0.06333820
INCOMENEW25000 to < 50000                                 0.29811218 0.04039560
INCOMENEW>=50000                                          0.58566274 0.04613639
INCOMENEWUnknown                                          0.37531598 0.04885615
RACEGRNon-Hispanic black                                  0.22042019 0.04828767
RACEGROthers                                             -0.07358821 0.05068671
RACEGRHispanic                                           -0.08808176 0.06176631
EDUCANEWHigh School Graduate to < 4 years of college      0.14234950 0.06883049
EDUCANEW>= 4 years of college                             0.30529759 0.07478811
EMPLOY1NEWUnemployed                                     -0.95790547 0.06037165
EMPLOY1NEWHomemaker                                      -0.14085710 0.06462557
EMPLOY1NEWRetired                                        -0.21060872 0.04571170
EMPLOY1NEWUnable to Work                                 -1.76203243 0.04410016
MARITALNEWDivorced/Widowed/Separated                     -0.25570322 0.03508749
MARITALNEWNever married                                  -0.07348124 0.05421425
                                                                   p
(Intercept)                                              6.506957e-93 36523.97
RENTHOM1Summary1own home                                 3.604993e-05 36523.97
SEXNEWFemale                                             2.115975e-22 36523.97
HOUSEHOLDSIZENEW3 or 4                                   2.838053e-02 36523.97
HOUSEHOLDSIZENEW5 or 6                                   6.757459e-01 36523.97
HOUSEHOLDSIZENEW7 and more                               8.224212e-01 36523.97
AGEGROUPNEW45-54                                         6.084197e-01 36523.97
AGEGROUPNEW55-64                                         1.535243e-07 36523.97
AGEGROUPNEW65-80                                         9.988067e-34 36523.97
INCOMENEW25000 to < 50000                                1.585066e-13 36523.97
INCOMENEW>=50000                                         6.371018e-37 36523.97
INCOMENEWUnknown                                         1.565470e-14 36523.97
RACEGRNon-Hispanic black                                 5.001362e-06 36523.97
RACEGROthers                                             1.465504e-01 36523.97
RACEGRHispanic                                           1.538543e-01 36523.97
EDUCANEWHigh School Graduate to < 4 years of college     3.862902e-02 36523.97
EDUCANEW>= 4 years of college                            4.461760e-05 36523.97
EMPLOY1NEWUnemployed                                     1.075737e-56 36523.97
EMPLOY1NEWHomemaker                                      2.928803e-02 36523.97
EMPLOY1NEWRetired                                        4.078797e-06 36523.97
EMPLOY1NEWUnable to Work                                 0.000000e+00 36523.97
MARITALNEWDivorced/Widowed/Separated                     3.155503e-13 36523.97
MARITALNEWNever married                                  1.752946e-01 36523.97

(Intercept)                                              -18238.98
RENTHOM1Summary1own home                                 -18238.98
SEXNEWFemale                                             -18238.98
HOUSEHOLDSIZENEW3 or 4                                   -18238.98
HOUSEHOLDSIZENEW5 or 6                                   -18238.98
HOUSEHOLDSIZENEW7 and more                               -18238.98
AGEGROUPNEW45-54                                         -18238.98
AGEGROUPNEW55-64                                         -18238.98
AGEGROUPNEW65-80                                         -18238.98
INCOMENEW25000 to < 50000                                -18238.98
INCOMENEW>=50000                                         -18238.98
INCOMENEWUnknown                                         -18238.98
RACEGRNon-Hispanic black                                 -18238.98
RACEGROthers                                             -18238.98
RACEGRHispanic                                           -18238.98
EDUCANEWHigh School Graduate to < 4 years of college     -18238.98
EDUCANEW>= 4 years of college                            -18238.98
EMPLOY1NEWUnemployed                                     -18238.98
EMPLOY1NEWHomemaker                                      -18238.98
EMPLOY1NEWRetired                                        -18238.98
EMPLOY1NEWUnable to Work                                 -18238.98
MARITALNEWDivorced/Widowed/Separated                     -18238.98
MARITALNEWNever married                                  -18238.98
```

```
> logistictable <- cbind(coef(logistic), summary(logistic)$coef[,2],
p=summary(logistic)$coef[, 4], AIC(logistic), logLik(logistic))
> POISSON <- glm(NEWDATA$MENTHLTH ~ RENTHOM1Summary1 + SEXNEW +
HOUSEHOLDSIZENEW + AGEGROUPNEW + INCOMENEW + RACEGR + EDUCANEW + EMPLOY1NEW +
MARITALNEW, family=poisson(link="log"))
> cbind(coef(POISSON), summary(POISSON)$coef[,2], p=summary(POISSON)$coef[,
4], AIC(POISSON), logLik(POISSON))
```

(Intercept)	1.225527463	0.015769462	
RENTHOM1Summary1own home	-0.109091612	0.005774683	
SEXNEWFemale	0.281583342	0.005119495	
HOUSEHOLDSIZENEW3 or 4	0.094658473	0.006569301	
HOUSEHOLDSIZENEW5 or 6	0.042891452	0.011450847	
HOUSEHOLDSIZENEW7 and more	-0.001799483	0.024515952	
AGEGROUPNEW45-54	-0.005941004	0.008573111	
AGEGROUPNEW55-64	-0.170817857	0.008807515	
AGEGROUPNEW65-80	-0.558700622	0.010060390	
INCOMENEW25000 to < 50000	-0.222877479	0.006606519	
INCOMENEW>=50000	-0.424065532	0.007486259	
INCOMENEWUnknown	-0.300507648	0.007991511	
RACEGRNon-Hispanic black	-0.137654766	0.007553175	
RACEGROthers	0.051453339	0.008053006	
RACEGRHispanic	0.018780920	0.009981855	
EDUCANEWHigh School Graduate to < 4 years of college	-0.106372646	0.010848042	
EDUCANEW>= 4 years of college	-0.193155483	0.011822761	
EMPLOY1NEWUnemployed	0.709654455	0.009838078	
EMPLOY1NEWHomemaker	0.075313197	0.010660440	
EMPLOY1NEWRetired	0.123635270	0.007426993	
EMPLOY1NEWUnable to Work	1.252716853	0.006944177	
MARITALNEWDivorced/Widowed/Separated	0.181247702	0.005651818	
MARITALNEWNever married	0.053331615	0.008620871	

		p	
(Intercept)	0.000000e+00	667566.9	
RENTHOM1Summary1own home	1.343405e-79	667566.9	
SEXNEWFemale	0.000000e+00	667566.9	
HOUSEHOLDSIZENEW3 or 4	4.528292e-47	667566.9	
HOUSEHOLDSIZENEW5 or 6	1.798905e-04	667566.9	
HOUSEHOLDSIZENEW7 and more	9.414874e-01	667566.9	
AGEGROUPNEW45-54	4.883214e-01	667566.9	
AGEGROUPNEW55-64	8.578735e-84	667566.9	
AGEGROUPNEW65-80	0.000000e+00	667566.9	
INCOMENEW25000 to < 50000	1.715716e-249	667566.9	
INCOMENEW>=50000	0.000000e+00	667566.9	
INCOMENEWUnknown	0.000000e+00	667566.9	
RACEGRNon-Hispanic black	3.283376e-74	667566.9	
RACEGROthers	1.666109e-10	667566.9	
RACEGRHispanic	5.990313e-02	667566.9	
EDUCANEWHigh School Graduate to < 4 years of college	1.064068e-22	667566.9	
EDUCANEW>= 4 years of college	5.331444e-60	667566.9	
EMPLOY1NEWUnemployed	0.000000e+00	667566.9	
EMPLOY1NEWHomemaker	1.609214e-12	667566.9	
EMPLOY1NEWRetired	3.195044e-62	667566.9	
EMPLOY1NEWUnable to Work	0.000000e+00	667566.9	
MARITALNEWDivorced/Widowed/Separated	1.196301e-225	667566.9	
MARITALNEWNever married	6.157832e-10	667566.9	

(Intercept)	-333760.5
RENTHOM1Summary1own home	-333760.5
SEXNEWFemale	-333760.5
HOUSEHOLDSIZENEW3 or 4	-333760.5
HOUSEHOLDSIZENEW5 or 6	-333760.5
HOUSEHOLDSIZENEW7 and more	-333760.5
AGEGROUPNEW45-54	-333760.5
AGEGROUPNEW55-64	-333760.5

```
AGEGROUPNEW65-80                                        -333760.5
INCOMENEW25000 to < 50000                               -333760.5
INCOMENEW>=50000                                        -333760.5
INCOMENEWUnknown                                        -333760.5
RACEGRNon-Hispanic black                                -333760.5
RACEGROthers                                            -333760.5
RACEGRHispanic                                          -333760.5
EDUCANEWHigh School Graduate to < 4 years of college    -333760.5
EDUCANEW>= 4 years of college                           -333760.5
EMPLOY1NEWUnemployed                                    -333760.5
EMPLOY1NEWHomemaker                                     -333760.5
EMPLOY1NEWRetired                                       -333760.5
EMPLOY1NEWUnable to Work                                -333760.5
MARITALNEWDivorced/Widowed/Separated                    -333760.5
MARITALNEWNever married                                 -333760.5
> poissontable <- cbind(coef(POISSON), summary(POISSON)$coef[,2],
p=summary(POISSON)$coef[, 4], AIC(POISSON), logLik(POISSON))
> cbind(coef(NEGBIN), summary(NEGBIN)$coef[,2], p=summary(NEGBIN)$coef[, 4],
AIC(NEGBIN), logLik(NEGBIN))

(Intercept)                                             1.22936878 0.09882441
RENTHOM1Summary1own home                               -0.13509315 0.03677329
SEXNEWFemale                                            0.31974145 0.02674277
HOUSEHOLDSIZENEW3 or 4                                  0.14724130 0.03823034
HOUSEHOLDSIZENEW5 or 6                                  0.10049835 0.06554410
HOUSEHOLDSIZENEW7 and more                              0.06928941 0.14758608
AGEGROUPNEW45-54                                       -0.01663632 0.05163356
AGEGROUPNEW55-64                                       -0.14373582 0.05272559
AGEGROUPNEW65-80                                       -0.48265407 0.05774899
INCOMENEW25000 to < 50000                              -0.25275001 0.03759045
INCOMENEW>=50000                                       -0.43374092 0.04026341
INCOMENEWUnknown                                       -0.35167015 0.04482861
RACEGRNon-Hispanic black                               -0.03776562 0.04637914
RACEGROthers                                            0.09322933 0.04624220
RACEGRHispanic                                          0.10627032 0.06085736
EDUCANEWHigh School Graduate to < 4 years of college   -0.17814510 0.07433029
EDUCANEW>= 4 years of college                          -0.28064717 0.07762352
EMPLOY1NEWUnemployed                                    0.70482846 0.06940971
EMPLOY1NEWHomemaker                                     0.04897583 0.05468753
EMPLOY1NEWRetired                                       0.10267790 0.03620433
EMPLOY1NEWUnable to Work                                1.26914091 0.05240077
MARITALNEWDivorced/Widowed/Separated                    0.21985633 0.03069482
MARITALNEWNever married                                 0.10792763 0.05078571
                                                                   p
(Intercept)                                             1.586423e-35 198783.5
RENTHOM1Summary1own home                                2.390862e-04 198783.5
SEXNEWFemale                                            6.027035e-33 198783.5
HOUSEHOLDSIZENEW3 or 4                                  1.174322e-04 198783.5
HOUSEHOLDSIZENEW5 or 6                                  1.252035e-01 198783.5
HOUSEHOLDSIZENEW7 and more                              6.387232e-01 198783.5
AGEGROUPNEW45-54                                        7.473014e-01 198783.5
AGEGROUPNEW55-64                                        6.408537e-03 198783.5
AGEGROUPNEW65-80                                        6.390278e-17 198783.5
INCOMENEW25000 to < 50000                               1.770668e-11 198783.5
INCOMENEW>=50000                                        4.638064e-27 198783.5
INCOMENEWUnknown                                        4.337483e-15 198783.5
RACEGRNon-Hispanic black                                4.154844e-01 198783.5
RACEGROthers                                            4.378852e-02 198783.5
RACEGRHispanic                                          8.077282e-02 198783.5
EDUCANEWHigh School Graduate to < 4 years of college    1.654486e-02 198783.5
EDUCANEW>= 4 years of college                           2.997784e-04 198783.5
EMPLOY1NEWUnemployed                                    3.160755e-24 198783.5
EMPLOY1NEWHomemaker                                     3.704892e-01 198783.5
EMPLOY1NEWRetired                                       4.567286e-03 198783.5
```

```
EMPLOY1NEWUnable to Work                                  1.373372e-129 198783.5
MARITALNEWDivorced/Widowed/Separated                       7.913138e-13 198783.5
MARITALNEWNever married                                    3.357347e-02 198783.5

(Intercept)                                               -99367.76
RENTHOM1Summary1own home                                  -99367.76
SEXNEWFemale                                              -99367.76
HOUSEHOLDSIZENEW3 or 4                                    -99367.76
HOUSEHOLDSIZENEW5 or 6                                    -99367.76
HOUSEHOLDSIZENEW7 and more                                -99367.76
AGEGROUPNEW45-54                                          -99367.76
AGEGROUPNEW55-64                                          -99367.76
AGEGROUPNEW65-80                                          -99367.76
INCOMENEW25000 to < 50000                                 -99367.76
INCOMENEW>=50000                                          -99367.76
INCOMENEWUnknown                                          -99367.76
RACEGRNon-Hispanic black                                  -99367.76
RACEGROthers                                              -99367.76
RACEGRHispanic                                            -99367.76
EDUCANEWHigh School Graduate to < 4 years of college      -99367.76
EDUCANEW>= 4 years of college                             -99367.76
EMPLOY1NEWUnemployed                                      -99367.76
EMPLOY1NEWHomemaker                                       -99367.76
EMPLOY1NEWRetired                                         -99367.76
EMPLOY1NEWUnable to Work                                  -99367.76
MARITALNEWDivorced/Widowed/Separated                      -99367.76
MARITALNEWNever married                                   -99367.76
> negbintable <- cbind(coef(NEGBIN), summary(NEGBIN)$coef[,2],
p=summary(NEGBIN)$coef[, 4], AIC(NEGBIN), logLik(NEGBIN))
> write.csv(negbintable, "C:/Users/James/Desktop/NEGBINTABLE.csv")
> total <- rbind(lineartable, logistictable, poissontable, negbintable)



## Make into CSV file.

> write.csv(total, "C:/Users/James/Desktop/HOMEOWNTABLE.csv")
```