new

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(1) Data cleaning

```
rm(list = ls())
gc()
```

```
##           used (Mb) gc trigger (Mb) max used (Mb)
## Ncells 469865 25.1    1012041 54.1    660860 35.3
## Vcells 880156  6.8    8388608 64.0  1800812 13.8
```

```
set.seed(123)
############### (1) Data cleaning ####################################
## select variables
library(NHANES)
library(car)
```

```
## Loading required package: carData
```

```
df0 <- NHANES
df <- NHANES[NHANES$Age >= 18 & NHANES$Age < 60,]
# colSums(is.na(df)) / nrow(df)
df <- df[, which(colSums(is.na(df)) / nrow(df) < 0.3)]
# exclude duplication
df <- df[!duplicated(df),]
names(df)
```

```
##  [1] "ID"             "SurveyYr"        "Gender"          "Age"
##  [5] "AgeDecade"      "Race1"           "Education"       "MaritalStatus"
##  [9] "HHIncome"       "HHIncomeMid"     "Poverty"         "HomeRooms"
## [13] "HomeOwn"        "Work"            "Weight"          "Height"
## [17] "BMI"            "BMI_WHO"         "Pulse"           "BPSysAve"
## [21] "BPDiaAve"       "BPSys1"          "BPDia1"          "BPSys2"
## [25] "BPDia2"         "BPSys3"          "BPDia3"          "DirectChol"
## [29] "TotChol"        "UrineVol1"       "UrineFlow1"      "Diabetes"
## [33] "HealthGen"      "DaysPhysHlthBad" "DaysMentHlthBad" "LittleInterest"
## [37] "Depressed"      "SleepHrsNight"   "SleepTrouble"    "PhysActive"
## [41] "Alcohol12PlusYr" "AlcoholYear"    "Smoke100"        "Smoke100n"
## [45] "Marijuana"      "RegularMarij"    "HardDrugs"       "SexEver"
## [49] "SexAge"         "SexNumPartnLife" "SexNumPartYear" "SameSex"
## [53] "SexOrientation"
```

```
# df$BPSysAve
library(dplyr)
```

```
##
```

```
## Attaching package: 'dplyr'

## The following object is masked from 'package:car':
##
##     recode

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```r
df2 <- df %>% select(
  SleepHrsNight,
  BMI,
  DirectChol,
  Age,
  Gender,
  Race1,
  TotChol,
  BPDiaAve,
  BPSysAve,
  AlcoholYear,
  Poverty,
  SexNumPartnLife,
  SexNumPartYear,
  DaysMentHlthBad,
  UrineFlow1,
  PhysActive,
  DaysPhysHlthBad,
  Smoke100,
  Depressed,
  HealthGen,
  SexAge
)

df3 <- na.omit(df2)
#df3$SleepHrsNight <- df3$SleepHrsNight * 60
#df3 <- df3[, -which(names(df3) %in% "SleepHrsNight")]
# cor(df3$BPSysAve,df3$BPDiaAve)
psych::describe(df3)
```

```
##                 vars    n   mean     sd median trimmed   mad   min     max
## SleepHrsNight      1 2152   6.78   1.31   7.00    6.85  1.48  2.00   12.00
## BMI                2 2152  28.77   6.75  27.60   28.09  5.78 15.02   69.00
## DirectChol         3 2152   1.35   0.41   1.29    1.31  0.39  0.39    3.83
## Age                4 2152  39.18  11.33  39.00   39.15 14.83 20.00   59.00
## Gender*            5 2152   1.53   0.50   2.00    1.54  0.00  1.00    2.00
## Race1*             6 2152   3.43   1.15   4.00    3.57  0.00  1.00    5.00
## TotChol            7 2152   5.07   1.05   4.99    5.01  1.04  1.53   13.65
## BPDiaAve           8 2152  71.19  11.84  71.00   71.28 10.38  0.00  116.00
## BPSysAve           9 2152 117.43  14.28 116.00  116.50 13.34 78.00  209.00
## AlcoholYear       10 2152  70.59  94.22  24.00   50.94 35.58  0.00  364.00
## Poverty           11 2152   2.84   1.69   2.78    2.89  2.49  0.00    5.00
```

```
## SexNumPartnLife    12 2152   16.73 66.13    7.00    8.91  5.93  0.00 2000.00
## SexNumPartYear     13 2152    1.38  2.59    1.00    1.04  0.00  0.00   69.00
## DaysMentHlthBad    14 2152    4.47  8.02    0.00    2.40  0.00  0.00   30.00
## UrineFlow1         15 2152    1.07  0.97    0.81    0.91  0.60  0.00   10.14
## PhysActive*        16 2152    1.58  0.49    2.00    1.60  0.00  1.00    2.00
## DaysPhysHlthBad    17 2152    3.16  7.19    0.00    1.12  0.00  0.00   30.00
## Smoke100*          18 2152    1.46  0.50    1.00    1.45  0.00  1.00    2.00
## Depressed*         19 2152    1.30  0.58    1.00    1.16  0.00  1.00    3.00
## HealthGen*         20 2152    2.64  0.94    3.00    2.65  1.48  1.00    5.00
## SexAge             21 2152   17.10  3.39   17.00   16.80  2.97  9.00   44.00
##                     range   skew kurtosis    se
## SleepHrsNight       10.00  -0.30     0.69  0.03
## BMI                 53.98   1.28     2.96  0.15
## DirectChol           3.44   1.09     2.27  0.01
## Age                 39.00   0.02    -1.15  0.24
## Gender*              1.00  -0.12    -1.99  0.01
## Race1*               4.00  -1.13     0.08  0.02
## TotChol             12.12   0.92     3.47  0.02
## BPDiaAve           116.00  -0.39     3.13  0.26
## BPSysAve           131.00   1.00     2.94  0.31
## AlcoholYear        364.00   1.66     1.98  2.03
## Poverty              5.00  -0.01    -1.47  0.04
## SexNumPartnLife   2000.00  18.82   456.62  1.43
## SexNumPartYear      69.00  14.07   293.16  0.06
## DaysMentHlthBad     30.00   2.16     3.76  0.17
## UrineFlow1          10.14   2.89    14.06  0.02
## PhysActive*          1.00  -0.32    -1.90  0.01
## DaysPhysHlthBad     30.00   2.80     7.06  0.15
## Smoke100*            1.00   0.15    -1.98  0.01
## Depressed*           2.00   1.83     2.21  0.01
## HealthGen*           4.00   0.11    -0.33  0.02
## SexAge              35.00   1.51     5.56  0.07
```

```r
# psych::pairs.panels(df3)
hist(df3$SleepHrsNight)
```

Histogram of df3$SleepHrsNight
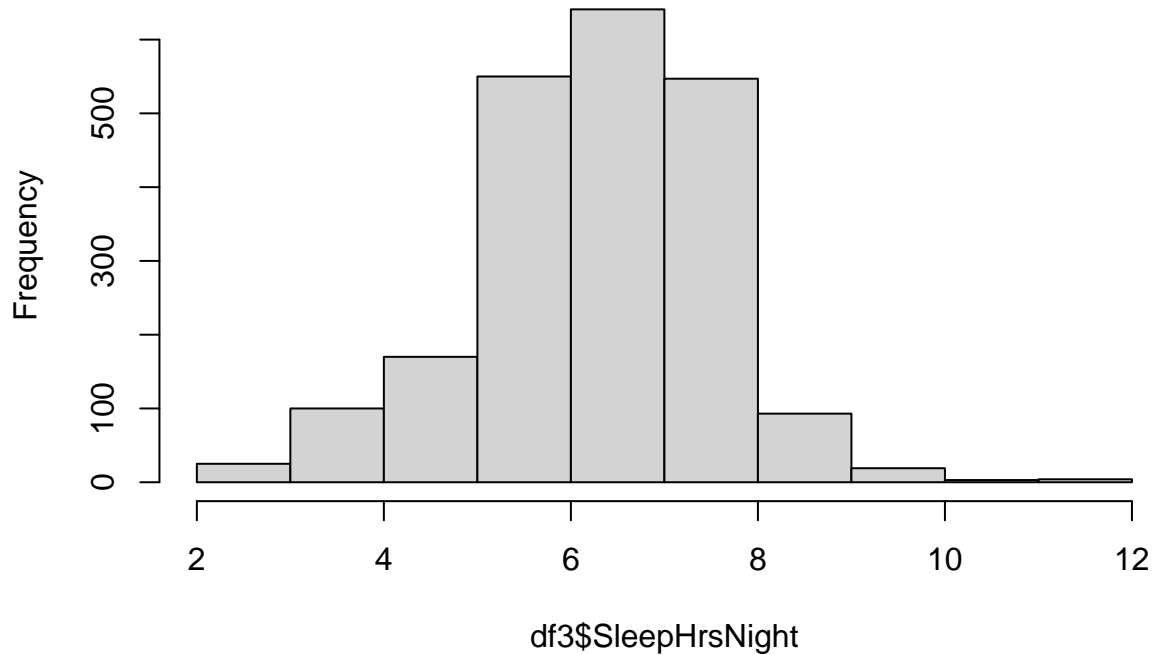

```
# colSums(is.na(df2)) / nrow(df2)
fit0 <-
  lm(SleepHrsNight ~ .,
     data = df3)
#data type
df3$Gender <- ifelse(df3$Gender == "male", 0, 1)
df3 <- df3 %>%
  mutate(
    Race1 = case_when(
      Race1 == 'Black' ~ 1,
      Race1 == 'Hispanic' ~ 2,
      Race1 == 'Mexican' ~ 3,
      Race1 == 'White' ~ 4,
      Race1 == 'Other' ~ 5,
      TRUE ~ NA_integer_   # Default value if none of the conditions are met
    )
  )
```

#Raw data normality analysis

```
# Assuming 'df3' is your dataframe from the NHANES dataset.
# Load necessary libraries
library(e1071)
library(ggplot2)
library(rlang)


# Function to perform normality analysis on a given column
```

```r
perform_normality_analysis <- function(data, column_x, column_y) {
  # Check if the columns are numeric
  if(!is.numeric(data[[column_x]]) || !is.numeric(data[[column_y]])) {
    return(paste("One or both columns are not numeric. Skipping."))
  }

  # Shapiro-Wilk Test for Y column
  shapiro_test <- shapiro.test(data[[column_y]])

  # Skewness and Kurtosis for Y column
  skewness_value <- skewness(data[[column_y]])
  kurtosis_value <- kurtosis(data[[column_y]])

  # Q-Q Plot for Y column
  qqplot <- ggplot(data, aes_string(sample = column_y)) +
          stat_qq() +
          stat_qq_line() +
          ggtitle(paste("Q-Q Plot for", column_y))

  # Histogram with Normal Distribution Fit for Y column
  hist_plot <- ggplot(data, aes_string(x = column_y)) +
              geom_histogram(aes(y = ..density..), binwidth = 1, fill = "blue", alpha = 0.5) +
              geom_density(color = "red", size = 1) +
              theme_bw() +
              xlab(paste(column_y, "(Value)")) +
              ylab("Density") +
              ggtitle(paste("Histogram with Normal Distribution Fit for", column_y))

  # Scatter Plot with Jittering and Alpha adjustment
  scatter_plot <- ggplot(df3, aes_string(x = "SleepHrsNight", y = "BMI")) +
              geom_jitter(alpha = 0.5, width = 0.2) + # Add jittering and alpha adjustment
              geom_smooth(method = "lm", color = "red") +
              theme_bw() +
              ggtitle("Scatter Plot with Regression Line for SleepHrsNight vs BMI")

  # Boxplot for Y column
  boxplot <- ggplot(data, aes_string(y = column_y)) +
          geom_boxplot() +
          theme_bw() +
          ggtitle(paste("Boxplot for", column_y))

  # Density Plot for Y column
  density_plot <- ggplot(data, aes_string(x = column_y)) +
              geom_density(fill = "blue", alpha = 0.5) +
              theme_bw() +
              ggtitle(paste("Density Plot for", column_y))

  # Output results
  list(
    Column_Y = column_y,
    Shapiro_Test = shapiro_test,
    Skewness = skewness_value,
    Kurtosis = kurtosis_value,
```

```
    QQPlot = qqplot,
    Histogram = hist_plot,
    ScatterPlot = scatter_plot,
    Boxplot = boxplot,
    DensityPlot = density_plot
  )
}


# Analyze BMI with SleepHrsNight as X-axis
bmi_sleep_analysis <- perform_normality_analysis(df3, "SleepHrsNight", "BMI")

## Warning: `aes_string()` was deprecated in ggplot2 3.0.0.
## i Please use tidy evaluation idioms with `aes()`.
## i See also `vignette("ggplot2-in-packages")` for more information.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.

## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.

# Display the results
print(bmi_sleep_analysis$Shapiro_Test)

##
##  Shapiro-Wilk normality test
##
## data:  data[[column_y]]
## W = 0.92639, p-value < 2.2e-16

print(paste("Skewness:", bmi_sleep_analysis$Skewness))

## [1] "Skewness: 1.282503606303"

print(paste("Kurtosis:", bmi_sleep_analysis$Kurtosis))

## [1] "Kurtosis: 2.95825812976249"

print(bmi_sleep_analysis$QQPlot)
```
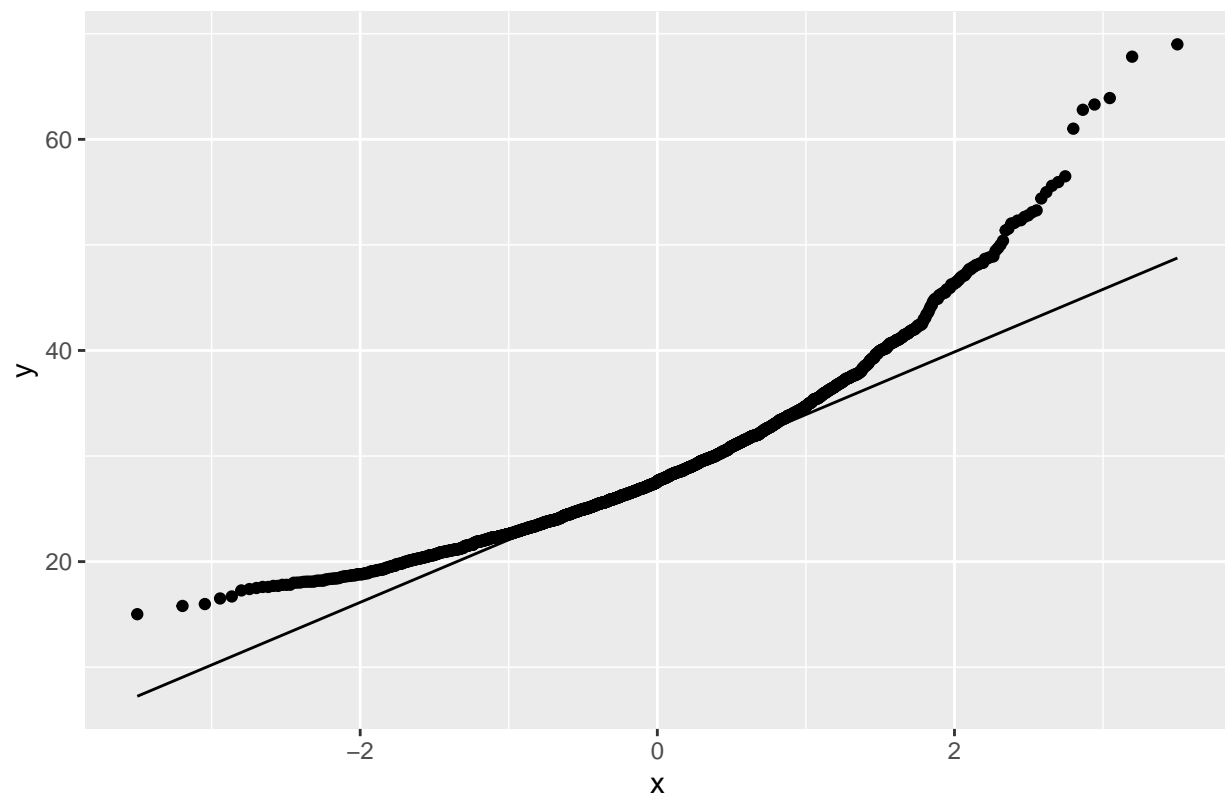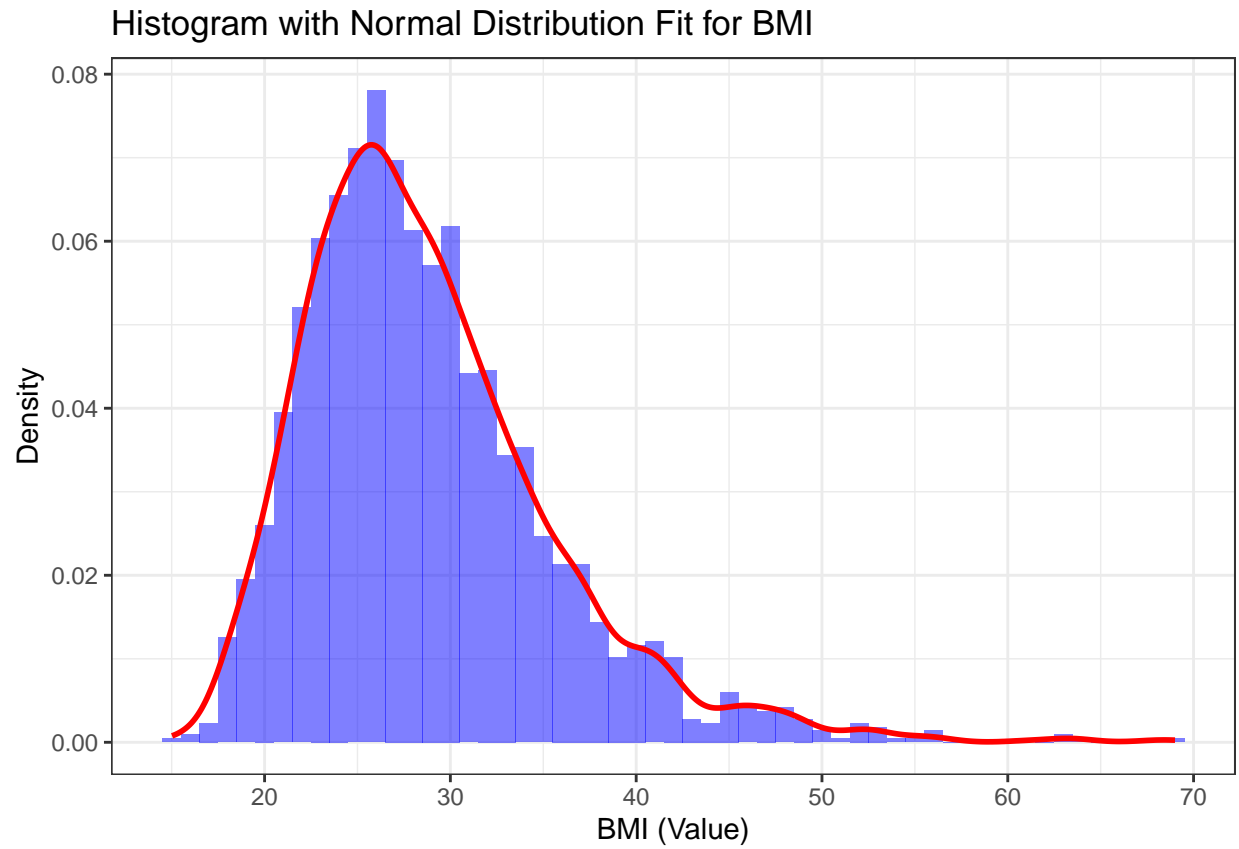
Q–Q Plot for BMI



```
print(bmi_sleep_analysis$Histogram)
```

```
## Warning: The dot-dot notation (`..density..`) was deprecated in ggplot2 3.4.0.
## i Please use `after_stat(density)` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```
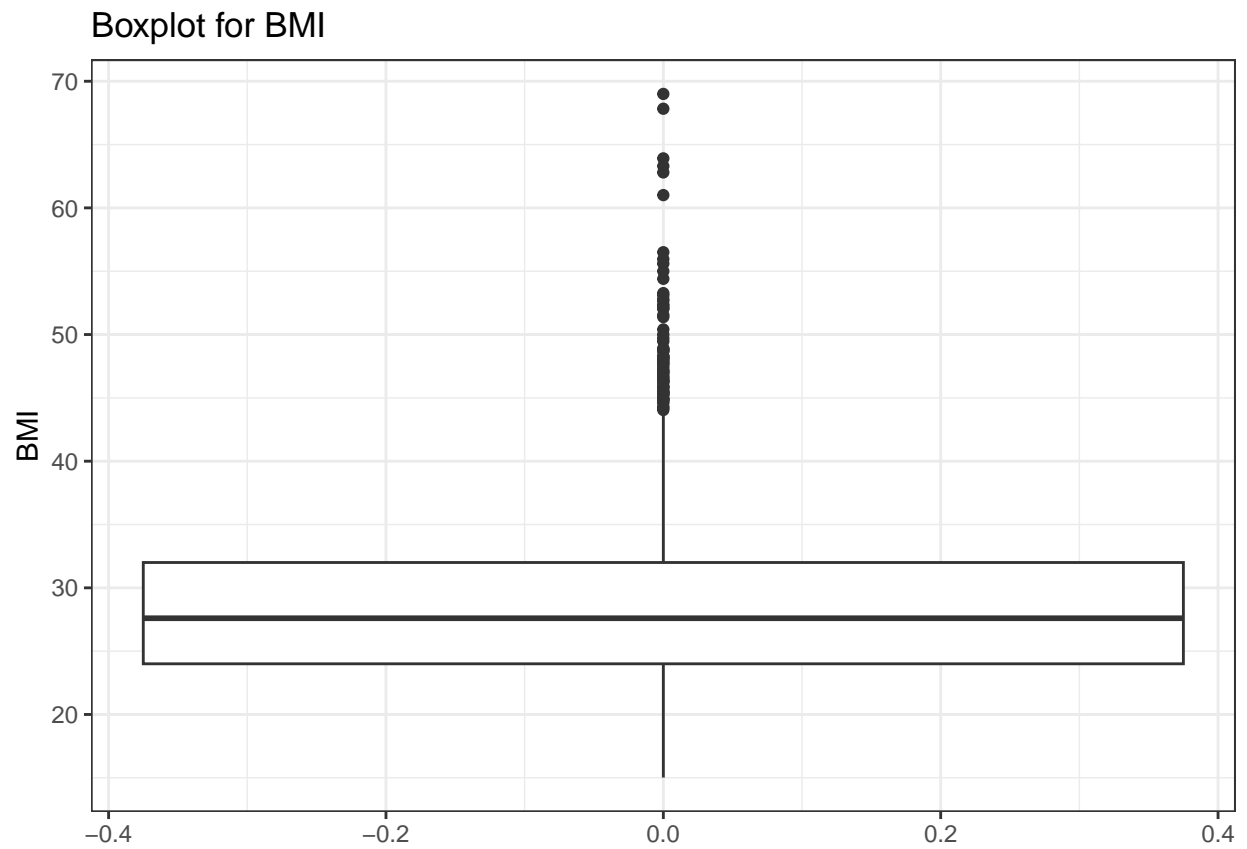
Histogram with Normal Distribution Fit for BMI

```
print(bmi_sleep_analysis$ScatterPlot)
```

```
## `geom_smooth()` using formula = 'y ~ x'
```

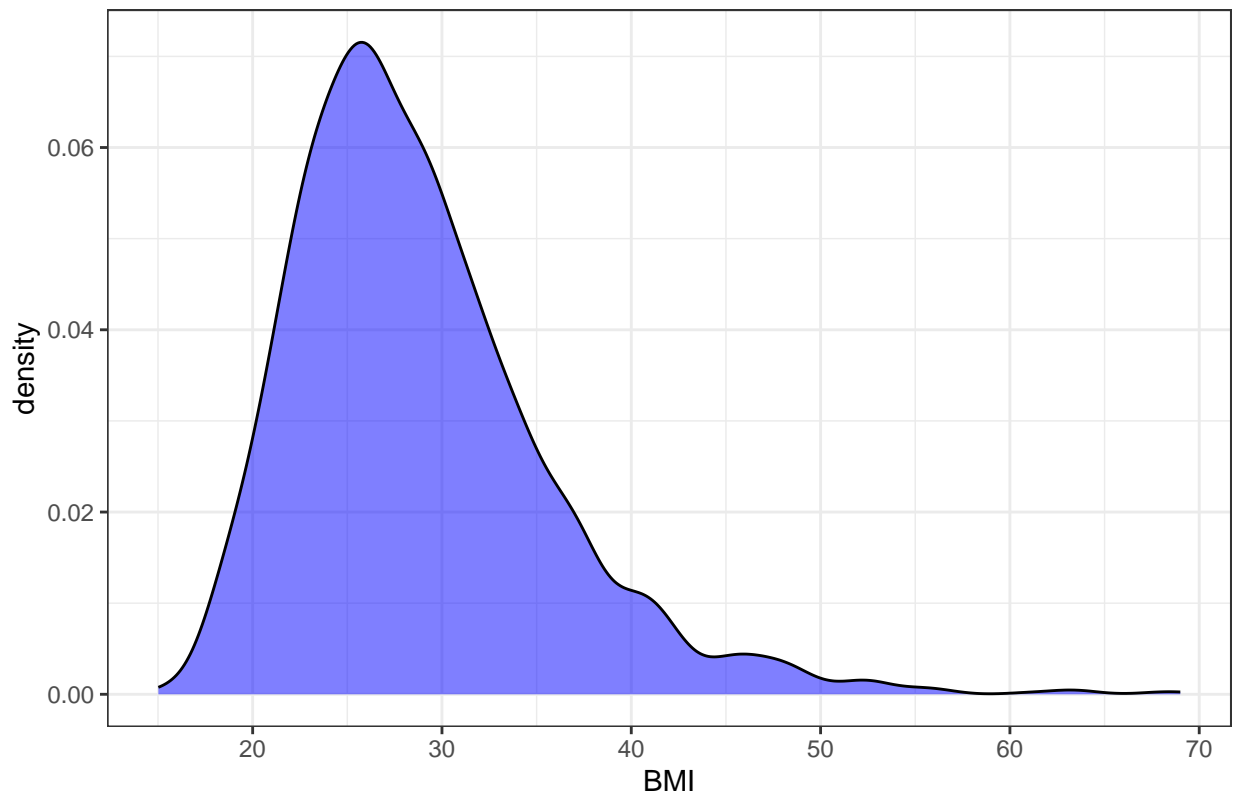Scatter Plot with Regression Line for SleepHrsNight vs BMI
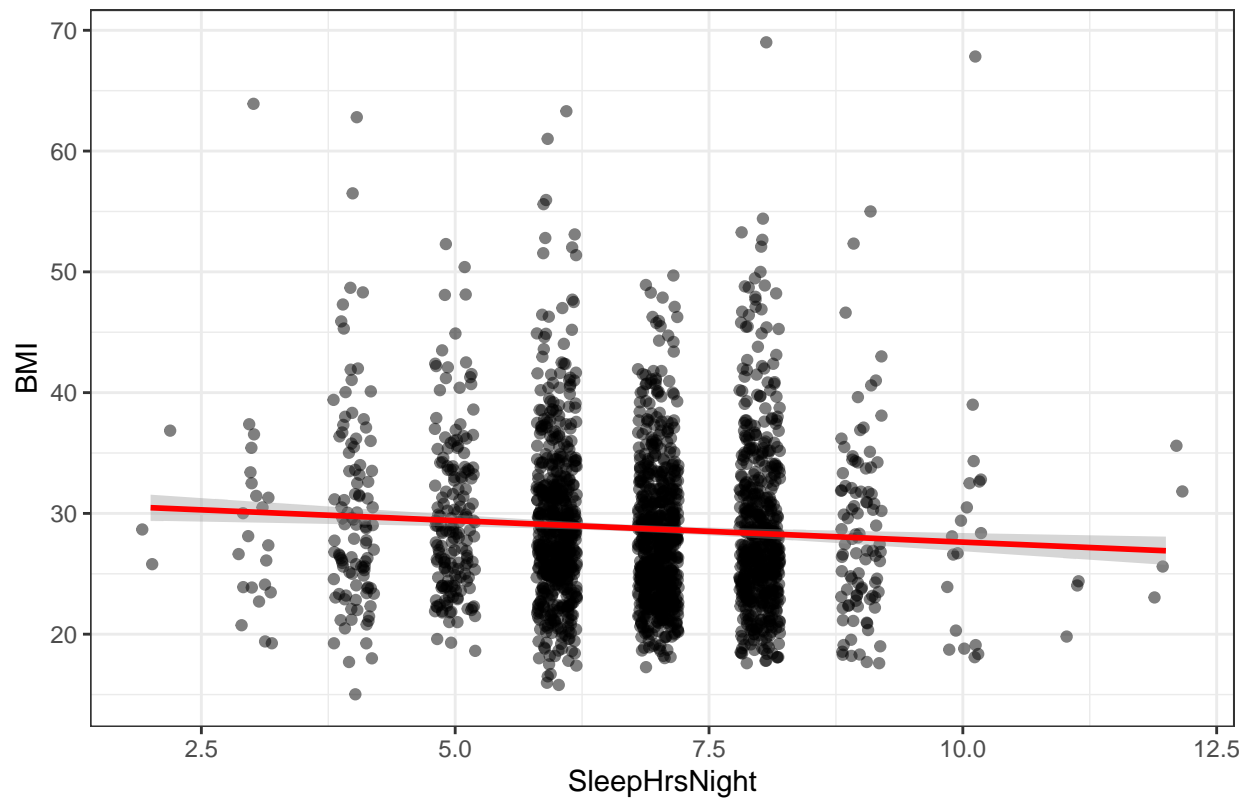
```
print(bmi_sleep_analysis$Boxplot)
```

Boxplot for BMI


```
print(bmi_sleep_analysis$DensityPlot)
```

Density Plot for BMI

#basic characteristics

```r
# Assuming 'df3' is your dataframe.

# Load necessary library
library(dplyr)

# Function to get basic characteristics of a given column
get_basic_characteristics <- function(data, column) {
  # Ensure the column is numeric
  if(!is.numeric(data[[column]])) {
    return(data.frame(Variable = column, Mean = NA, Median = NA, SD = NA, Min = NA, Max = NA, Q1 = NA, Q
  }

  # Calculate basic characteristics
  characteristics <- data %>%
                    summarise(
                      Mean = mean(.data[[column]], na.rm = TRUE),
                      Median = median(.data[[column]], na.rm = TRUE),
                      SD = sd(.data[[column]], na.rm = TRUE),
                      Min = min(.data[[column]], na.rm = TRUE),
                      Max = max(.data[[column]], na.rm = TRUE),
                      Q1 = quantile(.data[[column]], 0.25, na.rm = TRUE),
                      Q3 = quantile(.data[[column]], 0.75, na.rm = TRUE)
                    ) %>%
                    mutate(Variable = column) %>%
                    select(Variable, everything())
```

```
  # Return the results
  return(characteristics)
}

# List of columns to analyze
columns_to_analyze <- c("SleepHrsNight", "BMI", "DirectChol", "Age", "Gender", "Race1", "TotChol", "BPD:

# Apply the function to each column and combine results
combined_characteristics <- lapply(columns_to_analyze, function(col) get_basic_characteristics(df3, col)
                          bind_rows()

# Display the combined basic characteristics
print(combined_characteristics)
```

```
## # A tibble: 21 x 8
##    Variable       Mean Median     SD    Min    Max     Q1     Q3
##    <chr>         <dbl>  <dbl>  <dbl>  <dbl>  <dbl>  <dbl>  <dbl>
##  1 SleepHrsNight  6.78      7   1.31      2     12      6      8
##  2 BMI           28.8    27.6   6.75   15.0     69     24     32
##  3 DirectChol     1.35    1.29  0.410   0.39   3.83   1.06   1.58
##  4 Age           39.2     39   11.3      20     59     30     49
##  5 Gender         0.470     0   0.499     0      1      0      1
##  6 Race1          3.43      4   1.15      1      5      3      4
##  7 TotChol        5.07    4.99  1.05    1.53   13.6    4.32   5.69
##  8 BPDiaAve      71.2     71   11.8       0    116     64     78
##  9 BPSysAve     117.     116   14.3      78    209    108    125
## 10 AlcoholYear   70.6     24   94.2       0    364      4    104
## # i 11 more rows
```

(2) Baseline characteristics

```
Hmisc::describe(df3)
```

```
## df3
##
##  21  Variables      2152  Observations
## --------------------------------------------------------------------------------
## SleepHrsNight
##        n  missing distinct      Info      Mean       Gmd       .05       .10
##     2152        0       11      0.94     6.781     1.415         4         5
##      .25      .50      .75      .90      .95
##        6        7        8        8        9
##
## lowest :  2  3  4  5  6, highest:  8  9 10 11 12
##
## Value            2     3     4     5     6     7     8     9    10    11    12
## Frequency        3    22   100   170   550   641   547    93    19     3     4
## Proportion   0.001 0.010 0.046 0.079 0.256 0.298 0.254 0.043 0.009 0.001 0.002
## --------------------------------------------------------------------------------
## BMI
##        n  missing distinct      Info      Mean       Gmd       .05       .10
##     2152        0     1072         1     28.77     7.223     20.18     21.50
```

```
##      .25      .50      .75      .90      .95
##    24.00    27.60    32.00    37.36    41.22
##
## lowest : 15.02 15.80 15.98 16.51 16.70, highest: 62.80 63.30 63.91 67.83 69.00
## -------------------------------------------------------------------------------
## DirectChol
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##     2152        0       98    0.999    1.346   0.4446     0.80     0.91
##      .25      .50      .75      .90      .95
##     1.06     1.29     1.58     1.89     2.09
##
## lowest : 0.39 0.41 0.52 0.54 0.57, highest: 3.13 3.41 3.44 3.59 3.83
## -------------------------------------------------------------------------------
## Age
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##     2152        0       40    0.999    39.18    13.08       21       23
##      .25      .50      .75      .90      .95
##       30       39       49       55       57
##
## lowest : 20 21 22 23 24, highest: 55 56 57 58 59
## -------------------------------------------------------------------------------
## Gender
##        n  missing distinct     Info      Sum     Mean      Gmd
##     2152        0        2    0.747     1011   0.4698   0.4984
##
## -------------------------------------------------------------------------------
## Race1
##        n  missing distinct     Info     Mean      Gmd
##     2152        0        5    0.758    3.428    1.115
##
## lowest : 1 2 3 4 5, highest: 1 2 3 4 5
##
## Value          1     2     3     4     5
## Frequency    289   145   230  1333   155
## Proportion 0.134 0.067 0.107 0.619 0.072
## -------------------------------------------------------------------------------
## TotChol
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##     2152        0      208        1    5.069    1.151     3.57     3.85
##      .25      .50      .75      .90      .95
##     4.32     4.99     5.69     6.36     6.83
##
## lowest :  1.53  2.69  2.74  2.79  2.82, highest:  9.31  9.34  9.90 12.28 13.65
## -------------------------------------------------------------------------------
## BPDiaAve
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##     2152        0       84    0.999    71.19    12.83       53       57
##      .25      .50      .75      .90      .95
##       64       71       78       85       89
##
## lowest :   0  20  21  22  25, highest: 108 109 110 114 116
## -------------------------------------------------------------------------------
## BPSysAve
##        n  missing distinct     Info      Mean      Gmd      .05      .10
```

```
##     2152        0        98   0.999    117.4    15.44        97       101
##      .25      .50      .75     .90      .95
##      108      116      125     134      142
##
## lowest :  78  83  84  85  86, highest: 182 184 191 202 209
## -------------------------------------------------------------------------------
## AlcoholYear
##        n  missing distinct    Info     Mean      Gmd      .05       .10
##     2152        0        56   0.993    70.59     91.9        0         0
##      .25      .50      .75     .90      .95
##        4       24      104     208      260
##
## lowest :   0   1   2   3   4, highest: 260 300 312 360 364
## -------------------------------------------------------------------------------
## Poverty
##        n  missing distinct    Info     Mean      Gmd      .05       .10
##     2152        0       393   0.988    2.841    1.931    0.340     0.660
##      .25      .50      .75     .90      .95
##    1.277    2.780    4.817   5.000    5.000
##
## lowest : 0.00 0.02 0.03 0.04 0.05, highest: 4.95 4.96 4.97 4.99 5.00
## -------------------------------------------------------------------------------
## SexNumPartnLife
##        n  missing distinct    Info     Mean      Gmd      .05       .10
##     2152        0        81   0.995    16.73    22.47        1         1
##      .25      .50      .75     .90      .95
##        3        7       15      30       50
##
## lowest :    0    1    2    3    4, highest:  600  800  999 1000 2000
## -------------------------------------------------------------------------------
## SexNumPartYear
##        n  missing distinct    Info     Mean      Gmd      .05       .10
##     2152        0        21   0.645    1.381     1.18        0         0
##      .25      .50      .75     .90      .95
##        1        1        1       2        3
##
## lowest : 0 1 2 3 4, highest: 19 20 30 50 69
## -------------------------------------------------------------------------------
## DaysMentHlthBad
##        n  missing distinct    Info     Mean      Gmd      .05       .10
##     2152        0        28   0.844    4.475    6.894        0         0
##      .25      .50      .75     .90      .95
##        0        0        5      15       30
##
## lowest : 0 1 2 3 4, highest: 25 26 27 29 30
## -------------------------------------------------------------------------------
## UrineFlow1
##        n  missing distinct    Info     Mean      Gmd      .05       .10
##     2152        0      1337       1    1.074   0.9061   0.1960    0.2775
##      .25      .50      .75     .90      .95
##   0.4580   0.8100   1.3618  2.1929   2.7780
##
## lowest : 0.000 0.006 0.011 0.014 0.016, highest: 7.325 7.826 8.730 9.410 10.143
## -------------------------------------------------------------------------------
```

```
## PhysActive
##        n  missing distinct
##     2152        0        2
##
## Value          No   Yes
## Frequency     906  1246
## Proportion  0.421 0.579
## --------------------------------------------------------------------------
## DaysPhysHlthBad
##        n  missing distinct      Info      Mean       Gmd       .05       .10
##     2152        0       24     0.708     3.165     5.318      0.00      0.00
##      .25      .50      .75      .90      .95
##     0.00     0.00     2.00    10.00    24.45
##
## lowest :  0  1  2  3  4, highest: 24 25 26 28 30
## --------------------------------------------------------------------------
## Smoke100
##        n  missing distinct
##     2152        0        2
##
## Value          No   Yes
## Frequency    1155   997
## Proportion  0.537 0.463
## --------------------------------------------------------------------------
## Depressed
##        n  missing distinct
##     2152        0        3
##
## Value         None Several     Most
## Frequency    1657     355      140
## Proportion  0.770   0.165    0.065
## --------------------------------------------------------------------------
## HealthGen
##        n  missing distinct
##     2152        0        5
##
## lowest : Excellent Vgood     Good      Fair      Poor
## highest: Excellent Vgood     Good      Fair      Poor
##
## Value      Excellent     Vgood      Good      Fair      Poor
## Frequency        240       697       854       313        48
## Proportion     0.112     0.324     0.397     0.145     0.022
## --------------------------------------------------------------------------
## SexAge
##        n  missing distinct      Info      Mean       Gmd       .05       .10
##     2152        0       28     0.985      17.1     3.463     13.00     14.00
##      .25      .50      .75      .90      .95
##    15.00    17.00    18.00    21.00    23.45
##
## lowest :  9 10 11 12 13, highest: 32 34 35 37 44
## --------------------------------------------------------------------------
```
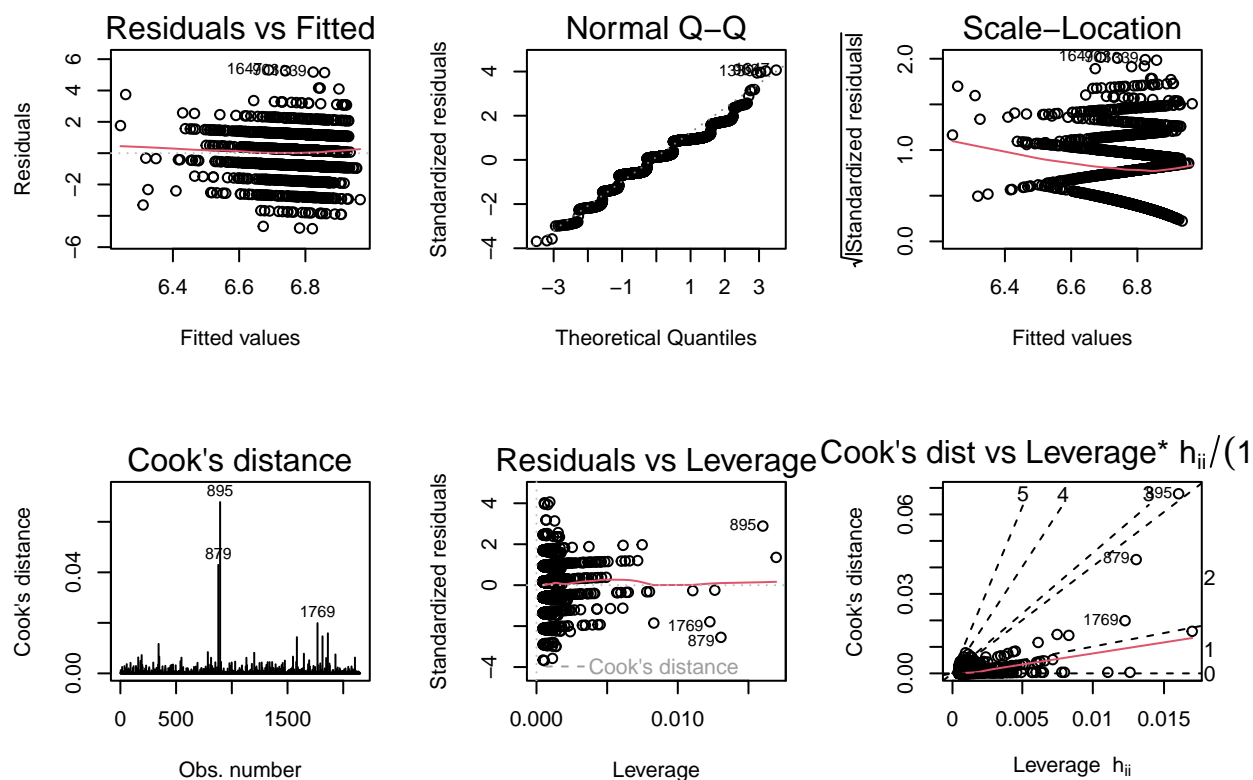
(3) linear regression model

```
##simple linear regression##
model1 = lm(df3$SleepHrsNight ~ df3$BMI, data = df3)
summary(model1)
```

```
##
## Call:
## lm(formula = df3$SleepHrsNight ~ df3$BMI, data = df3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.8209 -0.8022  0.1710  1.1494  5.3105
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  7.166900   0.123331  58.111  < 2e-16 ***
## df3$BMI     -0.013409   0.004174  -3.213  0.00133 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.307 on 2150 degrees of freedom
## Multiple R-squared:  0.004778,   Adjusted R-squared:  0.004315
## F-statistic: 10.32 on 1 and 2150 DF,  p-value: 0.001334
```

```
par(mfrow = c(2, 3)) #read more from ?plot.lm
plot(model1, which = 1)
plot(model1, which = 2)
plot(model1, which = 3)
plot(model1, which = 4)
plot(model1, which = 5)
plot(model1, which = 6)
```

Residuals vs Fitted

Normal Q–Q

Scale–Location

Cook's distance

Residuals vs Leverage

Cook's dist vs Leverage* $h_{ii}/(1$

```r
par(mfrow = c(1, 1)) # reset

dummy_b = 1 * (df3$Race1 == "Black")
dummy_h = 1 * (df3$Race1 == "Hispanic")
dummy_m = 1 * (df3$Race1 == "Mexican")
dummy_w = 1 * (df3$Race1 == "White")
dummy_o = 1 * (df3$Race1 == "Other")

age_quant = quantile(df3$Age)
df3$AgeC = 0
df3$AgeC[df3$Age > age_quant[2] & df3$Age <= age_quant[3]] = 1
df3$AgeC[df3$Age > age_quant[3] & df3$Age <= age_quant[4]] = 2
df3$AgeC[df3$Age > age_quant[4]] = 3

### multiple linear regression###
# model_1 add demographic
m_1 = lm(BMI ~ SleepHrsNight + Age + Gender + factor(Race1), df3)
summary(m_1)

##
## Call:
## lm(formula = BMI ~ SleepHrsNight + Age + Gender + factor(Race1),
##     data = df3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
```

```
## -14.347  -4.497  -1.201   3.190  40.277
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)    30.78080    0.97780  31.480  < 2e-16 ***
## SleepHrsNight  -0.29383    0.11031  -2.664 0.007785 **
## Age             0.05055    0.01282   3.944 8.26e-05 ***
## Gender          0.25869    0.28895   0.895 0.370740
## factor(Race1)2 -2.28054    0.67704  -3.368 0.000769 ***
## factor(Race1)3 -1.02309    0.59140  -1.730 0.083782 .
## factor(Race1)4 -2.51942    0.43385  -5.807 7.30e-09 ***
## factor(Race1)5 -4.14341    0.66274  -6.252 4.88e-10 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.643 on 2144 degrees of freedom
## Multiple R-squared:  0.03564,    Adjusted R-squared:  0.03249
## F-statistic: 11.32 on 7 and 2144 DF,  p-value: 3.698e-14
## model_2 add known risk factors
m_2 = lm(
  BMI ~ SleepHrsNight + Age + Gender + Race1 + TotChol + BPDiaAve + BPSysAve + AlcoholYear + Smoke100 +
    DaysPhysHlthBad + PhysActive,
  df3
)
summary(m_2)

##
## Call:
## lm(formula = BMI ~ SleepHrsNight + Age + Gender + Race1 + TotChol +
##     BPDiaAve + BPSysAve + AlcoholYear + Smoke100 + DaysPhysHlthBad +
##     PhysActive, data = df3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -14.752  -4.236  -0.849   3.055  37.857
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)     21.023150   1.610401  13.055  < 2e-16 ***
## SleepHrsNight   -0.212193   0.107400  -1.976 0.048314 *
## Age              0.012839   0.013495   0.951 0.341528
## Gender           0.514621   0.291331   1.766 0.077463 .
## Race1           -0.622971   0.122615  -5.081 4.09e-07 ***
## TotChol          0.076572   0.139325   0.550 0.582658
## BPDiaAve         0.054500   0.014049   3.879 0.000108 ***
## BPSysAve         0.066004   0.012027   5.488 4.55e-08 ***
## AlcoholYear     -0.009762   0.001533  -6.368 2.34e-10 ***
## Smoke100Yes     -0.507830   0.287921  -1.764 0.077911 .
## DaysPhysHlthBad  0.066309   0.019785   3.352 0.000818 ***
## PhysActiveYes   -1.260928   0.292769  -4.307 1.73e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.413 on 2140 degrees of freedom
```

```
## Multiple R-squared:  0.1029, Adjusted R-squared:  0.09826
## F-statistic: 22.31 on 11 and 2140 DF,  p-value: < 2.2e-16
```

```
#LINE

#influential observations

#multicollinearity

vif(m_1)
```

```
##                   GVIF Df GVIF^(1/(2*Df))
## SleepHrsNight 1.017942  1        1.008931
## Age           1.028310  1        1.014056
## Gender        1.014189  1        1.007069
## factor(Race1) 1.042495  4        1.005216

vif(m_2)
```

```
##   SleepHrsNight            Age          Gender           Race1          TotChol
##        1.035419       1.223319        1.106167        1.045711         1.122357
##        BPDiaAve        BPSysAve      AlcoholYear        Smoke100 DaysPhysHlthBad
##        1.447702       1.542999        1.091195        1.078534         1.057582
##      PhysActive
##        1.093222
```

```
## model_3 add additional risk factors

m_3 = lm(
  BMI ~ SleepHrsNight + Age + Gender + Race1  + Poverty + TotChol + BPDiaAve + BPSysAve + AlcoholYear +
    DaysPhysHlthBad + HealthGen + PhysActive,
  df3
)
summary(m_3)
```

```
##
## Call:
## lm(formula = BMI ~ SleepHrsNight + Age + Gender + Race1 + Poverty +
##     TotChol + BPDiaAve + BPSysAve + AlcoholYear + Smoke100 +
##     UrineFlow1 + DaysMentHlthBad + DaysPhysHlthBad + HealthGen +
##     PhysActive, data = df3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -16.838  -4.054  -0.646   3.203  35.902
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  18.471020   1.621565  11.391  < 2e-16 ***
## SleepHrsNight -0.121393  0.106352  -1.141  0.25382
## Age           0.010806   0.013725   0.787  0.43118
## Gender        0.532917   0.286537   1.860  0.06304 .
## Race1        -0.500763   0.122151  -4.100 4.29e-05 ***
## Poverty       0.073370   0.090958   0.807  0.41997
## TotChol       0.030653   0.136000   0.225  0.82170
## BPDiaAve      0.058458   0.013721   4.260 2.13e-05 ***
```

```
## BPSysAve         0.053724   0.011806   4.550 5.65e-06 ***
## AlcoholYear      -0.008337   0.001515  -5.503 4.18e-08 ***
## Smoke100Yes      -0.807332   0.287264  -2.810  0.00499 **
## UrineFlow1       -0.113369   0.142545  -0.795  0.42652
## DaysMentHlthBad  -0.030360   0.017984  -1.688  0.09153 .
## DaysPhysHlthBad   0.014779   0.020974   0.705  0.48112
## HealthGenVgood    1.922013   0.470923   4.081 4.64e-05 ***
## HealthGenGood     3.569501   0.468730   7.615 3.93e-14 ***
## HealthGenFair     5.283476   0.575334   9.183  < 2e-16 ***
## HealthGenPoor     7.546146   1.078147   6.999 3.43e-12 ***
## PhysActiveYes    -0.818408   0.294015  -2.784  0.00542 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.251 on 2133 degrees of freedom
## Multiple R-squared:  0.1504, Adjusted R-squared:  0.1432
## F-statistic: 20.97 on 18 and 2133 DF,  p-value: < 2.2e-16
```

```
vif(m_3)
```

```
##                     GVIF Df GVIF^(1/(2*Df))
## SleepHrsNight   1.068552  1        1.033708
## Age             1.331598  1        1.153949
## Gender          1.126176  1        1.061214
## Race1           1.092236  1        1.045101
## Poverty         1.302699  1        1.141358
## TotChol         1.125511  1        1.060901
## BPDiaAve        1.453387  1        1.205565
## BPSysAve        1.564805  1        1.250922
## AlcoholYear     1.121584  1        1.059049
## Smoke100        1.129923  1        1.062979
## UrineFlow1      1.044330  1        1.021925
## DaysMentHlthBad 1.145584  1        1.070320
## DaysPhysHlthBad 1.250957  1        1.118462
## HealthGen       1.435741  4        1.046248
## PhysActive      1.160363  1        1.077202
```

```
par(mfrow = c(2, 3)) #read more from ?plot.lm
plot(m_3, which = 1)
plot(m_3, which = 2)
plot(m_3, which = 3)
plot(m_3, which = 4)
plot(m_3, which = 5)
plot(m_3, which = 6)
```
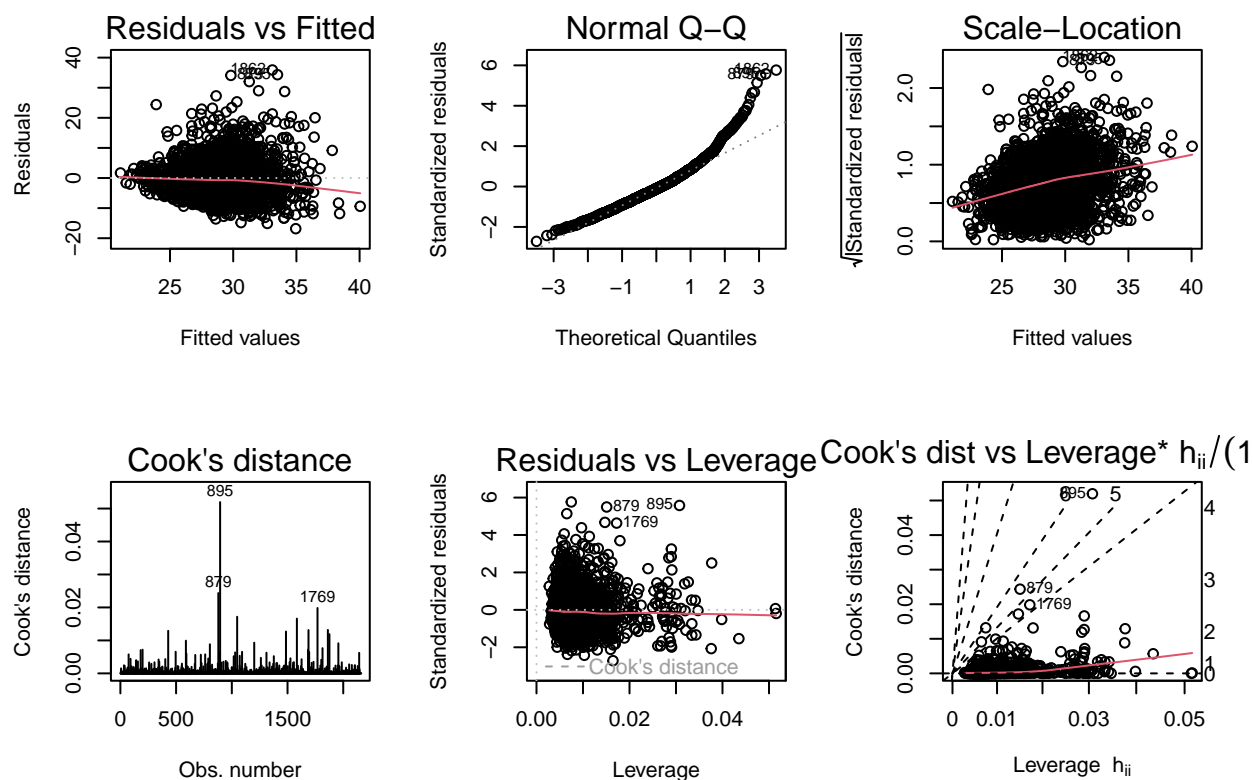
```r
par(mfrow = c(1, 1)) # reset

# model_4 add additional risk factors
m_full = lm(
  BMI ~ SleepHrsNight + Age + Gender + Race1  + Poverty + TotChol + BPDiaAve + BPSysAve + AlcoholYear +
    DaysPhysHlthBad + HealthGen + PhysActive + SleepHrsNight * Age + SleepHrsNight *
    Gender,
  df3
)
summary(m_full)
```

```
##
## Call:
## lm(formula = BMI ~ SleepHrsNight + Age + Gender + Race1 + Poverty +
##     TotChol + BPDiaAve + BPSysAve + AlcoholYear + Smoke100 +
##     UrineFlow1 + DaysMentHlthBad + DaysPhysHlthBad + HealthGen +
##     PhysActive + SleepHrsNight * Age + SleepHrsNight * Gender,
##     data = df3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -17.019  -4.059  -0.648   3.165  36.301
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        21.349305   2.996916   7.124 1.43e-12 ***
```

```
## SleepHrsNight        -0.542616   0.378594  -1.433  0.15194
## Age                  -0.105136   0.062783  -1.675  0.09416 .
## Gender                3.768696   1.435161   2.626  0.00870 **
## Race1                -0.503222   0.121964  -4.126 3.83e-05 ***
## Poverty               0.072729   0.090968   0.800  0.42409
## TotChol               0.014773   0.135905   0.109  0.91345
## BPDiaAve              0.058709   0.013701   4.285 1.91e-05 ***
## BPSysAve              0.054450   0.011792   4.617 4.12e-06 ***
## AlcoholYear          -0.008396   0.001513  -5.549 3.23e-08 ***
## Smoke100Yes          -0.802999   0.286852  -2.799  0.00517 **
## UrineFlow1           -0.102218   0.142435  -0.718  0.47305
## DaysMentHlthBad      -0.030250   0.017962  -1.684  0.09230 .
## DaysPhysHlthBad       0.015142   0.020943   0.723  0.46975
## HealthGenVgood        1.928283   0.470249   4.101 4.28e-05 ***
## HealthGenGood         3.559316   0.468010   7.605 4.24e-14 ***
## HealthGenFair         5.299570   0.575060   9.216  < 2e-16 ***
## HealthGenPoor         7.640142   1.077494   7.091 1.81e-12 ***
## PhysActiveYes        -0.837418   0.294615  -2.842  0.00452 **
## SleepHrsNight:Age     0.017092   0.009024   1.894  0.05837 .
## SleepHrsNight:Gender -0.477032   0.206903  -2.306  0.02123 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.242 on 2131 degrees of freedom
## Multiple R-squared:  0.1538, Adjusted R-squared:  0.1459
## F-statistic: 19.37 on 20 and 2131 DF,  p-value: < 2.2e-16
```

```
vif(m_full)
```

```
## there are higher-order terms (interactions) in this model
## consider setting type = 'predictor'; see ?vif

##                          GVIF Df GVIF^(1/(2*Df))
## SleepHrsNight        13.583457  1        3.685574
## Age                  27.952318  1        5.286995
## Gender               28.340488  1        5.323579
## Race1                 1.092306  1        1.045135
## Poverty               1.307058  1        1.143266
## TotChol               1.127465  1        1.061822
## BPDiaAve              1.453678  1        1.205686
## BPSysAve              1.565996  1        1.251398
## AlcoholYear           1.122185  1        1.059332
## Smoke100               1.130221  1        1.063119
## UrineFlow1            1.045986  1        1.022734
## DaysMentHlthBad       1.146283  1        1.070646
## DaysPhysHlthBad       1.251072  1        1.118513
## HealthGen             1.447335  4        1.047300
## PhysActive            1.168763  1        1.081093
## SleepHrsNight:Age    37.541993  1        6.127152
## SleepHrsNight:Gender 29.940850  1        5.471823
```

```
par(mfrow = c(2, 3)) #read more from ?plot.lm
plot(m_full, which = 1)
plot(m_full, which = 2)
plot(m_full, which = 3)
plot(m_full, which = 4)
```

```
plot(m_full, which = 5)
plot(m_full, which = 6)
```
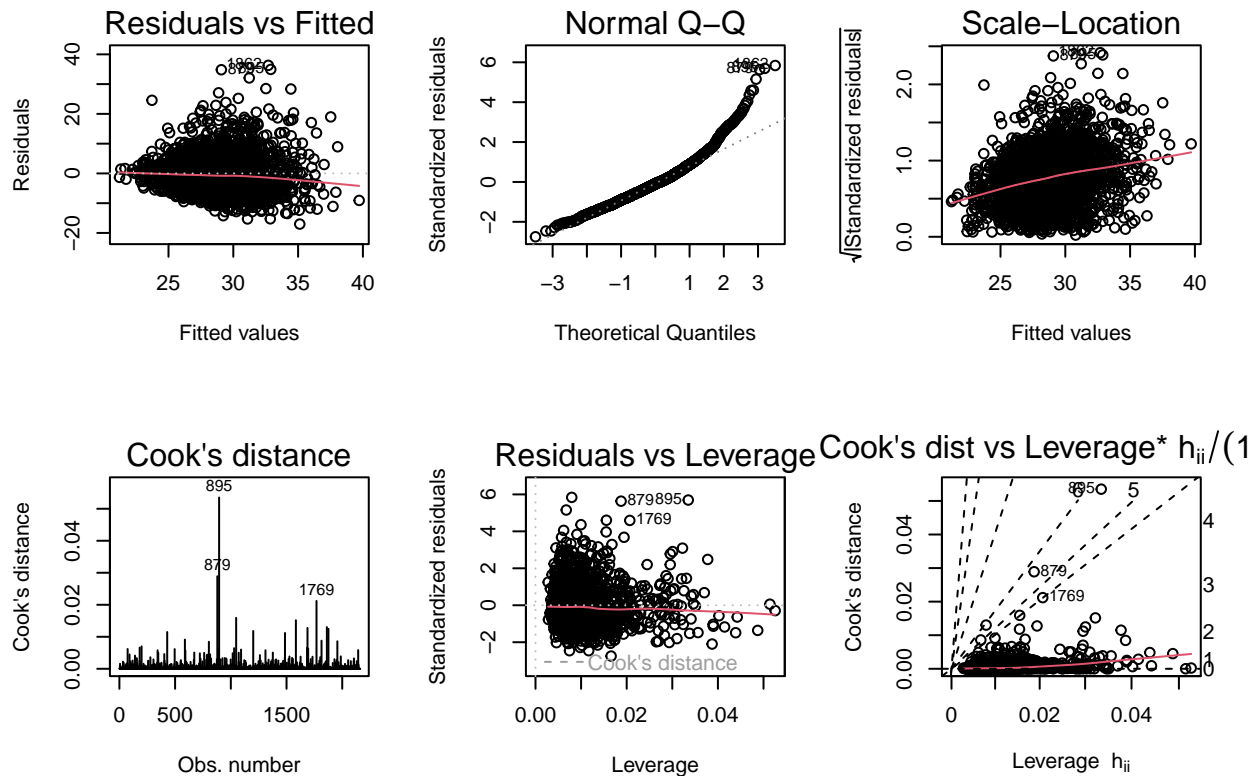


```
par(mfrow = c(1, 1)) # reset

getMode <- function(v) {
  uniqv <- unique(v)
  uniqv[which.max(tabulate(match(v, uniqv)))]
}

new_data <- expand.grid(SleepHrsNight = seq(min(df3$SleepHrsNight), max(df3$SleepHrsNight), length.out =
                        Age = quantile(df3$Age, probs = c(0.25, 0.5, 0.75)),
                        Gender = median(df3$Gender, na.rm = TRUE),
                        Race1 = median(df3$Race1, na.rm = TRUE),
                        Poverty = median(df3$Poverty, na.rm = TRUE),
                        TotChol = median(df3$TotChol, na.rm = TRUE),
                        BPDiaAve = median(df3$BPDiaAve, na.rm = TRUE),
                        BPSysAve = median(df3$BPSysAve, na.rm = TRUE),
                        AlcoholYear = median(df3$AlcoholYear, na.rm = TRUE),
                        Smoke100 = getMode(df3$Smoke100),
                        UrineFlow1 = median(df3$UrineFlow1, na.rm = TRUE),
                        DaysMentHlthBad = median(df3$DaysMentHlthBad, na.rm = TRUE),
                        DaysPhysHlthBad = median(df3$DaysPhysHlthBad, na.rm = TRUE),
                        HealthGen = getMode(df3$HealthGen),
                        PhysActive = getMode(df3$PhysActive)
)
```

```r
# predict
new_data$predicted_BMI <- predict(m_full, newdata = new_data)
# interaction
library(ggplot2)
ggplot(new_data, aes(x = SleepHrsNight, y = predicted_BMI, group = factor(Age))) +
  geom_line(aes(color = factor(Age))) +
  labs(title = "Interaction between Sleep Hours and Age on BMI",
       x = "Sleep Hours per Night",
       y = "Predicted BMI")
```
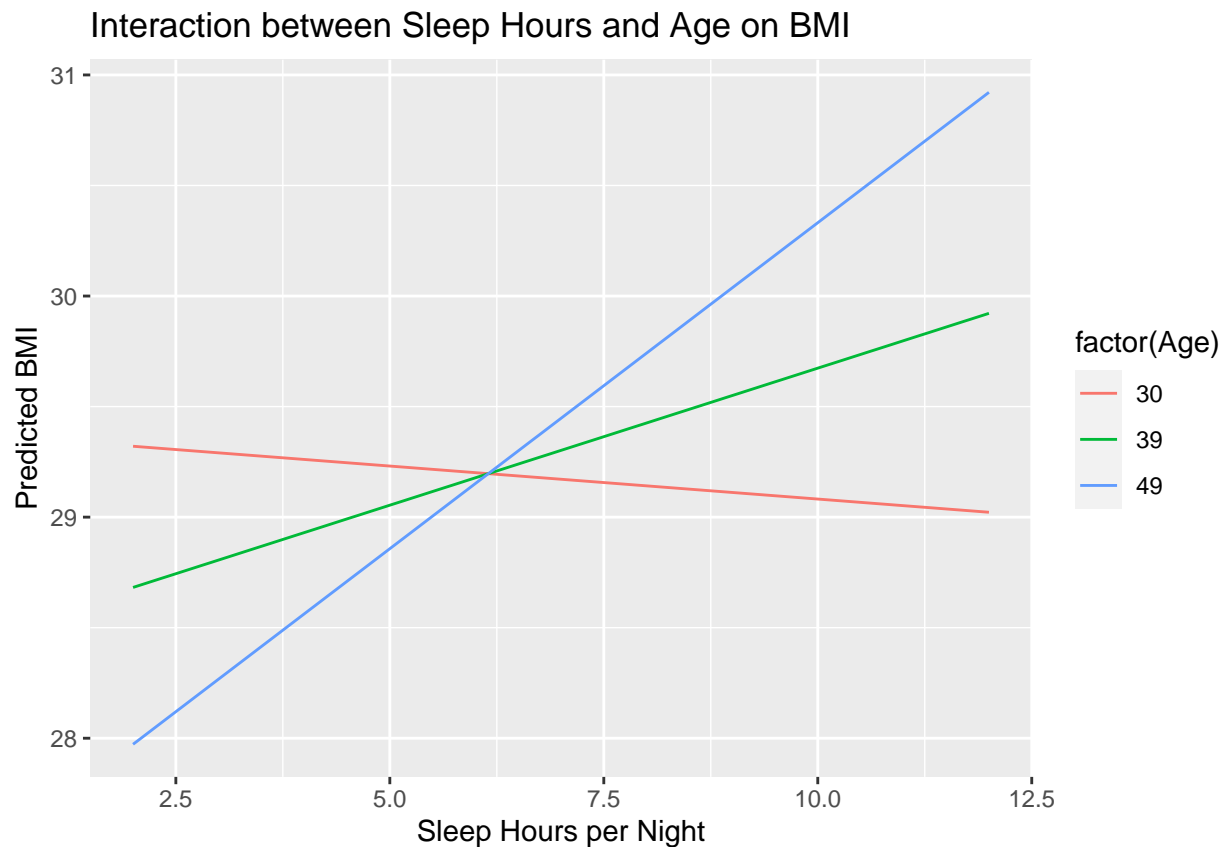

(4) Diagnosis: 10-fold CV

```r
library(caret)
```

```
## Loading required package: lattice
```

```r
splitIndex <-
  createDataPartition(df3$SleepHrsNight, p = 0.7, list = FALSE)
trainData <- df3[splitIndex, ]
testData <- df3[-splitIndex, ]
predictions <- predict(m_full, newdata = testData)
mse <- mean((testData$SleepHrsNight - predictions) ^ 2)
control <-
  trainControl(method = "cv", number = 10)  # 10-fold cross-validation
```

```
cv_model <-
  train(
    SleepHrsNight ~ .,
    data = df3,
    method = "lm",
    trControl = control
  )
cv_model

## Linear Regression
##
## 2152 samples
##   21 predictor
##
## No pre-processing
## Resampling: Cross-Validated (10 fold)
## Summary of sample sizes: 1937, 1938, 1936, 1937, 1937, 1937, ...
## Resampling results:
##
##   RMSE        Rsquared    MAE
##   1.280209    0.05043061  0.9931499
##
## Tuning parameter 'intercept' was held constant at a value of TRUE

(cv_results <- cv_model$results)

##   intercept      RMSE   Rsquared        MAE      RMSESD  RsquaredSD       MAESD
## 1      TRUE  1.280209 0.05043061  0.9931499  0.04543809  0.02732622  0.02794626
```
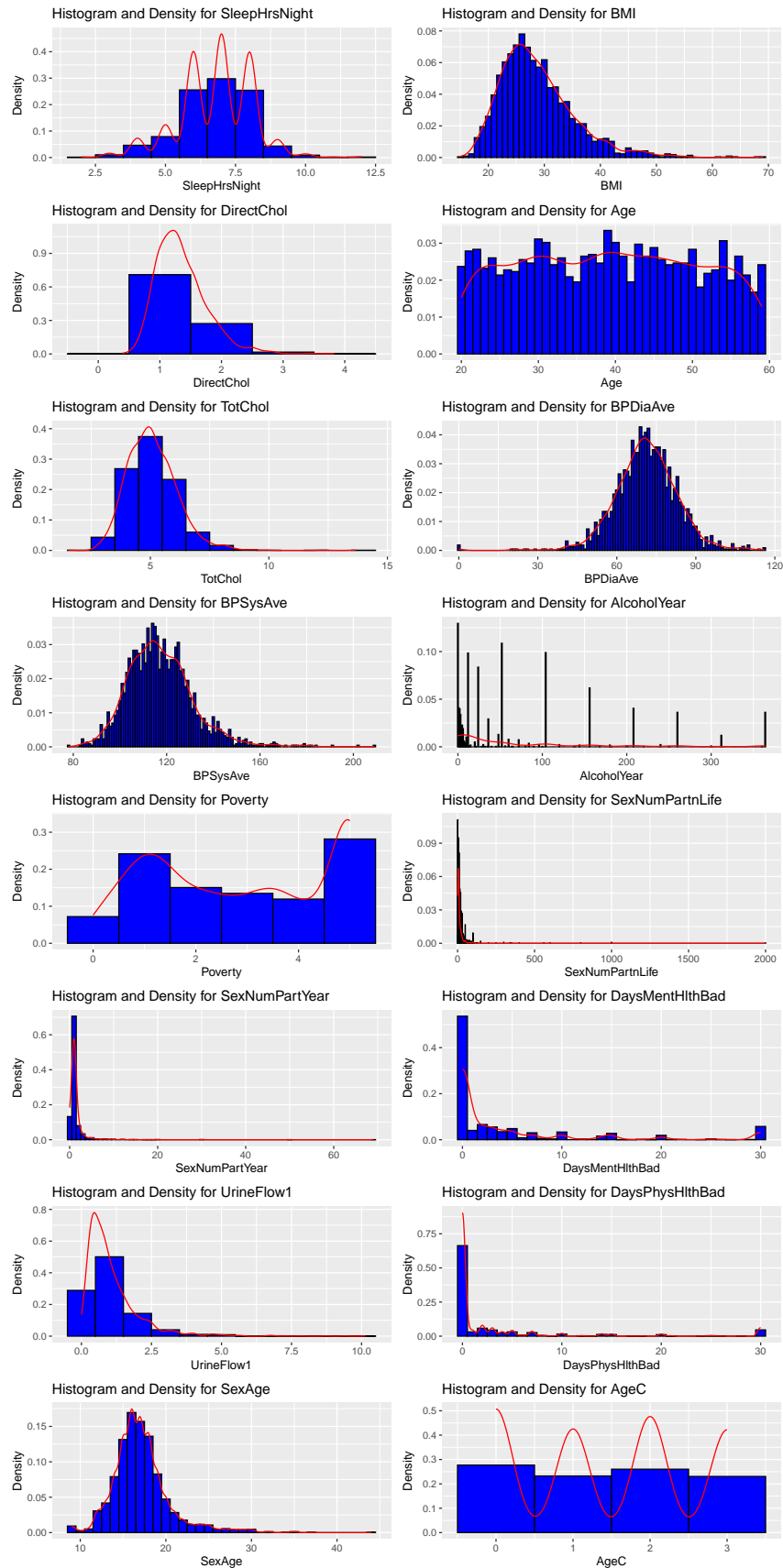
(4) Diagnosis: Normality Assumption

```
library(ggplot2)
library(patchwork)
# Initializes an empty patchwork object
plot_list <- list()

# Draw a histogram for each numeric variable (except Race1 and Gender) and add it to the list
for (var in names(df3)) {
  if (is.numeric(df3[[var]]) && !(var %in% c("Race1", "Gender"))) {
    p <- ggplot(df3, aes(x = .data[[var]])) +
      geom_histogram(
        aes(y = after_stat(density)),
        binwidth = 1,
        fill = "blue",
        color = "black"
      ) +
      geom_density(col = "red") +
      ggtitle(paste("Histogram and Density for", var)) +
      xlab(var) +
      ylab("Density")
    plot_list[[length(plot_list) + 1]] <- p
  }
```

```
}

# Use patchwork to put all the charts together
combined_plot <- wrap_plots(plot_list, ncol = 2)
print(combined_plot)
```

Histogram and Density for SleepHrsNight

Histogram and Density for BMI

Histogram and Density for DirectChol

Histogram and Density for Age

Histogram and Density for TotChol

Histogram and Density for BPDiaAve

Histogram and Density for BPSysAve

Histogram and Density for AlcoholYear

Histogram and Density for Poverty

Histogram and Density for SexNumPartnLife

Histogram and Density for SexNumPartYear

Histogram and Density for DaysMentHlthBad

Histogram and Density for UrineFlow1

Histogram and Density for DaysPhysHlthBad

Histogram and Density for SexAge

Histogram and Density for AgeC

```
df3 <- data.frame(df3)
library(dplyr)
# Shapiro-Wilk normality test is performed for each numerical variable in df3
results <- sapply(df3, function(x) {
  if (is.numeric(x)) {
    shapiro_test <- shapiro.test(x)
    return(c(shapiro_test$statistic, shapiro_test$p.value))
  } else {
    return(c(NA, NA))
  }
})
# Convert the result to a data box and name the column
results_df <- as.data.frame(t(results))
names(results_df) <- c("W", "p.value")
# Add a variable name as a new column
results_df$Variable <- rownames(results_df)
# Rearrange the order of columns
results_df <- results_df[, c("Variable", "W", "p.value")]
# Calculate the corrected P-value (for example, using Bonferroni correction)
results_df$p.adjusted <-
  p.adjust(results_df$p.value, method = "bonferroni")
print(results_df)
```

```
##                      Variable         W      p.value   p.adjusted
## SleepHrsNight     SleepHrsNight 0.9347691 1.022342e-29 1.840215e-28
## BMI                        BMI 0.9263898 2.950926e-31 5.311666e-30
## DirectChol          DirectChol 0.9439221 7.552977e-28 1.359536e-26
## Age                        Age 0.9579654 1.832383e-24 3.298290e-23
## Gender                  Gender 0.6352876 1.636740e-55 2.946133e-54
## Race1                    Race1 0.7327797 3.104346e-50 5.587823e-49
## TotChol                TotChol 0.9642744 1.175111e-22 2.115200e-21
## BPDiaAve              BPDiaAve 0.9718079 3.709893e-20 6.677808e-19
## BPSysAve              BPSysAve 0.9554033 3.865527e-25 6.957949e-24
## AlcoholYear        AlcoholYear 0.7454040 1.944127e-49 3.499428e-48
## Poverty                Poverty 0.8942742 4.092136e-36 7.365845e-35
## SexNumPartnLife SexNumPartnLife 0.1496531 2.951432e-71 5.312577e-70
## SexNumPartYear   SexNumPartYear 0.2562318 1.244353e-68 2.239836e-67
## DaysMentHlthBad DaysMentHlthBad 0.6112779 1.254550e-56 2.258190e-55
## UrineFlow1            UrineFlow1 0.7555438 8.969094e-49 1.614437e-47
## PhysActive            PhysActive        NA           NA           NA
## DaysPhysHlthBad DaysPhysHlthBad 0.4968273 2.926552e-61 5.267794e-60
## Smoke100              Smoke100        NA           NA           NA
## Depressed            Depressed        NA           NA           NA
## HealthGen            HealthGen        NA           NA           NA
## SexAge                  SexAge 0.8954434 5.842918e-36 1.051725e-34
## AgeC                      AgeC 0.8533480 8.034125e-41 1.446143e-39
```

Standardized residuals, Studentized residuals

```
# Regular residuals
residual_1 <- m_full$residuals
```

```r
# Standardized residuals
residual_2 <- rstandard(m_full)

# Studentized residuals
residual_3 <- rstudent(m_full)

# Externally studentized residuals
# Note: Externally studentized residuals are the same as studentized residuals in most cases
residual_4 <- rstudent(m_full)

# Creating a data frame to summarize these residuals
residual_summary <- data.frame(
  Residuals = c("Regular", "Standardized", "Studentized", "Externally Studentized"),
  Mean = c(mean(residual_1), mean(residual_2), mean(residual_3), mean(residual_4)),
  SD = c(sd(residual_1), sd(residual_2), sd(residual_3), sd(residual_4)),
  Min = c(min(residual_1), min(residual_2), min(residual_3), min(residual_4)),
  Max = c(max(residual_1), max(residual_2), max(residual_3), max(residual_4))
)

# Display the summary
print(residual_summary)
```

```
##                   Residuals          Mean       SD        Min       Max
## 1                   Regular -1.448790e-16 6.212489 -17.019074 36.300973
## 2              Standardized -2.232345e-05 1.000939  -2.749618  5.839262
## 3               Studentized  2.310529e-04 1.002091  -2.753862  5.885164
## 4 Externally Studentized  2.310529e-04 1.002091  -2.753862  5.885164
```

```r
# Load necessary library
library(ggplot2)

# Assuming m_full is your linear model
# m_full <- lm(SleepMinNight ~ ., data = df3)

# Calculate standardized and studentized residuals
residual_2 <- rstandard(m_full)
residual_3 <- rstudent(m_full)

# Calculate leverage values
leverage_values <- hatvalues(m_full)

# Create a data frame for plotting
plot_data <- data.frame(
  Standardized_Residuals = residual_2,
  Difference = residual_3 - residual_2,
  Leverage = leverage_values
)

# Create the plot
ggplot(plot_data, aes(x = Standardized_Residuals, y = Difference)) +
  geom_point(aes(size = Leverage)) +
  ggtitle("Difference between Studentized and Standardized Residuals vs. Standardized Residuals") +
  xlab("Standardized Residuals") +
  ylab("Difference between Studentized and Standardized Residuals")
```
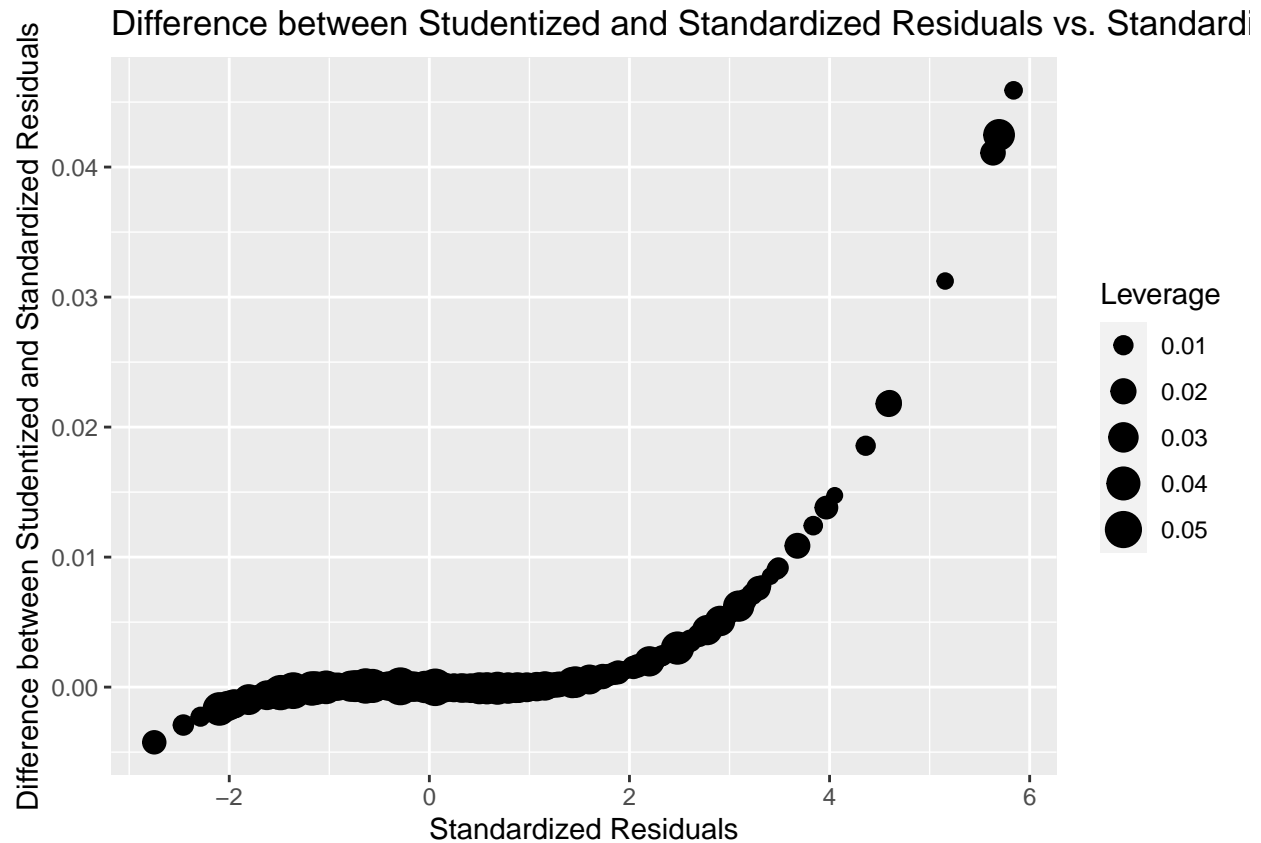
Difference between Studentized and Standardized Residuals vs. Standard[...]


```r
# Display the plot
print(ggplot)
```

```
## function (data = NULL, mapping = aes(), ..., environment = parent.frame())
## {
##     UseMethod("ggplot")
## }
## <bytecode: 0x62bf118>
## <environment: namespace:ggplot2>
```

```r
# Load necessary library
library(ggplot2)

# Assuming m_full is your linear model
# m_full <- lm(SleepMinNight ~ ., data = df3)

# Calculate studentized and externally studentized residuals
residual_3 <- rstudent(m_full)
residual_4 <- rstudent(m_full)  # Externally studentized residuals are typically the same as studentize[...]

# Regular residuals
residual_1 <- m_full$residuals

# Create a data frame for plotting
plot_data <- data.frame(
  Studentized_Residuals = residual_3,
  Difference = residual_4 - residual_3,
```
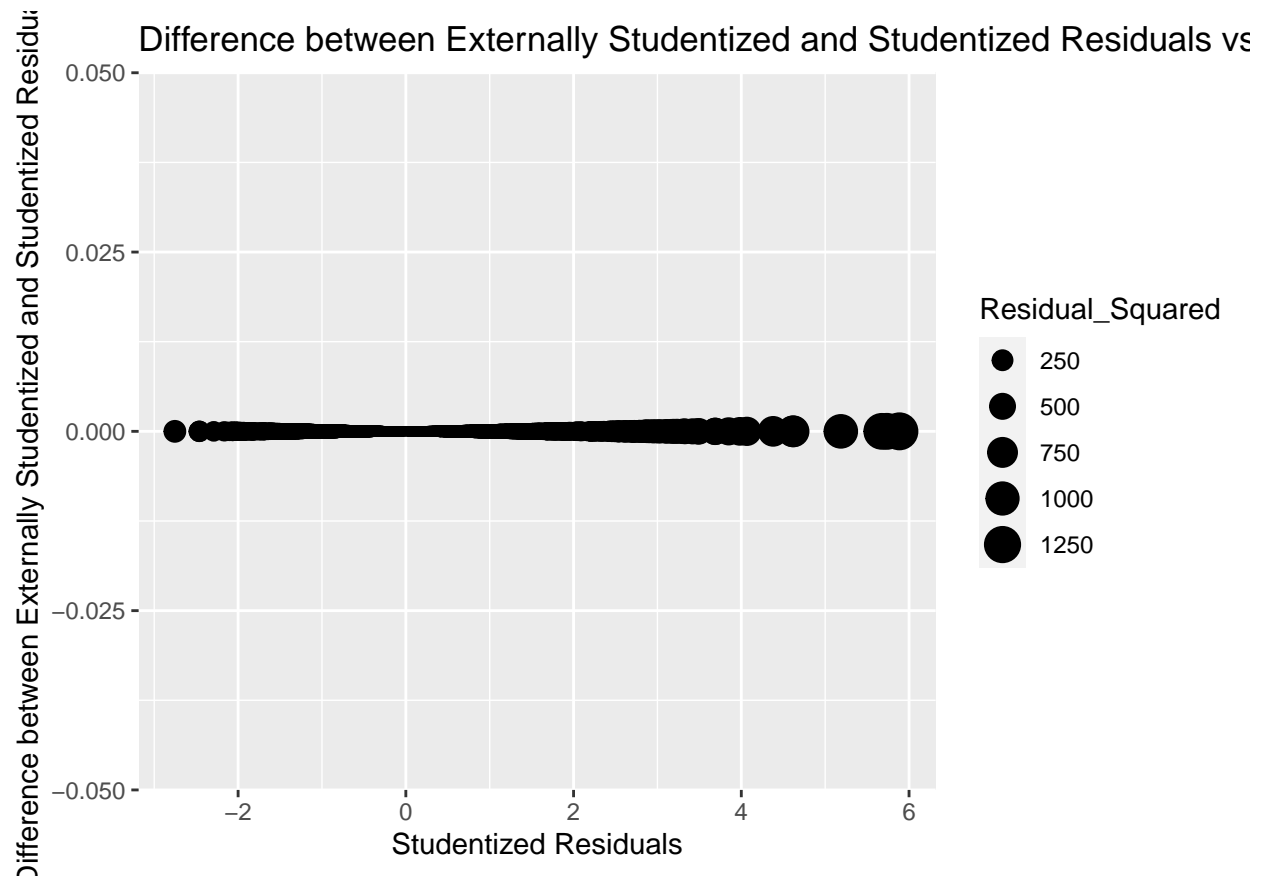
```
  Residual_Squared = residual_1^2
)

# Create the plot
ggplot(plot_data, aes(x = Studentized_Residuals, y = Difference)) +
  geom_point(aes(size = Residual_Squared)) +
  ggtitle("Difference between Externally Studentized and Studentized Residuals vs. Studentized Residuals
  xlab("Studentized Residuals") +
  ylab("Difference between Externally Studentized and Studentized Residuals")
```



```
# Display the plot
print(ggplot)
```

```
## function (data = NULL, mapping = aes(), ..., environment = parent.frame())
## {
##     UseMethod("ggplot")
## }
## <bytecode: 0x62bf118>
## <environment: namespace:ggplot2>
```

```
# Load necessary library
library(ggplot2)

# Assuming m_full is your linear model
# m_full <- lm(SleepMinNight ~ ., data = df3)

# Calculate regular residuals
```
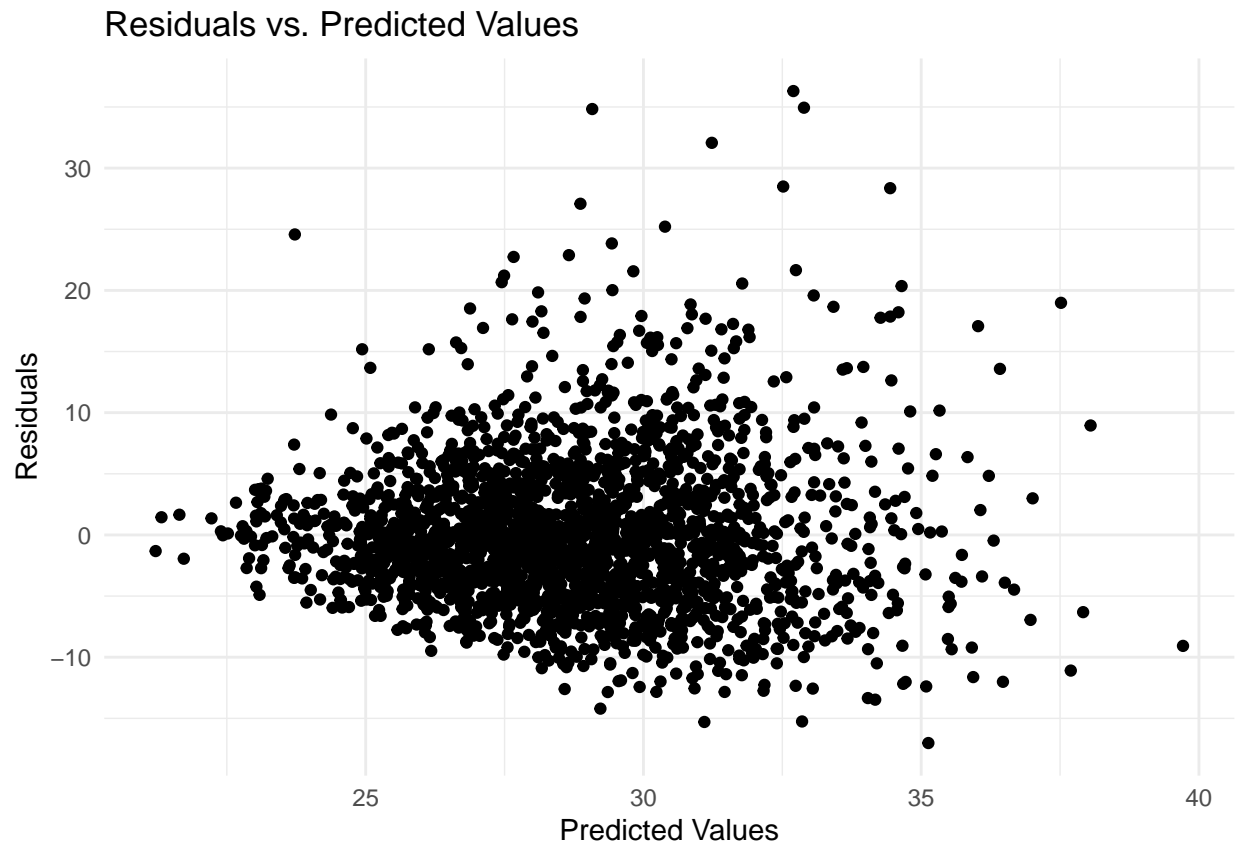
```
residual_1 <- m_full$residuals

# Get predicted values from the model
predicted_values <- predict(m_full)

# Create the plot
ggplot() +
  geom_point(aes(x = predicted_values, y = residual_1)) +
  ggtitle("Residuals vs. Predicted Values") +
  xlab("Predicted Values") +
  ylab("Residuals") +
  theme_minimal()
```


Residuals vs. Predicted Values

```
# Display the plot
print(ggplot)
```

```
## function (data = NULL, mapping = aes(), ..., environment = parent.frame())
## {
##     UseMethod("ggplot")
## }
## <bytecode: 0x62bf118>
## <environment: namespace:ggplot2>
```

```
# Load necessary library
library(ggplot2)

# Assuming m_full is your linear model
```

```
# m_full <- lm(SleepMinNight ~ ., data = df3)

# Calculate different types of residuals
residual_2 <- rstandard(m_full)
residual_3 <- rstudent(m_full)
residual_4 <- rstudent(m_full)   # Externally studentized residuals

# Get predicted values from the model
predicted_values <- predict(m_full)

# Plot for Standardized Residuals
ggplot() +
  geom_point(aes(x = predicted_values, y = residual_2)) +
  ggtitle("Standardized Residuals vs. Predicted Values") +
  xlab("Predicted Values") +
  ylab("Standardized Residuals") +
  theme_minimal()
```
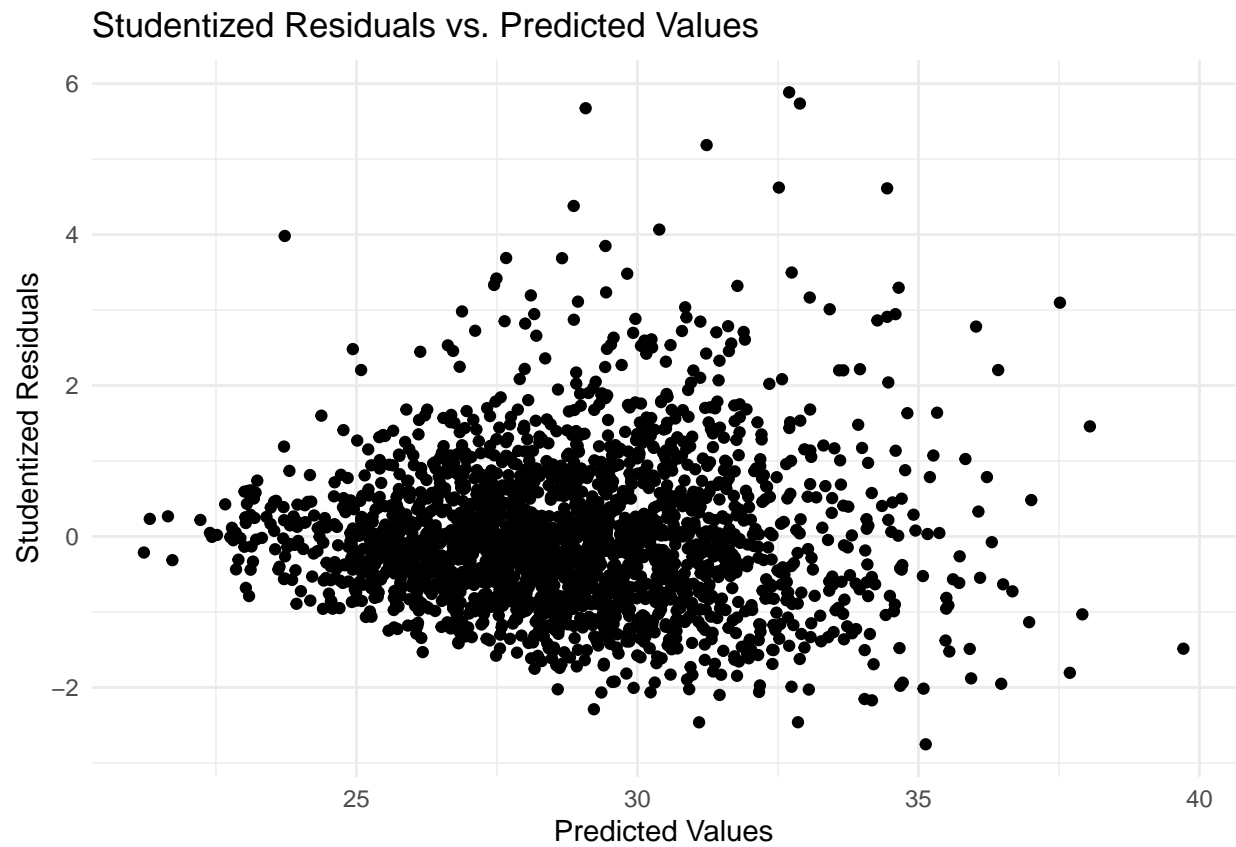

Standardized Residuals vs. Predicted Values
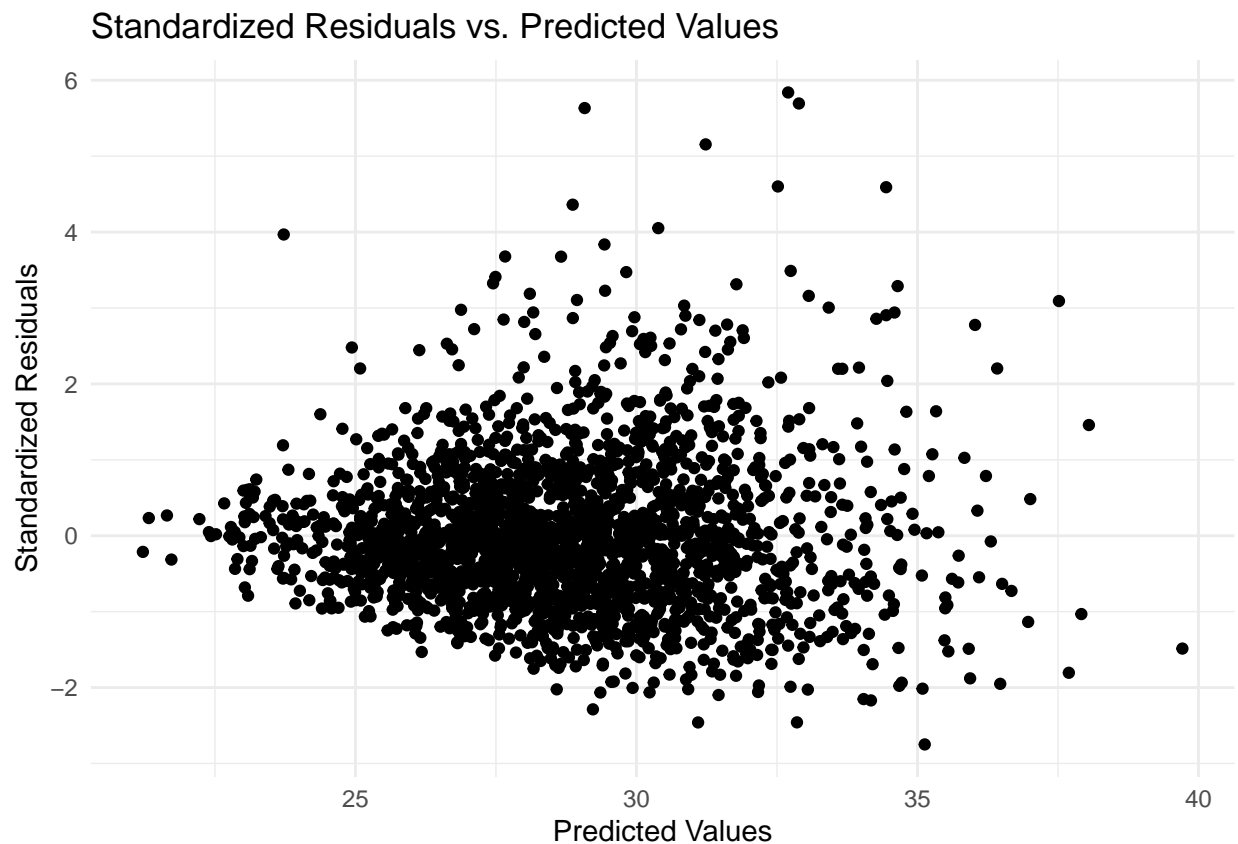
```
# Plot for Studentized Residuals
ggplot() +
  geom_point(aes(x = predicted_values, y = residual_3)) +
  ggtitle("Studentized Residuals vs. Predicted Values") +
  xlab("Predicted Values") +
  ylab("Studentized Residuals") +
  theme_minimal()
```

Studentized Residuals vs. Predicted Values


```r
# Plot for Externally Studentized Residuals
ggplot() +
  geom_point(aes(x = predicted_values, y = residual_4)) +
  ggtitle("Externally Studentized Residuals vs. Predicted Values") +
  xlab("Predicted Values") +
  ylab("Externally Studentized Residuals") +
  theme_minimal()
```

Externally Studentized Residuals vs. Predicted Values
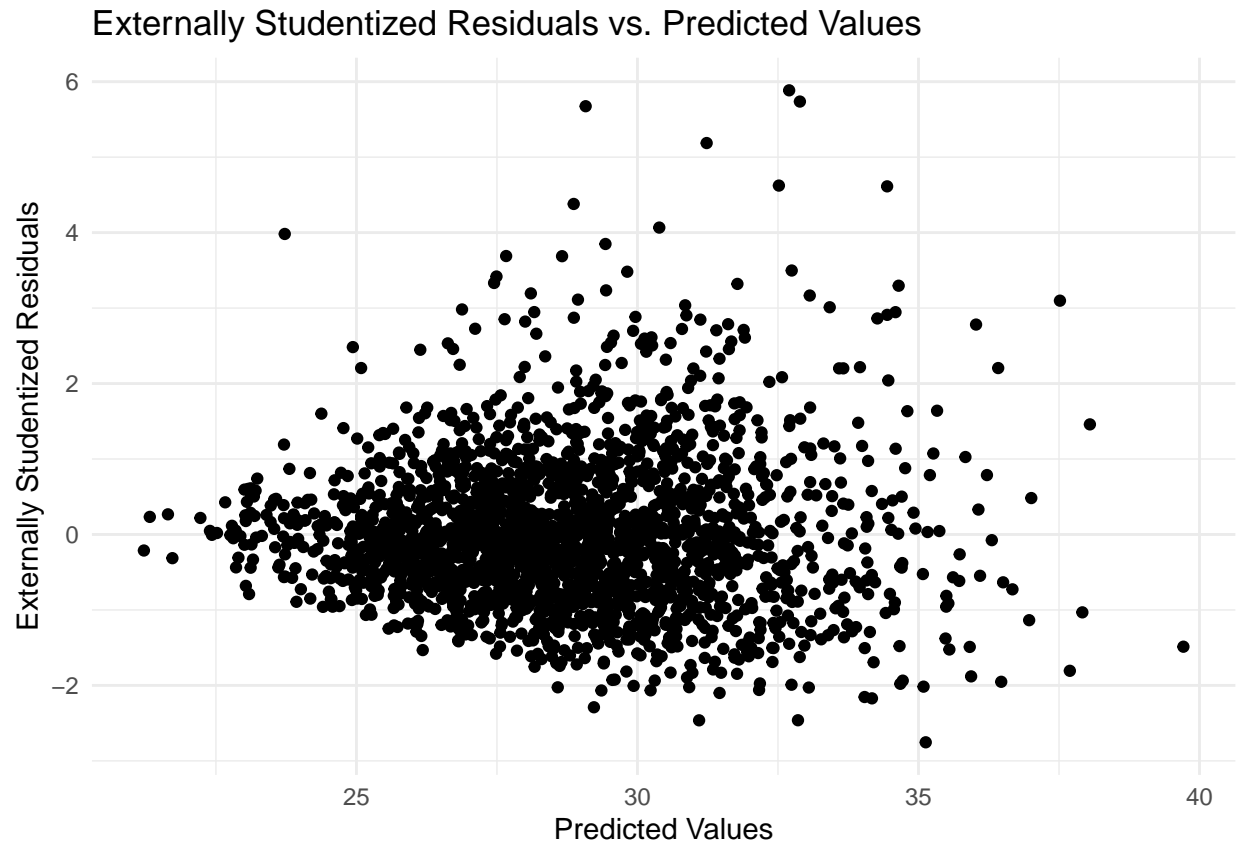
(5) Model Selection

```
step(m_full)
```

```
## Start:  AIC=7902.52
## BMI ~ SleepHrsNight + Age + Gender + Race1 + Poverty + TotChol +
##     BPDiaAve + BPSysAve + AlcoholYear + Smoke100 + UrineFlow1 +
##     DaysMentHlthBad + DaysPhysHlthBad + HealthGen + PhysActive +
##     SleepHrsNight * Age + SleepHrsNight * Gender
##
##                         Df Sum of Sq   RSS    AIC
## - TotChol                1       0.5 83018 7900.5
## - UrineFlow1             1      20.1 83038 7901.0
## - DaysPhysHlthBad        1      20.4 83038 7901.0
## - Poverty                1      24.9 83043 7901.2
## <none>                               83018 7902.5
## - DaysMentHlthBad        1     110.5 83128 7903.4
## - SleepHrsNight:Age      1     139.7 83158 7904.1
## - SleepHrsNight:Gender   1     207.1 83225 7905.9
## - Smoke100               1     305.3 83323 7908.4
## - PhysActive             1     314.7 83333 7908.7
## - Race1                  1     663.2 83681 7917.6
## - BPDiaAve               1     715.3 83733 7919.0
## - BPSysAve               1     830.6 83848 7921.9
```

```
## - AlcoholYear            1    1199.6 84217 7931.4
## - HealthGen              4    4547.8 87566 8009.3
##
## Step:  AIC=7900.53
## BMI ~ SleepHrsNight + Age + Gender + Race1 + Poverty + BPDiaAve +
##     BPSysAve + AlcoholYear + Smoke100 + UrineFlow1 + DaysMentHlthBad +
##     DaysPhysHlthBad + HealthGen + PhysActive + SleepHrsNight:Age +
##     SleepHrsNight:Gender
##
##                         Df Sum of Sq   RSS    AIC
## - UrineFlow1             1      20.0 83038 7899.1
## - DaysPhysHlthBad        1      20.3 83039 7899.1
## - Poverty                1      24.8 83043 7899.2
## <none>                               83018 7900.5
## - DaysMentHlthBad        1     110.9 83129 7901.4
## - SleepHrsNight:Age      1     140.5 83159 7902.2
## - SleepHrsNight:Gender   1     207.6 83226 7903.9
## - Smoke100               1     306.6 83325 7906.5
## - PhysActive             1     315.3 83334 7906.7
## - Race1                  1     662.9 83681 7915.6
## - BPDiaAve               1     725.3 83744 7917.3
## - BPSysAve               1     832.7 83851 7920.0
## - AlcoholYear            1    1200.1 84218 7929.4
## - HealthGen              4    4554.4 87573 8007.5
##
## Step:  AIC=7899.05
## BMI ~ SleepHrsNight + Age + Gender + Race1 + Poverty + BPDiaAve +
##     BPSysAve + AlcoholYear + Smoke100 + DaysMentHlthBad + DaysPhysHlthBad +
##     HealthGen + PhysActive + SleepHrsNight:Age + SleepHrsNight:Gender
##
##                         Df Sum of Sq   RSS    AIC
## - DaysPhysHlthBad        1      20.2 83058 7897.6
## - Poverty                1      21.7 83060 7897.6
## <none>                               83038 7899.1
## - DaysMentHlthBad        1     113.2 83152 7900.0
## - SleepHrsNight:Age      1     144.9 83183 7900.8
## - SleepHrsNight:Gender   1     207.9 83246 7902.4
## - Smoke100               1     307.7 83346 7905.0
## - PhysActive             1     325.0 83363 7905.5
## - Race1                  1     690.4 83729 7914.9
## - BPDiaAve               1     728.0 83766 7915.8
## - BPSysAve               1     828.9 83867 7918.4
## - AlcoholYear            1    1223.1 84261 7928.5
## - HealthGen              4    4580.6 87619 8006.6
##
## Step:  AIC=7897.57
## BMI ~ SleepHrsNight + Age + Gender + Race1 + Poverty + BPDiaAve +
##     BPSysAve + AlcoholYear + Smoke100 + DaysMentHlthBad + HealthGen +
##     PhysActive + SleepHrsNight:Age + SleepHrsNight:Gender
##
##                         Df Sum of Sq   RSS    AIC
## - Poverty                1      21.3 83080 7896.1
## <none>                               83058 7897.6
## - DaysMentHlthBad        1     100.0 83158 7898.2
```

```
## - SleepHrsNight:Age      1    143.8 83202 7899.3
## - SleepHrsNight:Gender   1    207.9 83266 7901.0
## - Smoke100               1    301.9 83360 7903.4
## - PhysActive             1    334.8 83393 7904.2
## - Race1                  1    688.1 83747 7913.3
## - BPDiaAve               1    719.1 83778 7914.1
## - BPSysAve               1    829.9 83888 7917.0
## - AlcoholYear            1   1235.8 84294 7927.4
## - HealthGen              4   5008.6 88067 8015.6
##
## Step:  AIC=7896.12
## BMI ~ SleepHrsNight + Age + Gender + Race1 + BPDiaAve + BPSysAve +
##     AlcoholYear + Smoke100 + DaysMentHlthBad + HealthGen + PhysActive +
##     SleepHrsNight:Age + SleepHrsNight:Gender
##
##                         Df Sum of Sq   RSS    AIC
## <none>                               83080 7896.1
## - DaysMentHlthBad        1    105.0 83185 7896.8
## - SleepHrsNight:Age      1    148.8 83229 7898.0
## - SleepHrsNight:Gender   1    203.5 83283 7899.4
## - PhysActive             1    317.7 83397 7902.3
## - Smoke100               1    338.7 83418 7902.9
## - Race1                  1    668.7 83748 7911.4
## - BPDiaAve               1    726.3 83806 7912.9
## - BPSysAve               1    818.4 83898 7915.2
## - AlcoholYear            1   1214.9 84295 7925.4
## - HealthGen              4   5098.7 88178 8016.3
##
## Call:
## lm(formula = BMI ~ SleepHrsNight + Age + Gender + Race1 + BPDiaAve +
##     BPSysAve + AlcoholYear + Smoke100 + DaysMentHlthBad + HealthGen +
##     PhysActive + SleepHrsNight:Age + SleepHrsNight:Gender, data = df3)
##
## Coefficients:
##         (Intercept)        SleepHrsNight                  Age
##           21.620969            -0.565231            -0.104961
##              Gender                Race1             BPDiaAve
##            3.749303            -0.498750             0.058815
##             BPSysAve           AlcoholYear          Smoke100Yes
##            0.053941            -0.008364            -0.832608
##      DaysMentHlthBad         HealthGenVgood       HealthGenGood
##           -0.028955             1.913856             3.548945
##        HealthGenFair         HealthGenPoor         PhysActiveYes
##            5.292807             7.773117            -0.830109
##    SleepHrsNight:Age  SleepHrsNight:Gender
##            0.017598            -0.472517
```

```
library(olsrr)
```

```
##
## Attaching package: 'olsrr'

## The following object is masked from 'package:datasets':
##
##     rivers
```

```
ols_step_forward_p(m_full, penter = 0.1, details = F)
```

```
##
##                              Selection Summary
## -------------------------------------------------------------------------------
##            Variable                    Adj.
## Step        Entered      R-Square    R-Square     C(p)        AIC        RMSE
## -------------------------------------------------------------------------------
##    1     HealthGen            0.0826      0.0809   162.3618   14153.5414   6.4747
##    2     BPDiaAve             0.1066      0.1045   103.8740   14098.4490   6.3908
##    3     AlcoholYear          0.1226      0.1201    65.6513   14061.6280   6.3349
##    4     Race1                0.1323      0.1295    43.2247   14039.7062   6.3013
##    5     BPSysAve             0.1401      0.1369    25.5844   14022.2771   6.2744
##    6     Smoke100             0.1430      0.1394    20.2357   14016.9620   6.2652
##    7     PhysActive           0.1463      0.1424    13.8134   14010.5477   6.2544
##    8     Gender               0.1476      0.1432    12.6813   14009.4102   6.2513
##    9     SleepHrsNight:Gender 0.1497      0.1449     9.4392   14006.1486   6.2451
##   10     DaysMentHlthBad      0.1509      0.1458     8.3036   14004.9953   6.2420
##   11     Poverty              0.1514      0.1458     9.1090   14005.7926   6.2417
##   12     DaysPhysHlthBad      0.1516      0.1457    10.4990   14007.1783   6.2423
##   13     TotChol              0.1517      0.1453    12.3665   14009.0448   6.2436
##   14     UrineFlow1           0.1519      0.1452    13.7880   14010.4620   6.2442
##   15     Age                  0.1522      0.1450    15.1916   14011.8610   6.2448
##   16     SleepHrsNight        0.1524      0.1448    16.5871   14013.2516   6.2454
##   17     SleepHrsNight:Age    0.1538      0.1459    15.0000   14011.6323   6.2416
## -------------------------------------------------------------------------------
```

```
ols_step_forward_p(m_full, penter = 0.05, details = F)
```

```
##
##                              Selection Summary
## -------------------------------------------------------------------------------
##            Variable                    Adj.
## Step        Entered      R-Square    R-Square     C(p)        AIC        RMSE
## -------------------------------------------------------------------------------
##    1     HealthGen            0.0826      0.0809   162.3618   14153.5414   6.4747
##    2     BPDiaAve             0.1066      0.1045   103.8740   14098.4490   6.3908
##    3     AlcoholYear          0.1226      0.1201    65.6513   14061.6280   6.3349
##    4     Race1                0.1323      0.1295    43.2247   14039.7062   6.3013
##    5     BPSysAve             0.1401      0.1369    25.5844   14022.2771   6.2744
##    6     Smoke100             0.1430      0.1394    20.2357   14016.9620   6.2652
##    7     PhysActive           0.1463      0.1424    13.8134   14010.5477   6.2544
## -------------------------------------------------------------------------------
```

```
ols_mallows_cp(model = m_3, fullmodel = m_full)  # Mallows' Cp
```

```
## [1] 19.69163
```

#general hypothesis test

```
# Load the required libraries
library(dplyr)
library(car)
library(emmeans)

# Assuming your dataframe is df3
```

```r
# Categorizing Age
df3 <- df3 %>%
  mutate(
    Age_Category = case_when(
      Age >= 18 & Age < 30 ~ "18-29",
      Age >= 30 & Age < 40 ~ "30-39",
      Age >= 40 & Age < 50 ~ "40-49",
      Age >= 50 & Age < 60 ~ "50-59",
      TRUE ~ NA_character_  # For cases not in the 18 to 60 age range
    ),
    Gender = as.factor(Gender),  # Ensure Gender is a factor type
    Race1 = as.factor(Race1)     # Ensure Race1 is a factor type
  )


# Update the model using categorical variables
m_full_updated <- lm(SleepHrsNight ~ Age_Category + Gender + Race1, data = df3)

# Overall hypothesis test
anova_results_updated <- Anova(m_full_updated, type="III")
```

```
## Warning in printHypothesis(L, rhs, names(b)): one or more coefficients in the hypothesis include
##     arithmetic operators in their names;
##   the printed representation of the hypothesis will be omitted
```

```r
summary(anova_results_updated)
```

```
##      Sum Sq              Df            F value             Pr(>F)
## Min.   :  15.29   Min.   :   1.0   Min.   :   3.014   Min.   :0.0000000
## 1st Qu.:  20.99   1st Qu.:   1.0   1st Qu.:   4.783   1st Qu.:0.0001986
## Median :  36.33   Median :   3.0   Median :   8.894   Median :0.0003498
## Mean   :2332.98   Mean   : 430.4   Mean   :1183.827   Mean   :0.0074135
## 3rd Qu.:3622.64   3rd Qu.:   4.0   3rd Qu.:1187.938   3rd Qu.:0.0075647
## Max.   :7969.66   Max.   :2143.0   Max.   :4714.505   Max.   :0.0289545
##                                    NA's   :1          NA's   :1
```

```r
# Post-hoc comparisons using emmeans
emmeans_results_updated <- emmeans(m_full_updated, specs = pairwise ~ Age_Category + Gender + Race1)
summary(emmeans_results_updated)
```

```
## $emmeans
##  Age_Category Gender Race1 emmean     SE   df lower.CL upper.CL
##  18-29        0      1       6.51 0.0947 2143     6.32     6.69
##  30-39        0      1       6.42 0.0948 2143     6.24     6.61
##  40-49        0      1       6.30 0.0954 2143     6.11     6.48
##  50-59        0      1       6.31 0.0965 2143     6.12     6.50
##  18-29        1      1       6.70 0.0936 2143     6.52     6.89
##  30-39        1      1       6.62 0.0935 2143     6.44     6.81
##  40-49        1      1       6.49 0.0950 2143     6.31     6.68
##  50-59        1      1       6.51 0.0970 2143     6.32     6.70
##  18-29        0      2       6.69 0.1197 2143     6.46     6.93
##  30-39        0      2       6.61 0.1209 2143     6.37     6.85
##  40-49        0      2       6.48 0.1212 2143     6.25     6.72
##  50-59        0      2       6.50 0.1246 2143     6.26     6.74
##  18-29        1      2       6.89 0.1202 2143     6.66     7.13
##  30-39        1      2       6.81 0.1213 2143     6.57     7.05
```

```
## 40-49        1    2      6.68 0.1222 2143    6.44    6.92
## 50-59        1    2      6.70 0.1263 2143    6.45    6.95
## 18-29        0    3      6.93 0.0989 2143    6.73    7.12
## 30-39        0    3      6.85 0.0995 2143    6.65    7.04
## 40-49        0    3      6.72 0.0999 2143    6.52    6.91
## 50-59        0    3      6.74 0.1056 2143    6.53    6.94
## 18-29        1    3      7.13 0.1031 2143    6.93    7.33
## 30-39        1    3      7.04 0.1036 2143    6.84    7.25
## 40-49        1    3      6.92 0.1047 2143    6.71    7.12
## 50-59        1    3      6.93 0.1110 2143    6.72    7.15
## 18-29        0    4      6.87 0.0688 2143    6.73    7.00
## 30-39        0    4      6.79 0.0661 2143    6.66    6.91
## 40-49        0    4      6.66 0.0646 2143    6.53    6.78
## 50-59        0    4      6.67 0.0658 2143    6.55    6.80
## 18-29        1    4      7.07 0.0689 2143    6.93    7.20
## 30-39        1    4      6.98 0.0659 2143    6.85    7.11
## 40-49        1    4      6.86 0.0657 2143    6.73    6.99
## 50-59        1    4      6.87 0.0681 2143    6.74    7.01
## 18-29        0    5      6.80 0.1173 2143    6.57    7.03
## 30-39        0    5      6.71 0.1157 2143    6.49    6.94
## 40-49        0    5      6.59 0.1185 2143    6.35    6.82
## 50-59        0    5      6.60 0.1212 2143    6.36    6.84
## 18-29        1    5      6.99 0.1185 2143    6.76    7.23
## 30-39        1    5      6.91 0.1168 2143    6.68    7.14
## 40-49        1    5      6.78 0.1202 2143    6.55    7.02
## 50-59        1    5      6.80 0.1235 2143    6.56    7.04
##
## Confidence level used: 0.95
##
## $contrasts
##  contrast                                                 estimate     SE   df t.ratio
##  (18-29 Gender0 Race11) - (30-39 Gender0 Race11)  0.082425 0.0787 2143    1.047
##  (18-29 Gender0 Race11) - (40-49 Gender0 Race11)  0.209495 0.0791 2143    2.648
##  (18-29 Gender0 Race11) - (50-59 Gender0 Race11)  0.193261 0.0822 2143    2.352
##  (18-29 Gender0 Race11) - (18-29 Gender1 Race11) -0.198758 0.0564 2143   -3.524
##  (18-29 Gender0 Race11) - (30-39 Gender1 Race11) -0.116333 0.0967 2143   -1.203
##  (18-29 Gender0 Race11) - (40-49 Gender1 Race11)  0.010737 0.0978 2143    0.110
##  (18-29 Gender0 Race11) - (50-59 Gender1 Race11) -0.005496 0.1012 2143   -0.054
##  (18-29 Gender0 Race11) - (18-29 Gender0 Race12) -0.187693 0.1325 2143   -1.417
##  (18-29 Gender0 Race11) - (30-39 Gender0 Race12) -0.105268 0.1550 2143   -0.679
##  (18-29 Gender0 Race11) - (40-49 Gender0 Race12)  0.021802 0.1551 2143    0.141
##  (18-29 Gender0 Race11) - (50-59 Gender0 Race12)  0.005568 0.1586 2143    0.035
##  (18-29 Gender0 Race11) - (18-29 Gender1 Race12) -0.386451 0.1451 2143   -2.663
##  (18-29 Gender0 Race11) - (30-39 Gender1 Race12) -0.304026 0.1659 2143   -1.832
##  (18-29 Gender0 Race11) - (40-49 Gender1 Race12) -0.176956 0.1664 2143   -1.063
##  (18-29 Gender0 Race11) - (50-59 Gender1 Race12) -0.193190 0.1702 2143   -1.135
##  (18-29 Gender0 Race11) - (18-29 Gender0 Race13) -0.423084 0.1155 2143   -3.664
##  (18-29 Gender0 Race11) - (30-39 Gender0 Race13) -0.340659 0.1402 2143   -2.430
##  (18-29 Gender0 Race11) - (40-49 Gender0 Race13) -0.213589 0.1402 2143   -1.523
##  (18-29 Gender0 Race11) - (50-59 Gender0 Race13) -0.229823 0.1454 2143   -1.581
##  (18-29 Gender0 Race11) - (18-29 Gender1 Race13) -0.621842 0.1326 2143   -4.690
##  (18-29 Gender0 Race11) - (30-39 Gender1 Race13) -0.539417 0.1545 2143   -3.491
##  (18-29 Gender0 Race11) - (40-49 Gender1 Race13) -0.412347 0.1550 2143   -2.660
##  (18-29 Gender0 Race11) - (50-59 Gender1 Race13) -0.428580 0.1602 2143   -2.675
```

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## (18-29 Gender0 Race11) - (18-29 Gender0 Race14) -0.362270 0.0845 2143   -4.285
## (18-29 Gender0 Race11) - (30-39 Gender0 Race14) -0.279845 0.1139 2143   -2.458
## (18-29 Gender0 Race11) - (40-49 Gender0 Race14) -0.152775 0.1128 2143   -1.354
## (18-29 Gender0 Race11) - (50-59 Gender0 Race14) -0.169008 0.1147 2143   -1.473
## (18-29 Gender0 Race11) - (18-29 Gender1 Race14) -0.561028 0.1027 2143   -5.462
## (18-29 Gender0 Race11) - (30-39 Gender1 Race14) -0.478602 0.1278 2143   -3.744
## (18-29 Gender0 Race11) - (40-49 Gender1 Race14) -0.351533 0.1275 2143   -2.757
## (18-29 Gender0 Race11) - (50-59 Gender1 Race14) -0.367766 0.1299 2143   -2.832
## (18-29 Gender0 Race11) - (18-29 Gender0 Race15) -0.290337 0.1296 2143   -2.239
## (18-29 Gender0 Race11) - (30-39 Gender0 Race15) -0.207912 0.1505 2143   -1.382
## (18-29 Gender0 Race11) - (40-49 Gender0 Race15) -0.080842 0.1524 2143   -0.530
## (18-29 Gender0 Race11) - (50-59 Gender0 Race15) -0.097076 0.1554 2143   -0.625
## (18-29 Gender0 Race11) - (18-29 Gender1 Race15) -0.489095 0.1431 2143   -3.417
## (18-29 Gender0 Race11) - (30-39 Gender1 Race15) -0.406670 0.1621 2143   -2.508
## (18-29 Gender0 Race11) - (40-49 Gender1 Race15) -0.279600 0.1644 2143   -1.701
## (18-29 Gender0 Race11) - (50-59 Gender1 Race15) -0.295834 0.1677 2143   -1.764
## (30-39 Gender0 Race11) - (40-49 Gender0 Race11)  0.127070 0.0776 2143    1.638
## (30-39 Gender0 Race11) - (50-59 Gender0 Race11)  0.110836 0.0805 2143    1.377
## (30-39 Gender0 Race11) - (18-29 Gender1 Race11) -0.281183 0.0970 2143   -2.900
## (30-39 Gender0 Race11) - (30-39 Gender1 Race11) -0.198758 0.0564 2143   -3.524
## (30-39 Gender0 Race11) - (40-49 Gender1 Race11) -0.071688 0.0967 2143   -0.741
## (30-39 Gender0 Race11) - (50-59 Gender1 Race11) -0.087921 0.0999 2143   -0.880
## (30-39 Gender0 Race11) - (18-29 Gender0 Race12) -0.270119 0.1531 2143   -1.764
## (30-39 Gender0 Race11) - (30-39 Gender0 Race12) -0.187693 0.1325 2143   -1.417
## (30-39 Gender0 Race11) - (40-49 Gender0 Race12) -0.060623 0.1533 2143   -0.395
## (30-39 Gender0 Race11) - (50-59 Gender0 Race12) -0.076857 0.1568 2143   -0.490
## (30-39 Gender0 Race11) - (18-29 Gender1 Race12) -0.468876 0.1643 2143   -2.854
## (30-39 Gender0 Race11) - (30-39 Gender1 Race12) -0.386451 0.1451 2143   -2.663
## (30-39 Gender0 Race11) - (40-49 Gender1 Race12) -0.259381 0.1649 2143   -1.573
## (30-39 Gender0 Race11) - (50-59 Gender1 Race12) -0.275615 0.1686 2143   -1.635
## (30-39 Gender0 Race11) - (18-29 Gender0 Race13) -0.505509 0.1393 2143   -3.629
## (30-39 Gender0 Race11) - (30-39 Gender0 Race13) -0.423084 0.1155 2143   -3.664
## (30-39 Gender0 Race11) - (40-49 Gender0 Race13) -0.296014 0.1389 2143   -2.131
## (30-39 Gender0 Race11) - (50-59 Gender0 Race13) -0.312248 0.1440 2143   -2.169
## (30-39 Gender0 Race11) - (18-29 Gender1 Race13) -0.704267 0.1539 2143   -4.577
## (30-39 Gender0 Race11) - (30-39 Gender1 Race13) -0.621842 0.1326 2143   -4.690
## (30-39 Gender0 Race11) - (40-49 Gender1 Race13) -0.494772 0.1539 2143   -3.214
## (30-39 Gender0 Race11) - (50-59 Gender1 Race13) -0.511006 0.1591 2143   -3.213
## (30-39 Gender0 Race11) - (18-29 Gender0 Race14) -0.444695 0.1171 2143   -3.797
## (30-39 Gender0 Race11) - (30-39 Gender0 Race14) -0.362270 0.0845 2143   -4.285
## (30-39 Gender0 Race11) - (40-49 Gender0 Race14) -0.235200 0.1134 2143   -2.074
## (30-39 Gender0 Race11) - (50-59 Gender0 Race14) -0.251434 0.1151 2143   -2.184
## (30-39 Gender0 Race11) - (18-29 Gender1 Race14) -0.643453 0.1309 2143   -4.914
## (30-39 Gender0 Race11) - (30-39 Gender1 Race14) -0.561028 0.1027 2143   -5.462
## (30-39 Gender0 Race11) - (40-49 Gender1 Race14) -0.433958 0.1281 2143   -3.387
## (30-39 Gender0 Race11) - (50-59 Gender1 Race14) -0.450191 0.1303 2143   -3.454
## (30-39 Gender0 Race11) - (18-29 Gender0 Race15) -0.372762 0.1529 2143   -2.438
## (30-39 Gender0 Race11) - (30-39 Gender0 Race15) -0.290337 0.1296 2143   -2.239
## (30-39 Gender0 Race11) - (40-49 Gender0 Race15) -0.163267 0.1528 2143   -1.068
## (30-39 Gender0 Race11) - (50-59 Gender0 Race15) -0.179501 0.1557 2143   -1.153
## (30-39 Gender0 Race11) - (18-29 Gender1 Race15) -0.571520 0.1645 2143   -3.474
## (30-39 Gender0 Race11) - (30-39 Gender1 Race15) -0.489095 0.1431 2143   -3.417
## (30-39 Gender0 Race11) - (40-49 Gender1 Race15) -0.362025 0.1649 2143   -2.196
## (30-39 Gender0 Race11) - (50-59 Gender1 Race15) -0.378259 0.1680 2143   -2.251
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## (40-49 Gender0 Race11) - (50-59 Gender0 Race11) -0.016234 0.0804 2143   -0.202
## (40-49 Gender0 Race11) - (18-29 Gender1 Race11) -0.408253 0.0965 2143   -4.230
## (40-49 Gender0 Race11) - (30-39 Gender1 Race11) -0.325828 0.0951 2143   -3.426
## (40-49 Gender0 Race11) - (40-49 Gender1 Race11) -0.198758 0.0564 2143   -3.524
## (40-49 Gender0 Race11) - (50-59 Gender1 Race11) -0.214991 0.0991 2143   -2.169
## (40-49 Gender0 Race11) - (18-29 Gender0 Race12) -0.397188 0.1535 2143   -2.587
## (40-49 Gender0 Race11) - (30-39 Gender0 Race12) -0.314763 0.1537 2143   -2.048
## (40-49 Gender0 Race11) - (40-49 Gender0 Race12) -0.187693 0.1325 2143   -1.417
## (40-49 Gender0 Race11) - (50-59 Gender0 Race12) -0.203927 0.1569 2143   -1.299
## (40-49 Gender0 Race11) - (18-29 Gender1 Race12) -0.595946 0.1642 2143   -3.630
## (40-49 Gender0 Race11) - (30-39 Gender1 Race12) -0.513521 0.1643 2143   -3.126
## (40-49 Gender0 Race11) - (40-49 Gender1 Race12) -0.386451 0.1451 2143   -2.663
## (40-49 Gender0 Race11) - (50-59 Gender1 Race12) -0.402685 0.1683 2143   -2.393
## (40-49 Gender0 Race11) - (18-29 Gender0 Race13) -0.632579 0.1397 2143   -4.527
## (40-49 Gender0 Race11) - (30-39 Gender0 Race13) -0.550154 0.1393 2143   -3.949
## (40-49 Gender0 Race11) - (40-49 Gender0 Race13) -0.423084 0.1155 2143   -3.664
## (40-49 Gender0 Race11) - (50-59 Gender0 Race13) -0.439318 0.1441 2143   -3.048
## (40-49 Gender0 Race11) - (18-29 Gender1 Race13) -0.831337 0.1538 2143   -5.407
## (40-49 Gender0 Race11) - (30-39 Gender1 Race13) -0.748912 0.1533 2143   -4.886
## (40-49 Gender0 Race11) - (40-49 Gender1 Race13) -0.621842 0.1326 2143   -4.690
## (40-49 Gender0 Race11) - (50-59 Gender1 Race13) -0.638075 0.1587 2143   -4.020
## (40-49 Gender0 Race11) - (18-29 Gender0 Race14) -0.571765 0.1187 2143   -4.816
## (40-49 Gender0 Race11) - (30-39 Gender0 Race14) -0.489340 0.1161 2143   -4.215
## (40-49 Gender0 Race11) - (40-49 Gender0 Race14) -0.362270 0.0845 2143   -4.285
## (40-49 Gender0 Race11) - (50-59 Gender0 Race14) -0.378503 0.1164 2143   -3.251
## (40-49 Gender0 Race11) - (18-29 Gender1 Race14) -0.770523 0.1318 2143   -5.847
## (40-49 Gender0 Race11) - (30-39 Gender1 Race14) -0.688098 0.1293 2143   -5.321
## (40-49 Gender0 Race11) - (40-49 Gender1 Race14) -0.561028 0.1027 2143   -5.462
## (40-49 Gender0 Race11) - (50-59 Gender1 Race14) -0.577261 0.1309 2143   -4.411
## (40-49 Gender0 Race11) - (18-29 Gender0 Race15) -0.499832 0.1514 2143   -3.302
## (40-49 Gender0 Race11) - (30-39 Gender0 Race15) -0.417407 0.1493 2143   -2.795
## (40-49 Gender0 Race11) - (40-49 Gender0 Race15) -0.290337 0.1296 2143   -2.239
## (40-49 Gender0 Race11) - (50-59 Gender0 Race15) -0.306571 0.1539 2143   -1.992
## (40-49 Gender0 Race11) - (18-29 Gender1 Race15) -0.698590 0.1627 2143   -4.295
## (40-49 Gender0 Race11) - (30-39 Gender1 Race15) -0.616165 0.1607 2143   -3.834
## (40-49 Gender0 Race11) - (40-49 Gender1 Race15) -0.489095 0.1431 2143   -3.417
## (40-49 Gender0 Race11) - (50-59 Gender1 Race15) -0.505328 0.1660 2143   -3.045
## (50-59 Gender0 Race11) - (18-29 Gender1 Race11) -0.392019 0.0982 2143   -3.994
## (50-59 Gender0 Race11) - (30-39 Gender1 Race11) -0.309594 0.0966 2143   -3.205
## (50-59 Gender0 Race11) - (40-49 Gender1 Race11) -0.182524 0.0973 2143   -1.875
## (50-59 Gender0 Race11) - (50-59 Gender1 Race11) -0.198758 0.0564 2143   -3.524
## (50-59 Gender0 Race11) - (18-29 Gender0 Race12) -0.380955 0.1531 2143   -2.488
## (50-59 Gender0 Race11) - (30-39 Gender0 Race12) -0.298530 0.1532 2143   -1.949
## (50-59 Gender0 Race11) - (40-49 Gender0 Race12) -0.171460 0.1530 2143   -1.121
## (50-59 Gender0 Race11) - (50-59 Gender0 Race12) -0.187693 0.1325 2143   -1.417
## (50-59 Gender0 Race11) - (18-29 Gender1 Race12) -0.579713 0.1633 2143   -3.550
## (50-59 Gender0 Race11) - (30-39 Gender1 Race12) -0.497287 0.1632 2143   -3.046
## (50-59 Gender0 Race11) - (40-49 Gender1 Race12) -0.370218 0.1635 2143   -2.264
## (50-59 Gender0 Race11) - (50-59 Gender1 Race12) -0.386451 0.1451 2143   -2.663
## (50-59 Gender0 Race11) - (18-29 Gender0 Race13) -0.616345 0.1380 2143   -4.466
## (50-59 Gender0 Race11) - (30-39 Gender0 Race13) -0.533920 0.1375 2143   -3.884
## (50-59 Gender0 Race11) - (40-49 Gender0 Race13) -0.406850 0.1372 2143   -2.965
## (50-59 Gender0 Race11) - (50-59 Gender0 Race13) -0.423084 0.1155 2143   -3.664
## (50-59 Gender0 Race11) - (18-29 Gender1 Race13) -0.815103 0.1516 2143   -5.376
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## (50-59 Gender0 Race11) - (30-39 Gender1 Race13) -0.732678 0.1510 2143   -4.851
## (50-59 Gender0 Race11) - (40-49 Gender1 Race13) -0.605608 0.1513 2143   -4.002
## (50-59 Gender0 Race11) - (50-59 Gender1 Race13) -0.621842 0.1326 2143   -4.690
## (50-59 Gender0 Race11) - (18-29 Gender0 Race14) -0.555531 0.1210 2143   -4.591
## (50-59 Gender0 Race11) - (30-39 Gender0 Race14) -0.473106 0.1183 2143   -4.000
## (50-59 Gender0 Race11) - (40-49 Gender0 Race14) -0.346036 0.1169 2143   -2.959
## (50-59 Gender0 Race11) - (50-59 Gender0 Race14) -0.362270 0.0845 2143   -4.285
## (50-59 Gender0 Race11) - (18-29 Gender1 Race14) -0.754289 0.1332 2143   -5.662
## (50-59 Gender0 Race11) - (30-39 Gender1 Race14) -0.671864 0.1306 2143   -5.143
## (50-59 Gender0 Race11) - (40-49 Gender1 Race14) -0.544794 0.1300 2143   -4.190
## (50-59 Gender0 Race11) - (50-59 Gender1 Race14) -0.561028 0.1027 2143   -5.462
## (50-59 Gender0 Race11) - (18-29 Gender0 Race15) -0.483599 0.1516 2143   -3.190
## (50-59 Gender0 Race11) - (30-39 Gender0 Race15) -0.401173 0.1495 2143   -2.684
## (50-59 Gender0 Race11) - (40-49 Gender0 Race15) -0.274103 0.1512 2143   -1.813
## (50-59 Gender0 Race11) - (50-59 Gender0 Race15) -0.290337 0.1296 2143   -2.239
## (50-59 Gender0 Race11) - (18-29 Gender1 Race15) -0.682356 0.1623 2143   -4.203
## (50-59 Gender0 Race11) - (30-39 Gender1 Race15) -0.599931 0.1603 2143   -3.743
## (50-59 Gender0 Race11) - (40-49 Gender1 Race15) -0.472861 0.1623 2143   -2.913
## (50-59 Gender0 Race11) - (50-59 Gender1 Race15) -0.489095 0.1431 2143   -3.417
## (18-29 Gender1 Race11) - (30-39 Gender1 Race11)  0.082425 0.0787 2143    1.047
## (18-29 Gender1 Race11) - (40-49 Gender1 Race11)  0.209495 0.0791 2143    2.648
## (18-29 Gender1 Race11) - (50-59 Gender1 Race11)  0.193261 0.0822 2143    2.352
## (18-29 Gender1 Race11) - (18-29 Gender0 Race12)  0.011064 0.1428 2143    0.077
## (18-29 Gender1 Race11) - (30-39 Gender0 Race12)  0.093490 0.1640 2143    0.570
## (18-29 Gender1 Race11) - (40-49 Gender0 Race12)  0.220559 0.1636 2143    1.348
## (18-29 Gender1 Race11) - (50-59 Gender0 Race12)  0.204326 0.1664 2143    1.228
## (18-29 Gender1 Race11) - (18-29 Gender1 Race12) -0.187693 0.1325 2143   -1.417
## (18-29 Gender1 Race11) - (30-39 Gender1 Race12) -0.105268 0.1550 2143   -0.679
## (18-29 Gender1 Race11) - (40-49 Gender1 Race12)  0.021802 0.1551 2143    0.141
## (18-29 Gender1 Race11) - (50-59 Gender1 Race12)  0.005568 0.1586 2143    0.035
## (18-29 Gender1 Race11) - (18-29 Gender0 Race13) -0.224326 0.1243 2143   -1.804
## (18-29 Gender1 Race11) - (30-39 Gender0 Race13) -0.141901 0.1476 2143   -0.961
## (18-29 Gender1 Race11) - (40-49 Gender0 Race13) -0.014831 0.1472 2143   -0.101
## (18-29 Gender1 Race11) - (50-59 Gender0 Race13) -0.031065 0.1515 2143   -0.205
## (18-29 Gender1 Race11) - (18-29 Gender1 Race13) -0.423084 0.1155 2143   -3.664
## (18-29 Gender1 Race11) - (30-39 Gender1 Race13) -0.340659 0.1402 2143   -2.430
## (18-29 Gender1 Race11) - (40-49 Gender1 Race13) -0.213589 0.1402 2143   -1.523
## (18-29 Gender1 Race11) - (50-59 Gender1 Race13) -0.229823 0.1454 2143   -1.581
## (18-29 Gender1 Race11) - (18-29 Gender0 Race14) -0.163512 0.1006 2143   -1.626
## (18-29 Gender1 Race11) - (30-39 Gender0 Race14) -0.081087 0.1263 2143   -0.642
## (18-29 Gender1 Race11) - (40-49 Gender0 Race14)  0.045983 0.1247 2143    0.369
## (18-29 Gender1 Race11) - (50-59 Gender0 Race14)  0.029749 0.1258 2143    0.237
## (18-29 Gender1 Race11) - (18-29 Gender1 Race14) -0.362270 0.0845 2143   -4.285
## (18-29 Gender1 Race11) - (30-39 Gender1 Race14) -0.279845 0.1139 2143   -2.458
## (18-29 Gender1 Race11) - (40-49 Gender1 Race14) -0.152775 0.1128 2143   -1.354
## (18-29 Gender1 Race11) - (50-59 Gender1 Race14) -0.169008 0.1147 2143   -1.473
## (18-29 Gender1 Race11) - (18-29 Gender0 Race15) -0.091579 0.1396 2143   -0.656
## (18-29 Gender1 Race11) - (30-39 Gender0 Race15) -0.009154 0.1592 2143   -0.057
## (18-29 Gender1 Race11) - (40-49 Gender0 Race15)  0.117916 0.1606 2143    0.734
## (18-29 Gender1 Race11) - (50-59 Gender0 Race15)  0.101682 0.1629 2143    0.624
## (18-29 Gender1 Race11) - (18-29 Gender1 Race15) -0.290337 0.1296 2143   -2.239
## (18-29 Gender1 Race11) - (30-39 Gender1 Race15) -0.207912 0.1505 2143   -1.382
## (18-29 Gender1 Race11) - (40-49 Gender1 Race15) -0.080842 0.1524 2143   -0.530
## (18-29 Gender1 Race11) - (50-59 Gender1 Race15) -0.097076 0.1554 2143   -0.625
```

```
## (30-39 Gender1 Race11) - (40-49 Gender1 Race11)   0.127070 0.0776 2143    1.638
## (30-39 Gender1 Race11) - (50-59 Gender1 Race11)   0.110836 0.0805 2143    1.377
## (30-39 Gender1 Race11) - (18-29 Gender0 Race12)  -0.071361 0.1621 2143   -0.440
## (30-39 Gender1 Race11) - (30-39 Gender0 Race12)   0.011064 0.1428 2143    0.077
## (30-39 Gender1 Race11) - (40-49 Gender0 Race12)   0.138134 0.1619 2143    0.853
## (30-39 Gender1 Race11) - (50-59 Gender0 Race12)   0.121901 0.1646 2143    0.740
## (30-39 Gender1 Race11) - (18-29 Gender1 Race12)  -0.270119 0.1531 2143   -1.764
## (30-39 Gender1 Race11) - (30-39 Gender1 Race12)  -0.187693 0.1325 2143   -1.417
## (30-39 Gender1 Race11) - (40-49 Gender1 Race12)  -0.060623 0.1533 2143   -0.395
## (30-39 Gender1 Race11) - (50-59 Gender1 Race12)  -0.076857 0.1568 2143   -0.490
## (30-39 Gender1 Race11) - (18-29 Gender0 Race13)  -0.306751 0.1466 2143   -2.092
## (30-39 Gender1 Race11) - (30-39 Gender0 Race13)  -0.224326 0.1243 2143   -1.804
## (30-39 Gender1 Race11) - (40-49 Gender0 Race13)  -0.097256 0.1458 2143   -0.667
## (30-39 Gender1 Race11) - (50-59 Gender0 Race13)  -0.113490 0.1501 2143   -0.756
## (30-39 Gender1 Race11) - (18-29 Gender1 Race13)  -0.505509 0.1393 2143   -3.629
## (30-39 Gender1 Race11) - (30-39 Gender1 Race13)  -0.423084 0.1155 2143   -3.664
## (30-39 Gender1 Race11) - (40-49 Gender1 Race13)  -0.296014 0.1389 2143   -2.131
## (30-39 Gender1 Race11) - (50-59 Gender1 Race13)  -0.312248 0.1440 2143   -2.169
## (30-39 Gender1 Race11) - (18-29 Gender0 Race14)  -0.245937 0.1291 2143   -1.906
## (30-39 Gender1 Race11) - (30-39 Gender0 Race14)  -0.163512 0.1006 2143   -1.626
## (30-39 Gender1 Race11) - (40-49 Gender0 Race14)  -0.036442 0.1252 2143   -0.291
## (30-39 Gender1 Race11) - (50-59 Gender0 Race14)  -0.052676 0.1261 2143   -0.418
## (30-39 Gender1 Race11) - (18-29 Gender1 Race14)  -0.444695 0.1171 2143   -3.797
## (30-39 Gender1 Race11) - (30-39 Gender1 Race14)  -0.362270 0.0845 2143   -4.285
## (30-39 Gender1 Race11) - (40-49 Gender1 Race14)  -0.235200 0.1134 2143   -2.074
## (30-39 Gender1 Race11) - (50-59 Gender1 Race14)  -0.251434 0.1151 2143   -2.184
## (30-39 Gender1 Race11) - (18-29 Gender0 Race15)  -0.174005 0.1613 2143   -1.079
## (30-39 Gender1 Race11) - (30-39 Gender0 Race15)  -0.091579 0.1396 2143   -0.656
## (30-39 Gender1 Race11) - (40-49 Gender0 Race15)   0.035491 0.1609 2143    0.221
## (30-39 Gender1 Race11) - (50-59 Gender0 Race15)   0.019257 0.1631 2143    0.118
## (30-39 Gender1 Race11) - (18-29 Gender1 Race15)  -0.372762 0.1529 2143   -2.438
## (30-39 Gender1 Race11) - (30-39 Gender1 Race15)  -0.290337 0.1296 2143   -2.239
## (30-39 Gender1 Race11) - (40-49 Gender1 Race15)  -0.163267 0.1528 2143   -1.068
## (30-39 Gender1 Race11) - (50-59 Gender1 Race15)  -0.179501 0.1557 2143   -1.153
## (40-49 Gender1 Race11) - (50-59 Gender1 Race11)  -0.016234 0.0804 2143   -0.202
## (40-49 Gender1 Race11) - (18-29 Gender0 Race12)  -0.198431 0.1629 2143   -1.218
## (40-49 Gender1 Race11) - (30-39 Gender0 Race12)  -0.116005 0.1631 2143   -0.711
## (40-49 Gender1 Race11) - (40-49 Gender0 Race12)   0.011064 0.1428 2143    0.077
## (40-49 Gender1 Race11) - (50-59 Gender0 Race12)  -0.005169 0.1652 2143   -0.031
## (40-49 Gender1 Race11) - (18-29 Gender1 Race12)  -0.397188 0.1535 2143   -2.587
## (40-49 Gender1 Race11) - (30-39 Gender1 Race12)  -0.314763 0.1537 2143   -2.048
## (40-49 Gender1 Race11) - (40-49 Gender1 Race12)  -0.187693 0.1325 2143   -1.417
## (40-49 Gender1 Race11) - (50-59 Gender1 Race12)  -0.203927 0.1569 2143   -1.299
## (40-49 Gender1 Race11) - (18-29 Gender0 Race13)  -0.433821 0.1476 2143   -2.940
## (40-49 Gender1 Race11) - (30-39 Gender0 Race13)  -0.351396 0.1473 2143   -2.386
## (40-49 Gender1 Race11) - (40-49 Gender0 Race13)  -0.224326 0.1243 2143   -1.804
## (40-49 Gender1 Race11) - (50-59 Gender0 Race13)  -0.240560 0.1507 2143   -1.596
## (40-49 Gender1 Race11) - (18-29 Gender1 Race13)  -0.632579 0.1397 2143   -4.527
## (40-49 Gender1 Race11) - (30-39 Gender1 Race13)  -0.550154 0.1393 2143   -3.949
## (40-49 Gender1 Race11) - (40-49 Gender1 Race13)  -0.423084 0.1155 2143   -3.664
## (40-49 Gender1 Race11) - (50-59 Gender1 Race13)  -0.439318 0.1441 2143   -3.048
## (40-49 Gender1 Race11) - (18-29 Gender0 Race14)  -0.373007 0.1311 2143   -2.846
## (40-49 Gender1 Race11) - (30-39 Gender0 Race14)  -0.290582 0.1288 2143   -2.256
## (40-49 Gender1 Race11) - (40-49 Gender0 Race14)  -0.163512 0.1006 2143   -1.626
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## (40-49 Gender1 Race11) - (50-59 Gender0 Race14) -0.179746 0.1278 2143  -1.406
## (40-49 Gender1 Race11) - (18-29 Gender1 Race14) -0.571765 0.1187 2143  -4.816
## (40-49 Gender1 Race11) - (30-39 Gender1 Race14) -0.489340 0.1161 2143  -4.215
## (40-49 Gender1 Race11) - (40-49 Gender1 Race14) -0.362270 0.0845 2143  -4.285
## (40-49 Gender1 Race11) - (50-59 Gender1 Race14) -0.378503 0.1164 2143  -3.251
## (40-49 Gender1 Race11) - (18-29 Gender0 Race15) -0.301074 0.1604 2143  -1.877
## (40-49 Gender1 Race11) - (30-39 Gender0 Race15) -0.218649 0.1586 2143  -1.379
## (40-49 Gender1 Race11) - (40-49 Gender0 Race15) -0.091579 0.1396 2143  -0.656
## (40-49 Gender1 Race11) - (50-59 Gender0 Race15) -0.107813 0.1619 2143  -0.666
## (40-49 Gender1 Race11) - (18-29 Gender1 Race15) -0.499832 0.1514 2143  -3.302
## (40-49 Gender1 Race11) - (30-39 Gender1 Race15) -0.417407 0.1493 2143  -2.795
## (40-49 Gender1 Race11) - (40-49 Gender1 Race15) -0.290337 0.1296 2143  -2.239
## (40-49 Gender1 Race11) - (50-59 Gender1 Race15) -0.306571 0.1539 2143  -1.992
## (50-59 Gender1 Race11) - (18-29 Gender0 Race12) -0.182197 0.1630 2143  -1.117
## (50-59 Gender1 Race11) - (30-39 Gender0 Race12) -0.099772 0.1632 2143  -0.611
## (50-59 Gender1 Race11) - (40-49 Gender0 Race12)  0.027298 0.1625 2143   0.168
## (50-59 Gender1 Race11) - (50-59 Gender0 Race12)  0.011064 0.1428 2143   0.077
## (50-59 Gender1 Race11) - (18-29 Gender1 Race12) -0.380955 0.1531 2143  -2.488
## (50-59 Gender1 Race11) - (30-39 Gender1 Race12) -0.298530 0.1532 2143  -1.949
## (50-59 Gender1 Race11) - (40-49 Gender1 Race12) -0.171460 0.1530 2143  -1.121
## (50-59 Gender1 Race11) - (50-59 Gender1 Race12) -0.187693 0.1325 2143  -1.417
## (50-59 Gender1 Race11) - (18-29 Gender0 Race13) -0.417588 0.1465 2143  -2.850
## (50-59 Gender1 Race11) - (30-39 Gender0 Race13) -0.335162 0.1461 2143  -2.294
## (50-59 Gender1 Race11) - (40-49 Gender0 Race13) -0.208093 0.1453 2143  -1.432
## (50-59 Gender1 Race11) - (50-59 Gender0 Race13) -0.224326 0.1243 2143  -1.804
## (50-59 Gender1 Race11) - (18-29 Gender1 Race13) -0.616345 0.1380 2143  -4.466
## (50-59 Gender1 Race11) - (30-39 Gender1 Race13) -0.533920 0.1375 2143  -3.884
## (50-59 Gender1 Race11) - (40-49 Gender1 Race13) -0.406850 0.1372 2143  -2.965
## (50-59 Gender1 Race11) - (50-59 Gender1 Race13) -0.423084 0.1155 2143  -3.664
## (50-59 Gender1 Race11) - (18-29 Gender0 Race14) -0.356774 0.1338 2143  -2.666
## (50-59 Gender1 Race11) - (30-39 Gender0 Race14) -0.274348 0.1315 2143  -2.087
## (50-59 Gender1 Race11) - (40-49 Gender0 Race14) -0.147279 0.1296 2143  -1.136
## (50-59 Gender1 Race11) - (50-59 Gender0 Race14) -0.163512 0.1006 2143  -1.626
## (50-59 Gender1 Race11) - (18-29 Gender1 Race14) -0.555531 0.1210 2143  -4.591
## (50-59 Gender1 Race11) - (30-39 Gender1 Race14) -0.473106 0.1183 2143  -4.000
## (50-59 Gender1 Race11) - (40-49 Gender1 Race14) -0.346036 0.1169 2143  -2.959
## (50-59 Gender1 Race11) - (50-59 Gender1 Race14) -0.362270 0.0845 2143  -4.285
## (50-59 Gender1 Race11) - (18-29 Gender0 Race15) -0.284841 0.1611 2143  -1.768
## (50-59 Gender1 Race11) - (30-39 Gender0 Race15) -0.202416 0.1592 2143  -1.271
## (50-59 Gender1 Race11) - (40-49 Gender0 Race15) -0.075346 0.1603 2143  -0.470
## (50-59 Gender1 Race11) - (50-59 Gender0 Race15) -0.091579 0.1396 2143  -0.656
## (50-59 Gender1 Race11) - (18-29 Gender1 Race15) -0.483599 0.1516 2143  -3.190
## (50-59 Gender1 Race11) - (30-39 Gender1 Race15) -0.401173 0.1495 2143  -2.684
## (50-59 Gender1 Race11) - (40-49 Gender1 Race15) -0.274103 0.1512 2143  -1.813
## (50-59 Gender1 Race11) - (50-59 Gender1 Race15) -0.290337 0.1296 2143  -2.239
## (18-29 Gender0 Race12) - (30-39 Gender0 Race12)  0.082425 0.0787 2143   1.047
## (18-29 Gender0 Race12) - (40-49 Gender0 Race12)  0.209495 0.0791 2143   2.648
## (18-29 Gender0 Race12) - (50-59 Gender0 Race12)  0.193261 0.0822 2143   2.352
## (18-29 Gender0 Race12) - (18-29 Gender1 Race12) -0.198758 0.0564 2143  -3.524
## (18-29 Gender0 Race12) - (30-39 Gender1 Race12) -0.116333 0.0967 2143  -1.203
## (18-29 Gender0 Race12) - (40-49 Gender1 Race12)  0.010737 0.0978 2143   0.110
## (18-29 Gender0 Race12) - (50-59 Gender1 Race12) -0.005496 0.1012 2143  -0.054
## (18-29 Gender0 Race12) - (18-29 Gender0 Race13) -0.235391 0.1380 2143  -1.705
## (18-29 Gender0 Race12) - (30-39 Gender0 Race13) -0.152965 0.1584 2143  -0.966
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## (18-29 Gender0 Race12) - (40-49 Gender0 Race13) -0.025895 0.1586 2143  -0.163
## (18-29 Gender0 Race12) - (50-59 Gender0 Race13) -0.042129 0.1612 2143  -0.261
## (18-29 Gender0 Race12) - (18-29 Gender1 Race13) -0.434148 0.1515 2143  -2.865
## (18-29 Gender0 Race12) - (30-39 Gender1 Race13) -0.351723 0.1702 2143  -2.067
## (18-29 Gender0 Race12) - (40-49 Gender1 Race13) -0.224653 0.1708 2143  -1.315
## (18-29 Gender0 Race12) - (50-59 Gender1 Race13) -0.240887 0.1738 2143  -1.386
## (18-29 Gender0 Race12) - (18-29 Gender0 Race14) -0.174576 0.1141 2143  -1.530
## (18-29 Gender0 Race12) - (30-39 Gender0 Race14) -0.092151 0.1362 2143  -0.677
## (18-29 Gender0 Race12) - (40-49 Gender0 Race14)  0.034919 0.1355 2143   0.258
## (18-29 Gender0 Race12) - (50-59 Gender0 Race14)  0.018685 0.1348 2143   0.139
## (18-29 Gender0 Race12) - (18-29 Gender1 Race14) -0.373334 0.1268 2143  -2.943
## (18-29 Gender0 Race12) - (30-39 Gender1 Race14) -0.290909 0.1469 2143  -1.980
## (18-29 Gender0 Race12) - (40-49 Gender1 Race14) -0.163839 0.1468 2143  -1.116
## (18-29 Gender0 Race12) - (50-59 Gender1 Race14) -0.180073 0.1468 2143  -1.227
## (18-29 Gender0 Race12) - (18-29 Gender0 Race15) -0.102644 0.1503 2143  -0.683
## (18-29 Gender0 Race12) - (30-39 Gender0 Race15) -0.020219 0.1677 2143  -0.121
## (18-29 Gender0 Race12) - (40-49 Gender0 Race15)  0.106851 0.1696 2143   0.630
## (18-29 Gender0 Race12) - (50-59 Gender0 Race15)  0.090618 0.1705 2143   0.532
## (18-29 Gender0 Race12) - (18-29 Gender1 Race15) -0.301401 0.1610 2143  -1.872
## (18-29 Gender0 Race12) - (30-39 Gender1 Race15) -0.218976 0.1773 2143  -1.235
## (18-29 Gender0 Race12) - (40-49 Gender1 Race15) -0.091907 0.1795 2143  -0.512
## (18-29 Gender0 Race12) - (50-59 Gender1 Race15) -0.108140 0.1808 2143  -0.598
## (30-39 Gender0 Race12) - (40-49 Gender0 Race12)  0.127070 0.0776 2143   1.638
## (30-39 Gender0 Race12) - (50-59 Gender0 Race12)  0.110836 0.0805 2143   1.377
## (30-39 Gender0 Race12) - (18-29 Gender1 Race12) -0.281183 0.0970 2143  -2.900
## (30-39 Gender0 Race12) - (30-39 Gender1 Race12) -0.198758 0.0564 2143  -3.524
## (30-39 Gender0 Race12) - (40-49 Gender1 Race12) -0.071688 0.0967 2143  -0.741
## (30-39 Gender0 Race12) - (50-59 Gender1 Race12) -0.087921 0.0999 2143  -0.880
## (30-39 Gender0 Race12) - (18-29 Gender0 Race13) -0.317816 0.1594 2143  -1.993
## (30-39 Gender0 Race12) - (30-39 Gender0 Race13) -0.235391 0.1380 2143  -1.705
## (30-39 Gender0 Race12) - (40-49 Gender0 Race13) -0.108321 0.1583 2143  -0.684
## (30-39 Gender0 Race12) - (50-59 Gender0 Race13) -0.124554 0.1609 2143  -0.774
## (30-39 Gender0 Race12) - (18-29 Gender1 Race13) -0.516574 0.1713 2143  -3.015
## (30-39 Gender0 Race12) - (30-39 Gender1 Race13) -0.434148 0.1515 2143  -2.865
## (30-39 Gender0 Race12) - (40-49 Gender1 Race13) -0.307078 0.1707 2143  -1.799
## (30-39 Gender0 Race12) - (50-59 Gender1 Race13) -0.323312 0.1735 2143  -1.863
## (30-39 Gender0 Race12) - (18-29 Gender0 Race14) -0.257002 0.1410 2143  -1.822
## (30-39 Gender0 Race12) - (30-39 Gender0 Race14) -0.174576 0.1141 2143  -1.530
## (30-39 Gender0 Race12) - (40-49 Gender0 Race14) -0.047507 0.1371 2143  -0.347
## (30-39 Gender0 Race12) - (50-59 Gender0 Race14) -0.063740 0.1363 2143  -0.468
## (30-39 Gender0 Race12) - (18-29 Gender1 Race14) -0.455759 0.1516 2143  -3.007
## (30-39 Gender0 Race12) - (30-39 Gender1 Race14) -0.373334 0.1268 2143  -2.943
## (30-39 Gender0 Race12) - (40-49 Gender1 Race14) -0.246264 0.1483 2143  -1.660
## (30-39 Gender0 Race12) - (50-59 Gender1 Race14) -0.262498 0.1482 2143  -1.771
## (30-39 Gender0 Race12) - (18-29 Gender0 Race15) -0.185069 0.1716 2143  -1.079
## (30-39 Gender0 Race12) - (30-39 Gender0 Race15) -0.102644 0.1503 2143  -0.683
## (30-39 Gender0 Race12) - (40-49 Gender0 Race15)  0.024426 0.1708 2143   0.143
## (30-39 Gender0 Race12) - (50-59 Gender0 Race15)  0.008193 0.1716 2143   0.048
## (30-39 Gender0 Race12) - (18-29 Gender1 Race15) -0.383827 0.1811 2143  -2.119
## (30-39 Gender0 Race12) - (30-39 Gender1 Race15) -0.301401 0.1610 2143  -1.872
## (30-39 Gender0 Race12) - (40-49 Gender1 Race15) -0.174332 0.1808 2143  -0.964
## (30-39 Gender0 Race12) - (50-59 Gender1 Race15) -0.190565 0.1820 2143  -1.047
## (40-49 Gender0 Race12) - (50-59 Gender0 Race12) -0.016234 0.0804 2143  -0.202
## (40-49 Gender0 Race12) - (18-29 Gender1 Race12) -0.408253 0.0965 2143  -4.230
```

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## (40-49 Gender0 Race12) - (30-39 Gender1 Race12) -0.325828 0.0951 2143   -3.426
## (40-49 Gender0 Race12) - (40-49 Gender1 Race12) -0.198758 0.0564 2143   -3.524
## (40-49 Gender0 Race12) - (50-59 Gender1 Race12) -0.214991 0.0991 2143   -2.169
## (40-49 Gender0 Race12) - (18-29 Gender0 Race13) -0.444886 0.1596 2143   -2.787
## (40-49 Gender0 Race12) - (30-39 Gender0 Race13) -0.362461 0.1584 2143   -2.289
## (40-49 Gender0 Race12) - (40-49 Gender0 Race13) -0.235391 0.1380 2143   -1.705
## (40-49 Gender0 Race12) - (50-59 Gender0 Race13) -0.251624 0.1609 2143   -1.564
## (40-49 Gender0 Race12) - (18-29 Gender1 Race13) -0.643644 0.1711 2143   -3.763
## (40-49 Gender0 Race12) - (30-39 Gender1 Race13) -0.561218 0.1698 2143   -3.305
## (40-49 Gender0 Race12) - (40-49 Gender1 Race13) -0.434148 0.1515 2143   -2.865
## (40-49 Gender0 Race12) - (50-59 Gender1 Race13) -0.450382 0.1731 2143   -2.602
## (40-49 Gender0 Race12) - (18-29 Gender0 Race14) -0.384072 0.1422 2143   -2.702
## (40-49 Gender0 Race12) - (30-39 Gender0 Race14) -0.301646 0.1389 2143   -2.171
## (40-49 Gender0 Race12) - (40-49 Gender0 Race14) -0.174576 0.1141 2143   -1.530
## (40-49 Gender0 Race12) - (50-59 Gender0 Race14) -0.190810 0.1372 2143   -1.391
## (40-49 Gender0 Race12) - (18-29 Gender1 Race14) -0.582829 0.1521 2143   -3.831
## (40-49 Gender0 Race12) - (30-39 Gender1 Race14) -0.500404 0.1490 2143   -3.358
## (40-49 Gender0 Race12) - (40-49 Gender1 Race14) -0.373334 0.1268 2143   -2.943
## (40-49 Gender0 Race12) - (50-59 Gender1 Race14) -0.389568 0.1485 2143   -2.623
## (40-49 Gender0 Race12) - (18-29 Gender0 Race15) -0.312139 0.1701 2143   -1.835
## (40-49 Gender0 Race12) - (30-39 Gender0 Race15) -0.229714 0.1674 2143   -1.372
## (40-49 Gender0 Race12) - (40-49 Gender0 Race15) -0.102644 0.1503 2143   -0.683
## (40-49 Gender0 Race12) - (50-59 Gender0 Race15) -0.118877 0.1699 2143   -0.700
## (40-49 Gender0 Race12) - (18-29 Gender1 Race15) -0.510897 0.1793 2143   -2.850
## (40-49 Gender0 Race12) - (30-39 Gender1 Race15) -0.428471 0.1767 2143   -2.425
## (40-49 Gender0 Race12) - (40-49 Gender1 Race15) -0.301401 0.1610 2143   -1.872
## (40-49 Gender0 Race12) - (50-59 Gender1 Race15) -0.317635 0.1799 2143   -1.765
## (50-59 Gender0 Race12) - (18-29 Gender1 Race12) -0.392019 0.0982 2143   -3.994
## (50-59 Gender0 Race12) - (30-39 Gender1 Race12) -0.309594 0.0966 2143   -3.205
## (50-59 Gender0 Race12) - (40-49 Gender1 Race12) -0.182524 0.0973 2143   -1.875
## (50-59 Gender0 Race12) - (50-59 Gender1 Race12) -0.198758 0.0564 2143   -3.524
## (50-59 Gender0 Race12) - (18-29 Gender0 Race13) -0.428652 0.1601 2143   -2.678
## (50-59 Gender0 Race12) - (30-39 Gender0 Race13) -0.346227 0.1587 2143   -2.182
## (50-59 Gender0 Race12) - (40-49 Gender0 Race13) -0.219157 0.1586 2143   -1.381
## (50-59 Gender0 Race12) - (50-59 Gender0 Race13) -0.235391 0.1380 2143   -1.705
## (50-59 Gender0 Race12) - (18-29 Gender1 Race13) -0.627410 0.1710 2143   -3.670
## (50-59 Gender0 Race12) - (30-39 Gender1 Race13) -0.544985 0.1696 2143   -3.214
## (50-59 Gender0 Race12) - (40-49 Gender1 Race13) -0.417915 0.1700 2143   -2.458
## (50-59 Gender0 Race12) - (50-59 Gender1 Race13) -0.434148 0.1515 2143   -2.865
## (50-59 Gender0 Race12) - (18-29 Gender0 Race14) -0.367838 0.1462 2143   -2.516
## (50-59 Gender0 Race12) - (30-39 Gender0 Race14) -0.285413 0.1429 2143   -1.997
## (50-59 Gender0 Race12) - (40-49 Gender0 Race14) -0.158343 0.1420 2143   -1.115
## (50-59 Gender0 Race12) - (50-59 Gender0 Race14) -0.174576 0.1141 2143   -1.530
## (50-59 Gender0 Race12) - (18-29 Gender1 Race14) -0.566596 0.1554 2143   -3.647
## (50-59 Gender0 Race12) - (30-39 Gender1 Race14) -0.484171 0.1522 2143   -3.181
## (50-59 Gender0 Race12) - (40-49 Gender1 Race14) -0.357101 0.1518 2143   -2.352
## (50-59 Gender0 Race12) - (50-59 Gender1 Race14) -0.373334 0.1268 2143   -2.943
## (50-59 Gender0 Race12) - (18-29 Gender0 Race15) -0.295905 0.1721 2143   -1.719
## (50-59 Gender0 Race12) - (30-39 Gender0 Race15) -0.213480 0.1694 2143   -1.261
## (50-59 Gender0 Race12) - (40-49 Gender0 Race15) -0.086410 0.1710 2143   -0.505
## (50-59 Gender0 Race12) - (50-59 Gender0 Race15) -0.102644 0.1503 2143   -0.683
## (50-59 Gender0 Race12) - (18-29 Gender1 Race15) -0.494663 0.1807 2143   -2.737
## (50-59 Gender0 Race12) - (30-39 Gender1 Race15) -0.412238 0.1780 2143   -2.316
## (50-59 Gender0 Race12) - (40-49 Gender1 Race15) -0.285168 0.1800 2143   -1.584
```

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## (50-59 Gender0 Race12) - (50-59 Gender1 Race15)  -0.301401 0.1610 2143   -1.872
## (18-29 Gender1 Race12) - (30-39 Gender1 Race12)    0.082425 0.0787 2143    1.047
## (18-29 Gender1 Race12) - (40-49 Gender1 Race12)    0.209495 0.0791 2143    2.648
## (18-29 Gender1 Race12) - (50-59 Gender1 Race12)    0.193261 0.0822 2143    2.352
## (18-29 Gender1 Race12) - (18-29 Gender0 Race13)   -0.036633 0.1467 2143   -0.250
## (18-29 Gender1 Race12) - (30-39 Gender0 Race13)    0.045792 0.1660 2143    0.276
## (18-29 Gender1 Race12) - (40-49 Gender0 Race13)    0.172862 0.1658 2143    1.043
## (18-29 Gender1 Race12) - (50-59 Gender0 Race13)    0.156629 0.1678 2143    0.934
## (18-29 Gender1 Race12) - (18-29 Gender1 Race13)   -0.235391 0.1380 2143   -1.705
## (18-29 Gender1 Race12) - (30-39 Gender1 Race13)   -0.152965 0.1584 2143   -0.966
## (18-29 Gender1 Race12) - (40-49 Gender1 Race13)   -0.025895 0.1586 2143   -0.163
## (18-29 Gender1 Race12) - (50-59 Gender1 Race13)   -0.042129 0.1612 2143   -0.261
## (18-29 Gender1 Race12) - (18-29 Gender0 Race14)    0.024181 0.1278 2143    0.189
## (18-29 Gender1 Race12) - (30-39 Gender0 Race14)    0.106607 0.1479 2143    0.721
## (18-29 Gender1 Race12) - (40-49 Gender0 Race14)    0.233676 0.1467 2143    1.592
## (18-29 Gender1 Race12) - (50-59 Gender0 Race14)    0.217443 0.1455 2143    1.494
## (18-29 Gender1 Race12) - (18-29 Gender1 Race14)   -0.174576 0.1141 2143   -1.530
## (18-29 Gender1 Race12) - (30-39 Gender1 Race14)   -0.092151 0.1362 2143   -0.677
## (18-29 Gender1 Race12) - (40-49 Gender1 Race14)    0.034919 0.1355 2143    0.258
## (18-29 Gender1 Race12) - (50-59 Gender1 Race14)    0.018685 0.1348 2143    0.139
## (18-29 Gender1 Race12) - (18-29 Gender0 Race15)    0.096114 0.1600 2143    0.601
## (18-29 Gender1 Race12) - (30-39 Gender0 Race15)    0.178539 0.1766 2143    1.011
## (18-29 Gender1 Race12) - (40-49 Gender0 Race15)    0.305609 0.1779 2143    1.717
## (18-29 Gender1 Race12) - (50-59 Gender0 Race15)    0.289376 0.1783 2143    1.623
## (18-29 Gender1 Race12) - (18-29 Gender1 Race15)   -0.102644 0.1503 2143   -0.683
## (18-29 Gender1 Race12) - (30-39 Gender1 Race15)   -0.020219 0.1677 2143   -0.121
## (18-29 Gender1 Race12) - (40-49 Gender1 Race15)    0.106851 0.1696 2143    0.630
## (18-29 Gender1 Race12) - (50-59 Gender1 Race15)    0.090618 0.1705 2143    0.532
## (30-39 Gender1 Race12) - (40-49 Gender1 Race12)    0.127070 0.0776 2143    1.638
## (30-39 Gender1 Race12) - (50-59 Gender1 Race12)    0.110836 0.0805 2143    1.377
## (30-39 Gender1 Race12) - (18-29 Gender0 Race13)   -0.119058 0.1669 2143   -0.713
## (30-39 Gender1 Race12) - (30-39 Gender0 Race13)   -0.036633 0.1467 2143   -0.250
## (30-39 Gender1 Race12) - (40-49 Gender0 Race13)    0.090437 0.1655 2143    0.547
## (30-39 Gender1 Race12) - (50-59 Gender0 Race13)    0.074204 0.1674 2143    0.443
## (30-39 Gender1 Race12) - (18-29 Gender1 Race13)   -0.317816 0.1594 2143   -1.993
## (30-39 Gender0 Race12) - (30-39 Gender1 Race13)   -0.235391 0.1380 2143   -1.705
## (30-39 Gender1 Race12) - (40-49 Gender1 Race13)   -0.108321 0.1583 2143   -0.684
## (30-39 Gender1 Race12) - (50-59 Gender1 Race13)   -0.124554 0.1609 2143   -0.774
## (30-39 Gender1 Race12) - (18-29 Gender0 Race14)   -0.058244 0.1522 2143   -0.383
## (30-39 Gender1 Race12) - (30-39 Gender0 Race14)    0.024181 0.1278 2143    0.189
## (30-39 Gender1 Race12) - (40-49 Gender0 Race14)    0.151251 0.1481 2143    1.021
## (30-39 Gender1 Race12) - (50-59 Gender0 Race14)    0.135018 0.1468 2143    0.920
## (30-39 Gender1 Race12) - (18-29 Gender1 Race14)   -0.257002 0.1410 2143   -1.822
## (30-39 Gender1 Race12) - (30-39 Gender1 Race14)   -0.174576 0.1141 2143   -1.530
## (30-39 Gender1 Race12) - (40-49 Gender1 Race14)   -0.047507 0.1371 2143   -0.347
## (30-39 Gender1 Race12) - (50-59 Gender1 Race14)   -0.063740 0.1363 2143   -0.468
## (30-39 Gender1 Race12) - (18-29 Gender0 Race15)    0.013689 0.1801 2143    0.076
## (30-39 Gender1 Race12) - (30-39 Gender0 Race15)    0.096114 0.1600 2143    0.601
## (30-39 Gender1 Race12) - (40-49 Gender0 Race15)    0.223184 0.1790 2143    1.247
## (30-39 Gender1 Race12) - (50-59 Gender0 Race15)    0.206950 0.1793 2143    1.154
## (30-39 Gender1 Race12) - (18-29 Gender1 Race15)   -0.185069 0.1716 2143   -1.079
## (30-39 Gender1 Race12) - (30-39 Gender1 Race15)   -0.102644 0.1503 2143   -0.683
## (30-39 Gender1 Race12) - (40-49 Gender1 Race15)    0.024426 0.1708 2143    0.143
## (30-39 Gender1 Race12) - (50-59 Gender1 Race15)    0.008193 0.1716 2143    0.048
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## (40-49 Gender1 Race12) - (50-59 Gender1 Race12) -0.016234 0.0804 2143  -0.202
## (40-49 Gender1 Race12) - (18-29 Gender0 Race13) -0.246128 0.1676 2143  -1.469
## (40-49 Gender1 Race12) - (30-39 Gender0 Race13) -0.163703 0.1664 2143  -0.984
## (40-49 Gender1 Race12) - (40-49 Gender0 Race13) -0.036633 0.1467 2143  -0.250
## (40-49 Gender1 Race12) - (50-59 Gender0 Race13) -0.052866 0.1678 2143  -0.315
## (40-49 Gender1 Race12) - (18-29 Gender1 Race13) -0.444886 0.1596 2143  -2.787
## (40-49 Gender1 Race12) - (30-39 Gender1 Race13) -0.362461 0.1584 2143  -2.289
## (40-49 Gender1 Race12) - (40-49 Gender1 Race13) -0.235391 0.1380 2143  -1.705
## (40-49 Gender1 Race12) - (50-59 Gender1 Race13) -0.251624 0.1609 2143  -1.564
## (40-49 Gender1 Race12) - (18-29 Gender0 Race14) -0.185314 0.1537 2143  -1.205
## (40-49 Gender1 Race12) - (30-39 Gender0 Race14) -0.102889 0.1508 2143  -0.682
## (40-49 Gender1 Race12) - (40-49 Gender0 Race14)  0.024181 0.1278 2143   0.189
## (40-49 Gender1 Race12) - (50-59 Gender0 Race14)  0.007948 0.1481 2143   0.054
## (40-49 Gender1 Race12) - (18-29 Gender1 Race14) -0.384072 0.1422 2143  -2.702
## (40-49 Gender1 Race12) - (30-39 Gender1 Race14) -0.301646 0.1389 2143  -2.171
## (40-49 Gender1 Race12) - (40-49 Gender1 Race14) -0.174576 0.1141 2143  -1.530
## (40-49 Gender1 Race12) - (50-59 Gender1 Race14) -0.190810 0.1372 2143  -1.391
## (40-49 Gender1 Race12) - (18-29 Gender0 Race15) -0.113381 0.1791 2143  -0.633
## (40-49 Gender1 Race12) - (30-39 Gender0 Race15) -0.030956 0.1767 2143  -0.175
## (40-49 Gender1 Race12) - (40-49 Gender0 Race15)  0.096114 0.1600 2143   0.601
## (40-49 Gender1 Race12) - (50-59 Gender0 Race15)  0.079880 0.1781 2143   0.449
## (40-49 Gender1 Race12) - (18-29 Gender1 Race15) -0.312139 0.1701 2143  -1.835
## (40-49 Gender1 Race12) - (30-39 Gender1 Race15) -0.229714 0.1674 2143  -1.372
## (40-49 Gender1 Race12) - (40-49 Gender1 Race15) -0.102644 0.1503 2143  -0.683
## (40-49 Gender1 Race12) - (50-59 Gender1 Race15) -0.118877 0.1699 2143  -0.700
## (50-59 Gender1 Race12) - (18-29 Gender0 Race13) -0.229894 0.1685 2143  -1.365
## (50-59 Gender1 Race12) - (30-39 Gender0 Race13) -0.147469 0.1672 2143  -0.882
## (50-59 Gender1 Race12) - (40-49 Gender0 Race13) -0.020399 0.1667 2143  -0.122
## (50-59 Gender1 Race12) - (50-59 Gender0 Race13) -0.036633 0.1467 2143  -0.250
## (50-59 Gender1 Race12) - (18-29 Gender1 Race13) -0.428652 0.1601 2143  -2.678
## (50-59 Gender1 Race12) - (30-39 Gender1 Race13) -0.346227 0.1587 2143  -2.182
## (50-59 Gender1 Race12) - (40-49 Gender1 Race13) -0.219157 0.1586 2143  -1.381
## (50-59 Gender1 Race12) - (50-59 Gender1 Race13) -0.235391 0.1380 2143  -1.705
## (50-59 Gender1 Race12) - (18-29 Gender0 Race14) -0.169080 0.1580 2143  -1.070
## (50-59 Gender1 Race12) - (30-39 Gender0 Race14) -0.086655 0.1551 2143  -0.559
## (50-59 Gender1 Race12) - (40-49 Gender0 Race14)  0.040415 0.1537 2143   0.263
## (50-59 Gender1 Race12) - (50-59 Gender0 Race14)  0.024181 0.1278 2143   0.189
## (50-59 Gender1 Race12) - (18-29 Gender1 Race14) -0.367838 0.1462 2143  -2.516
## (50-59 Gender1 Race12) - (30-39 Gender1 Race14) -0.285413 0.1429 2143  -1.997
## (50-59 Gender1 Race12) - (40-49 Gender1 Race14) -0.158343 0.1420 2143  -1.115
## (50-59 Gender1 Race12) - (50-59 Gender1 Race14) -0.174576 0.1141 2143  -1.530
## (50-59 Gender1 Race12) - (18-29 Gender0 Race15) -0.097147 0.1815 2143  -0.535
## (50-59 Gender1 Race12) - (30-39 Gender0 Race15) -0.014722 0.1790 2143  -0.082
## (50-59 Gender1 Race12) - (40-49 Gender0 Race15)  0.112348 0.1801 2143   0.624
## (50-59 Gender1 Race12) - (50-59 Gender0 Race15)  0.096114 0.1600 2143   0.601
## (50-59 Gender1 Race12) - (18-29 Gender1 Race15) -0.295905 0.1721 2143  -1.719
## (50-59 Gender1 Race12) - (30-39 Gender1 Race15) -0.213480 0.1694 2143  -1.261
## (50-59 Gender1 Race12) - (40-49 Gender1 Race15) -0.086410 0.1710 2143  -0.505
## (50-59 Gender1 Race12) - (50-59 Gender1 Race15) -0.102644 0.1503 2143  -0.683
## (18-29 Gender0 Race13) - (30-39 Gender0 Race13)  0.082425 0.0787 2143   1.047
## (18-29 Gender0 Race13) - (40-49 Gender0 Race13)  0.209495 0.0791 2143   2.648
## (18-29 Gender0 Race13) - (50-59 Gender0 Race13)  0.193261 0.0822 2143   2.352
## (18-29 Gender0 Race13) - (18-29 Gender1 Race13) -0.198758 0.0564 2143  -3.524
## (18-29 Gender0 Race13) - (30-39 Gender1 Race13) -0.116333 0.0967 2143  -1.203
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## (18-29 Gender0 Race13) - (40-49 Gender1 Race13)  0.010737 0.0978 2143   0.110
## (18-29 Gender0 Race13) - (50-59 Gender1 Race13) -0.005496 0.1012 2143  -0.054
## (18-29 Gender0 Race13) - (18-29 Gender0 Race14)  0.060814 0.0938 2143   0.649
## (18-29 Gender0 Race13) - (30-39 Gender0 Race14)  0.143239 0.1204 2143   1.190
## (18-29 Gender0 Race13) - (40-49 Gender0 Race14)  0.270309 0.1196 2143   2.261
## (18-29 Gender0 Race13) - (50-59 Gender0 Race14)  0.254076 0.1173 2143   2.166
## (18-29 Gender0 Race13) - (18-29 Gender1 Race14) -0.137944 0.1055 2143  -1.307
## (18-29 Gender0 Race13) - (30-39 Gender1 Race14) -0.055518 0.1296 2143  -0.428
## (18-29 Gender0 Race13) - (40-49 Gender1 Race14)  0.071551 0.1295 2143   0.553
## (18-29 Gender0 Race13) - (50-59 Gender1 Race14)  0.055318 0.1281 2143   0.432
## (18-29 Gender0 Race13) - (18-29 Gender0 Race15)  0.132747 0.1353 2143   0.981
## (18-29 Gender0 Race13) - (30-39 Gender0 Race15)  0.215172 0.1549 2143   1.389
## (18-29 Gender0 Race13) - (40-49 Gender0 Race15)  0.342242 0.1570 2143   2.180
## (18-29 Gender0 Race13) - (50-59 Gender0 Race15)  0.326008 0.1568 2143   2.079
## (18-29 Gender0 Race13) - (18-29 Gender1 Race15) -0.066011 0.1446 2143  -0.456
## (18-29 Gender0 Race13) - (30-39 Gender1 Race15)  0.016414 0.1631 2143   0.101
## (18-29 Gender0 Race13) - (40-49 Gender1 Race15)  0.143484 0.1655 2143   0.867
## (18-29 Gender0 Race13) - (50-59 Gender1 Race15)  0.127250 0.1659 2143   0.767
## (30-39 Gender0 Race13) - (40-49 Gender0 Race13)  0.127070 0.0776 2143   1.638
## (30-39 Gender0 Race13) - (50-59 Gender0 Race13)  0.110836 0.0805 2143   1.377
## (30-39 Gender0 Race13) - (18-29 Gender1 Race13) -0.281183 0.0970 2143  -2.900
## (30-39 Gender0 Race13) - (30-39 Gender1 Race13) -0.198758 0.0564 2143  -3.524
## (30-39 Gender0 Race13) - (40-49 Gender1 Race13) -0.071688 0.0967 2143  -0.741
## (30-39 Gender0 Race13) - (50-59 Gender1 Race13) -0.087921 0.0999 2143  -0.880
## (30-39 Gender0 Race13) - (18-29 Gender0 Race14) -0.021611 0.1244 2143  -0.174
## (30-39 Gender0 Race13) - (30-39 Gender0 Race14)  0.060814 0.0938 2143   0.649
## (30-39 Gender0 Race13) - (40-49 Gender0 Race14)  0.187884 0.1206 2143   1.557
## (30-39 Gender0 Race13) - (50-59 Gender0 Race14)  0.171650 0.1183 2143   1.452
## (30-39 Gender0 Race13) - (18-29 Gender1 Race14) -0.220369 0.1336 2143  -1.649
## (30-39 Gender0 Race13) - (30-39 Gender1 Race14) -0.137944 0.1055 2143  -1.307
## (30-39 Gender0 Race13) - (40-49 Gender1 Race14) -0.010874 0.1306 2143  -0.083
## (30-39 Gender0 Race13) - (50-59 Gender1 Race14) -0.027107 0.1290 2143  -0.210
## (30-39 Gender0 Race13) - (18-29 Gender0 Race15)  0.050322 0.1581 2143   0.318
## (30-39 Gender0 Race13) - (30-39 Gender0 Race15)  0.132747 0.1353 2143   0.981
## (30-39 Gender0 Race13) - (40-49 Gender0 Race15)  0.259817 0.1578 2143   1.647
## (30-39 Gender0 Race13) - (50-59 Gender0 Race15)  0.243583 0.1575 2143   1.546
## (30-39 Gender0 Race13) - (18-29 Gender1 Race15) -0.148436 0.1662 2143  -0.893
## (30-39 Gender0 Race13) - (30-39 Gender1 Race15) -0.066011 0.1446 2143  -0.456
## (30-39 Gender0 Race13) - (40-49 Gender1 Race15)  0.061059 0.1663 2143   0.367
## (30-39 Gender0 Race13) - (50-59 Gender1 Race15)  0.044825 0.1666 2143   0.269
## (40-49 Gender0 Race13) - (50-59 Gender0 Race13) -0.016234 0.0804 2143  -0.202
## (40-49 Gender0 Race13) - (18-29 Gender1 Race13) -0.408253 0.0965 2143  -4.230
## (40-49 Gender0 Race13) - (30-39 Gender1 Race13) -0.325828 0.0951 2143  -3.426
## (40-49 Gender0 Race13) - (40-49 Gender1 Race13) -0.198758 0.0564 2143  -3.524
## (40-49 Gender0 Race13) - (50-59 Gender1 Race13) -0.214991 0.0991 2143  -2.169
## (40-49 Gender0 Race13) - (18-29 Gender0 Race14) -0.148681 0.1257 2143  -1.183
## (40-49 Gender0 Race13) - (30-39 Gender0 Race14) -0.066256 0.1227 2143  -0.540
## (40-49 Gender0 Race13) - (40-49 Gender0 Race14)  0.060814 0.0938 2143   0.649
## (40-49 Gender0 Race13) - (50-59 Gender0 Race14)  0.044581 0.1193 2143   0.374
## (40-49 Gender0 Race13) - (18-29 Gender1 Race14) -0.347439 0.1342 2143  -2.588
## (40-49 Gender0 Race13) - (30-39 Gender1 Race14) -0.265014 0.1313 2143  -2.018
## (40-49 Gender0 Race13) - (40-49 Gender1 Race14) -0.137944 0.1055 2143  -1.307
## (40-49 Gender0 Race13) - (50-59 Gender1 Race14) -0.154177 0.1294 2143  -1.192
## (40-49 Gender0 Race13) - (18-29 Gender0 Race15) -0.076748 0.1564 2143  -0.491
```

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## (40-49 Gender0 Race13) - (30-39 Gender0 Race15)  0.005677 0.1541 2143   0.037
## (40-49 Gender0 Race13) - (40-49 Gender0 Race15)  0.132747 0.1353 2143   0.981
## (40-49 Gender0 Race13) - (50-59 Gender0 Race15)  0.116513 0.1556 2143   0.749
## (40-49 Gender0 Race13) - (18-29 Gender1 Race15) -0.275506 0.1642 2143  -1.678
## (40-49 Gender0 Race13) - (30-39 Gender1 Race15) -0.193081 0.1619 2143  -1.193
## (40-49 Gender0 Race13) - (40-49 Gender1 Race15) -0.066011 0.1446 2143  -0.456
## (40-49 Gender0 Race13) - (50-59 Gender1 Race15) -0.082244 0.1643 2143  -0.500
## (50-59 Gender0 Race13) - (18-29 Gender1 Race13) -0.392019 0.0982 2143  -3.994
## (50-59 Gender0 Race13) - (30-39 Gender1 Race13) -0.309594 0.0966 2143  -3.205
## (50-59 Gender0 Race13) - (40-49 Gender1 Race13) -0.182524 0.0973 2143  -1.875
## (50-59 Gender0 Race13) - (50-59 Gender1 Race13) -0.198758 0.0564 2143  -3.524
## (50-59 Gender0 Race13) - (18-29 Gender0 Race14) -0.132447 0.1316 2143  -1.006
## (50-59 Gender0 Race13) - (30-39 Gender0 Race14) -0.050022 0.1287 2143  -0.389
## (50-59 Gender0 Race13) - (40-49 Gender0 Race14)  0.077048 0.1276 2143   0.604
## (50-59 Gender0 Race13) - (50-59 Gender0 Race14)  0.060814 0.0938 2143   0.649
## (50-59 Gender0 Race13) - (18-29 Gender1 Race14) -0.331205 0.1392 2143  -2.380
## (50-59 Gender0 Race13) - (30-39 Gender1 Race14) -0.248780 0.1363 2143  -1.826
## (50-59 Gender0 Race13) - (40-49 Gender1 Race14) -0.121710 0.1358 2143  -0.896
## (50-59 Gender0 Race13) - (50-59 Gender1 Race14) -0.137944 0.1055 2143  -1.307
## (50-59 Gender0 Race13) - (18-29 Gender0 Race15) -0.060515 0.1597 2143  -0.379
## (50-59 Gender0 Race13) - (30-39 Gender0 Race15)  0.021911 0.1573 2143   0.139
## (50-59 Gender0 Race13) - (40-49 Gender0 Race15)  0.148980 0.1591 2143   0.936
## (50-59 Gender0 Race13) - (50-59 Gender0 Race15)  0.132747 0.1353 2143   0.981
## (50-59 Gender0 Race13) - (18-29 Gender1 Race15) -0.259272 0.1668 2143  -1.554
## (50-59 Gender0 Race13) - (30-39 Gender1 Race15) -0.176847 0.1644 2143  -1.076
## (50-59 Gender0 Race13) - (40-49 Gender1 Race15) -0.049777 0.1666 2143  -0.299
## (50-59 Gender0 Race13) - (50-59 Gender1 Race15) -0.066011 0.1446 2143  -0.456
## (18-29 Gender1 Race13) - (30-39 Gender1 Race13)  0.082425 0.0787 2143   1.047
## (18-29 Gender1 Race13) - (40-49 Gender1 Race13)  0.209495 0.0791 2143   2.648
## (18-29 Gender1 Race13) - (50-59 Gender1 Race13)  0.193261 0.0822 2143   2.352
## (18-29 Gender1 Race13) - (18-29 Gender0 Race14)  0.259572 0.1132 2143   2.293
## (18-29 Gender1 Race13) - (30-39 Gender0 Race14)  0.341997 0.1361 2143   2.512
## (18-29 Gender1 Race13) - (40-49 Gender0 Race14)  0.469067 0.1349 2143   3.478
## (18-29 Gender1 Race13) - (50-59 Gender0 Race14)  0.452833 0.1322 2143   3.425
## (18-29 Gender1 Race13) - (18-29 Gender1 Race14)  0.060814 0.0938 2143   0.649
## (18-29 Gender1 Race13) - (30-39 Gender1 Race14)  0.143239 0.1204 2143   1.190
## (18-29 Gender1 Race13) - (40-49 Gender1 Race14)  0.270309 0.1196 2143   2.261
## (18-29 Gender1 Race13) - (50-59 Gender1 Race14)  0.254076 0.1173 2143   2.166
## (18-29 Gender1 Race13) - (18-29 Gender0 Race15)  0.331505 0.1485 2143   2.232
## (18-29 Gender1 Race13) - (30-39 Gender0 Race15)  0.413930 0.1667 2143   2.483
## (18-29 Gender1 Race13) - (40-49 Gender0 Race15)  0.541000 0.1681 2143   3.218
## (18-29 Gender1 Race13) - (50-59 Gender0 Race15)  0.524766 0.1675 2143   3.134
## (18-29 Gender1 Race13) - (18-29 Gender1 Race15)  0.132747 0.1353 2143   0.981
## (18-29 Gender1 Race13) - (30-39 Gender1 Race15)  0.215172 0.1549 2143   1.389
## (18-29 Gender1 Race13) - (40-49 Gender1 Race15)  0.342242 0.1570 2143   2.180
## (18-29 Gender1 Race13) - (50-59 Gender1 Race15)  0.326008 0.1568 2143   2.079
## (30-39 Gender1 Race13) - (40-49 Gender1 Race13)  0.127070 0.0776 2143   1.638
## (30-39 Gender1 Race13) - (50-59 Gender1 Race13)  0.110836 0.0805 2143   1.377
## (30-39 Gender1 Race13) - (18-29 Gender0 Race14)  0.177147 0.1396 2143   1.269
## (30-39 Gender1 Race13) - (30-39 Gender0 Race14)  0.259572 0.1132 2143   2.293
## (30-39 Gender1 Race13) - (40-49 Gender0 Race14)  0.386642 0.1357 2143   2.848
## (30-39 Gender1 Race13) - (50-59 Gender0 Race14)  0.370408 0.1330 2143   2.786
## (30-39 Gender1 Race13) - (18-29 Gender1 Race14) -0.021611 0.1244 2143  -0.174
## (30-39 Gender1 Race13) - (30-39 Gender1 Race14)  0.060814 0.0938 2143   0.649
```

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## (30-39 Gender1 Race13) - (40-49 Gender1 Race14)  0.187884 0.1206 2143   1.557
## (30-39 Gender1 Race13) - (50-59 Gender1 Race14)  0.171650 0.1183 2143   1.452
## (30-39 Gender1 Race13) - (18-29 Gender0 Race15)  0.249080 0.1694 2143   1.470
## (30-39 Gender1 Race13) - (30-39 Gender0 Race15)  0.331505 0.1485 2143   2.232
## (30-39 Gender1 Race13) - (40-49 Gender0 Race15)  0.458575 0.1688 2143   2.717
## (30-39 Gender1 Race13) - (50-59 Gender0 Race15)  0.442341 0.1680 2143   2.633
## (30-39 Gender1 Race13) - (18-29 Gender1 Race15)  0.050322 0.1581 2143   0.318
## (30-39 Gender1 Race13) - (30-39 Gender1 Race15)  0.132747 0.1353 2143   0.981
## (30-39 Gender1 Race13) - (40-49 Gender1 Race15)  0.259817 0.1578 2143   1.647
## (30-39 Gender1 Race13) - (50-59 Gender1 Race15)  0.243583 0.1575 2143   1.546
## (40-49 Gender1 Race13) - (50-59 Gender1 Race13) -0.016234 0.0804 2143  -0.202
## (40-49 Gender1 Race13) - (18-29 Gender0 Race14)  0.050077 0.1413 2143   0.354
## (40-49 Gender1 Race13) - (30-39 Gender0 Race14)  0.132502 0.1387 2143   0.955
## (40-49 Gender1 Race13) - (40-49 Gender0 Race14)  0.259572 0.1132 2143   2.293
## (40-49 Gender1 Race13) - (50-59 Gender0 Race14)  0.243338 0.1345 2143   1.810
## (40-49 Gender1 Race13) - (18-29 Gender1 Race14) -0.148681 0.1257 2143  -1.183
## (40-49 Gender1 Race13) - (30-39 Gender1 Race14) -0.066256 0.1227 2143  -0.540
## (40-49 Gender1 Race13) - (40-49 Gender1 Race14)  0.060814 0.0938 2143   0.649
## (40-49 Gender1 Race13) - (50-59 Gender1 Race14)  0.044581 0.1193 2143   0.374
## (40-49 Gender1 Race13) - (18-29 Gender0 Race15)  0.122010 0.1684 2143   0.725
## (40-49 Gender1 Race13) - (30-39 Gender0 Race15)  0.204435 0.1663 2143   1.230
## (40-49 Gender1 Race13) - (40-49 Gender0 Race15)  0.331505 0.1485 2143   2.232
## (40-49 Gender1 Race13) - (50-59 Gender0 Race15)  0.315271 0.1667 2143   1.891
## (40-49 Gender1 Race13) - (18-29 Gender1 Race15) -0.076748 0.1564 2143  -0.491
## (40-49 Gender1 Race13) - (30-39 Gender1 Race15)  0.005677 0.1541 2143   0.037
## (40-49 Gender1 Race13) - (40-49 Gender1 Race15)  0.132747 0.1353 2143   0.981
## (40-49 Gender1 Race13) - (50-59 Gender1 Race15)  0.116513 0.1556 2143   0.749
## (50-59 Gender1 Race13) - (18-29 Gender0 Race14)  0.066310 0.1471 2143   0.451
## (50-59 Gender1 Race13) - (30-39 Gender0 Race14)  0.148736 0.1446 2143   1.029
## (50-59 Gender1 Race13) - (40-49 Gender0 Race14)  0.275805 0.1431 2143   1.927
## (50-59 Gender1 Race13) - (50-59 Gender0 Race14)  0.259572 0.1132 2143   2.293
## (50-59 Gender1 Race13) - (18-29 Gender1 Race14) -0.132447 0.1316 2143  -1.006
## (50-59 Gender1 Race13) - (30-39 Gender1 Race14) -0.050022 0.1287 2143  -0.389
## (50-59 Gender1 Race13) - (40-49 Gender1 Race14)  0.077048 0.1276 2143   0.604
## (50-59 Gender1 Race13) - (50-59 Gender1 Race14)  0.060814 0.0938 2143   0.649
## (50-59 Gender1 Race13) - (18-29 Gender0 Race15)  0.138243 0.1719 2143   0.804
## (50-59 Gender1 Race13) - (30-39 Gender0 Race15)  0.220668 0.1698 2143   1.300
## (50-59 Gender1 Race13) - (40-49 Gender0 Race15)  0.347738 0.1710 2143   2.034
## (50-59 Gender1 Race13) - (50-59 Gender0 Race15)  0.331505 0.1485 2143   2.232
## (50-59 Gender1 Race13) - (18-29 Gender1 Race15) -0.060515 0.1597 2143  -0.379
## (50-59 Gender1 Race13) - (30-39 Gender1 Race15)  0.021911 0.1573 2143   0.139
## (50-59 Gender1 Race13) - (40-49 Gender1 Race15)  0.148980 0.1591 2143   0.936
## (50-59 Gender1 Race13) - (50-59 Gender1 Race15)  0.132747 0.1353 2143   0.981
## (18-29 Gender0 Race14) - (30-39 Gender0 Race14)  0.082425 0.0787 2143   1.047
## (18-29 Gender0 Race14) - (40-49 Gender0 Race14)  0.209495 0.0791 2143   2.648
## (18-29 Gender0 Race14) - (50-59 Gender0 Race14)  0.193261 0.0822 2143   2.352
## (18-29 Gender0 Race14) - (18-29 Gender1 Race14) -0.198758 0.0564 2143  -3.524
## (18-29 Gender0 Race14) - (30-39 Gender1 Race14) -0.116333 0.0967 2143  -1.203
## (18-29 Gender0 Race14) - (40-49 Gender1 Race14)  0.010737 0.0978 2143   0.110
## (18-29 Gender0 Race14) - (50-59 Gender1 Race14) -0.005496 0.1012 2143  -0.054
## (18-29 Gender0 Race14) - (18-29 Gender0 Race15)  0.071933 0.1108 2143   0.649
## (18-29 Gender0 Race14) - (30-39 Gender0 Race15)  0.154358 0.1359 2143   1.136
## (18-29 Gender0 Race14) - (40-49 Gender0 Race15)  0.281428 0.1392 2143   2.022
## (18-29 Gender0 Race14) - (50-59 Gender0 Race15)  0.265194 0.1427 2143   1.859
```

```
## (18-29 Gender0 Race14) - (18-29 Gender1 Race15) -0.126825 0.1254 2143   -1.011
## (18-29 Gender0 Race14) - (30-39 Gender1 Race15) -0.044400 0.1480 2143   -0.300
## (18-29 Gender0 Race14) - (40-49 Gender1 Race15)  0.082670 0.1515 2143    0.546
## (18-29 Gender0 Race14) - (50-59 Gender1 Race15)  0.066436 0.1553 2143    0.428
## (30-39 Gender0 Race14) - (40-49 Gender0 Race14)  0.127070 0.0776 2143    1.638
## (30-39 Gender0 Race14) - (50-59 Gender0 Race14)  0.110836 0.0805 2143    1.377
## (30-39 Gender0 Race14) - (18-29 Gender1 Race14) -0.281183 0.0970 2143   -2.900
## (30-39 Gender0 Race14) - (30-39 Gender1 Race14) -0.198758 0.0564 2143   -3.524
## (30-39 Gender0 Race14) - (40-49 Gender1 Race14) -0.071688 0.0967 2143   -0.741
## (30-39 Gender0 Race14) - (50-59 Gender1 Race14) -0.087921 0.0999 2143   -0.880
## (30-39 Gender0 Race14) - (18-29 Gender0 Race15) -0.010492 0.1359 2143   -0.077
## (30-39 Gender0 Race14) - (30-39 Gender0 Race15)  0.071933 0.1108 2143    0.649
## (30-39 Gender0 Race14) - (40-49 Gender0 Race15)  0.199003 0.1383 2143    1.439
## (30-39 Gender0 Race14) - (50-59 Gender0 Race15)  0.182769 0.1417 2143    1.290
## (30-39 Gender0 Race14) - (18-29 Gender1 Race15) -0.209250 0.1481 2143   -1.413
## (30-39 Gender0 Race14) - (30-39 Gender1 Race15) -0.126825 0.1254 2143   -1.011
## (30-39 Gender0 Race14) - (40-49 Gender1 Race15)  0.000245 0.1508 2143    0.002
## (30-39 Gender0 Race14) - (50-59 Gender1 Race15) -0.015989 0.1544 2143   -0.104
## (40-49 Gender0 Race14) - (50-59 Gender0 Race14) -0.016234 0.0804 2143   -0.202
## (40-49 Gender0 Race14) - (18-29 Gender1 Race14) -0.408253 0.0965 2143   -4.230
## (40-49 Gender0 Race14) - (30-39 Gender1 Race14) -0.325828 0.0951 2143   -3.426
## (40-49 Gender0 Race14) - (40-49 Gender1 Race14) -0.198758 0.0564 2143   -3.524
## (40-49 Gender0 Race14) - (50-59 Gender1 Race14) -0.214991 0.0991 2143   -2.169
## (40-49 Gender0 Race14) - (18-29 Gender0 Race15) -0.137562 0.1330 2143   -1.034
## (40-49 Gender0 Race14) - (30-39 Gender0 Race15) -0.055137 0.1321 2143   -0.417
## (40-49 Gender0 Race14) - (40-49 Gender0 Race15)  0.071933 0.1108 2143    0.649
## (40-49 Gender0 Race14) - (50-59 Gender0 Race15)  0.055699 0.1386 2143    0.402
## (40-49 Gender0 Race14) - (18-29 Gender1 Race15) -0.336320 0.1450 2143   -2.320
## (40-49 Gender0 Race14) - (30-39 Gender1 Race15) -0.253895 0.1441 2143   -1.762
## (40-49 Gender0 Race14) - (40-49 Gender1 Race15) -0.126825 0.1254 2143   -1.011
## (40-49 Gender0 Race14) - (50-59 Gender1 Race15) -0.143059 0.1512 2143   -0.946
## (50-59 Gender0 Race14) - (18-29 Gender1 Race14) -0.392019 0.0982 2143   -3.994
## (50-59 Gender0 Race14) - (30-39 Gender1 Race14) -0.309594 0.0966 2143   -3.205
## (50-59 Gender0 Race14) - (40-49 Gender1 Race14) -0.182524 0.0973 2143   -1.875
## (50-59 Gender0 Race14) - (50-59 Gender1 Race14) -0.198758 0.0564 2143   -3.524
## (50-59 Gender0 Race14) - (18-29 Gender0 Race15) -0.121329 0.1331 2143   -0.912
## (50-59 Gender0 Race14) - (30-39 Gender0 Race15) -0.038904 0.1320 2143   -0.295
## (50-59 Gender0 Race14) - (40-49 Gender0 Race15)  0.088166 0.1351 2143    0.652
## (50-59 Gender0 Race14) - (50-59 Gender0 Race15)  0.071933 0.1108 2143    0.649
## (50-59 Gender0 Race14) - (18-29 Gender1 Race15) -0.320086 0.1444 2143   -2.216
## (50-59 Gender0 Race14) - (30-39 Gender1 Race15) -0.237661 0.1434 2143   -1.657
## (50-59 Gender0 Race14) - (40-49 Gender1 Race15) -0.110591 0.1468 2143   -0.753
## (50-59 Gender0 Race14) - (50-59 Gender1 Race15) -0.126825 0.1254 2143   -1.011
## (18-29 Gender1 Race14) - (30-39 Gender1 Race14)  0.082425 0.0787 2143    1.047
## (18-29 Gender1 Race14) - (40-49 Gender1 Race14)  0.209495 0.0791 2143    2.648
## (18-29 Gender1 Race14) - (50-59 Gender1 Race14)  0.193261 0.0822 2143    2.352
## (18-29 Gender1 Race14) - (18-29 Gender0 Race15)  0.270691 0.1232 2143    2.197
## (18-29 Gender1 Race14) - (30-39 Gender0 Race15)  0.353116 0.1463 2143    2.413
## (18-29 Gender1 Race14) - (40-49 Gender0 Race15)  0.480186 0.1489 2143    3.226
## (18-29 Gender1 Race14) - (50-59 Gender0 Race15)  0.463952 0.1515 2143    3.062
## (18-29 Gender1 Race14) - (18-29 Gender1 Race15)  0.071933 0.1108 2143    0.649
## (18-29 Gender1 Race14) - (30-39 Gender1 Race15)  0.154358 0.1359 2143    1.136
## (18-29 Gender1 Race14) - (40-49 Gender1 Race15)  0.281428 0.1392 2143    2.022
## (18-29 Gender1 Race14) - (50-59 Gender1 Race15)  0.265194 0.1427 2143    1.859
```

```
## (30-39 Gender1 Race14) - (40-49 Gender1 Race14)   0.127070 0.0776 2143    1.638
## (30-39 Gender1 Race14) - (50-59 Gender1 Race14)   0.110836 0.0805 2143    1.377
## (30-39 Gender1 Race14) - (18-29 Gender0 Race15)   0.188265 0.1461 2143    1.289
## (30-39 Gender1 Race14) - (30-39 Gender0 Race15)   0.270691 0.1232 2143    2.197
## (30-39 Gender1 Race14) - (40-49 Gender0 Race15)   0.397761 0.1479 2143    2.689
## (30-39 Gender1 Race14) - (50-59 Gender0 Race15)   0.381527 0.1505 2143    2.535
## (30-39 Gender1 Race14) - (18-29 Gender1 Race15)  -0.010492 0.1359 2143   -0.077
## (30-39 Gender1 Race14) - (30-39 Gender1 Race15)   0.071933 0.1108 2143    0.649
## (30-39 Gender1 Race14) - (40-49 Gender1 Race15)   0.199003 0.1383 2143    1.439
## (30-39 Gender1 Race14) - (50-59 Gender1 Race15)   0.182769 0.1417 2143    1.290
## (40-49 Gender1 Race14) - (50-59 Gender1 Race14)  -0.016234 0.0804 2143   -0.202
## (40-49 Gender1 Race14) - (18-29 Gender0 Race15)   0.061195 0.1440 2143    0.425
## (40-49 Gender1 Race14) - (30-39 Gender0 Race15)   0.143621 0.1433 2143    1.003
## (40-49 Gender1 Race14) - (40-49 Gender0 Race15)   0.270691 0.1232 2143    2.197
## (40-49 Gender1 Race14) - (50-59 Gender0 Race15)   0.254457 0.1482 2143    1.717
## (40-49 Gender1 Race14) - (18-29 Gender1 Race15)  -0.137562 0.1330 2143   -1.034
## (40-49 Gender1 Race14) - (30-39 Gender1 Race15)  -0.055137 0.1321 2143   -0.417
## (40-49 Gender1 Race14) - (40-49 Gender1 Race15)   0.071933 0.1108 2143    0.649
## (40-49 Gender1 Race14) - (50-59 Gender1 Race15)   0.055699 0.1386 2143    0.402
## (50-59 Gender1 Race14) - (18-29 Gender0 Race15)   0.077429 0.1446 2143    0.535
## (50-59 Gender1 Race14) - (30-39 Gender0 Race15)   0.159854 0.1438 2143    1.112
## (50-59 Gender1 Race14) - (40-49 Gender0 Race15)   0.286924 0.1461 2143    1.964
## (50-59 Gender1 Race14) - (50-59 Gender0 Race15)   0.270691 0.1232 2143    2.197
## (50-59 Gender1 Race14) - (18-29 Gender1 Race15)  -0.121329 0.1331 2143   -0.912
## (50-59 Gender1 Race14) - (30-39 Gender1 Race15)  -0.038904 0.1320 2143   -0.295
## (50-59 Gender1 Race14) - (40-49 Gender1 Race15)   0.088166 0.1351 2143    0.652
## (50-59 Gender1 Race14) - (50-59 Gender1 Race15)   0.071933 0.1108 2143    0.649
## (18-29 Gender0 Race15) - (30-39 Gender0 Race15)   0.082425 0.0787 2143    1.047
## (18-29 Gender0 Race15) - (40-49 Gender0 Race15)   0.209495 0.0791 2143    2.648
## (18-29 Gender0 Race15) - (50-59 Gender0 Race15)   0.193261 0.0822 2143    2.352
## (18-29 Gender0 Race15) - (18-29 Gender1 Race15)  -0.198758 0.0564 2143   -3.524
## (18-29 Gender0 Race15) - (30-39 Gender1 Race15)  -0.116333 0.0967 2143   -1.203
## (18-29 Gender0 Race15) - (40-49 Gender1 Race15)   0.010737 0.0978 2143    0.110
## (18-29 Gender0 Race15) - (50-59 Gender1 Race15)  -0.005496 0.1012 2143   -0.054
## (30-39 Gender0 Race15) - (40-49 Gender0 Race15)   0.127070 0.0776 2143    1.638
## (30-39 Gender0 Race15) - (50-59 Gender0 Race15)   0.110836 0.0805 2143    1.377
## (30-39 Gender0 Race15) - (18-29 Gender1 Race15)  -0.281183 0.0970 2143   -2.900
## (30-39 Gender0 Race15) - (30-39 Gender1 Race15)  -0.198758 0.0564 2143   -3.524
## (30-39 Gender0 Race15) - (40-49 Gender1 Race15)  -0.071688 0.0967 2143   -0.741
## (30-39 Gender0 Race15) - (50-59 Gender1 Race15)  -0.087921 0.0999 2143   -0.880
## (40-49 Gender0 Race15) - (50-59 Gender0 Race15)  -0.016234 0.0804 2143   -0.202
## (40-49 Gender0 Race15) - (18-29 Gender1 Race15)  -0.408253 0.0965 2143   -4.230
## (40-49 Gender0 Race15) - (30-39 Gender1 Race15)  -0.325828 0.0951 2143   -3.426
## (40-49 Gender0 Race15) - (40-49 Gender1 Race15)  -0.198758 0.0564 2143   -3.524
## (40-49 Gender0 Race15) - (50-59 Gender1 Race15)  -0.214991 0.0991 2143   -2.169
## (50-59 Gender0 Race15) - (18-29 Gender1 Race15)  -0.392019 0.0982 2143   -3.994
## (50-59 Gender0 Race15) - (30-39 Gender1 Race15)  -0.309594 0.0966 2143   -3.205
## (50-59 Gender0 Race15) - (40-49 Gender1 Race15)  -0.182524 0.0973 2143   -1.875
## (50-59 Gender0 Race15) - (50-59 Gender1 Race15)  -0.198758 0.0564 2143   -3.524
## (18-29 Gender1 Race15) - (30-39 Gender1 Race15)   0.082425 0.0787 2143    1.047
## (18-29 Gender1 Race15) - (40-49 Gender1 Race15)   0.209495 0.0791 2143    2.648
## (18-29 Gender1 Race15) - (50-59 Gender1 Race15)   0.193261 0.0822 2143    2.352
## (30-39 Gender1 Race15) - (40-49 Gender1 Race15)   0.127070 0.0776 2143    1.638
## (30-39 Gender1 Race15) - (50-59 Gender1 Race15)   0.110836 0.0805 2143    1.377
```

```
##  (40-49 Gender1 Race15) - (50-59 Gender1 Race15) -0.016234 0.0804 2143  -0.202
##  p.value
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##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.7927
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##   1.0000
##   1.0000
##   0.1062
##   0.9191
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##   1.0000
##   0.0020
##   0.1753
##   0.7947
##   0.7842
##   0.0114
##   0.9078
##   1.0000
##   1.0000
##   <.0001
##   0.0825
##   0.7230
##   0.6625
##   0.9722
##   1.0000
##   1.0000
##   1.0000
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##   0.8844
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##   0.9996
##   0.9999
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##   1.0000
##   1.0000
##   0.9996
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##   1.0000
##   1.0000
##   0.6444
##   0.7927
##   1.0000
```

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##   0.9827
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##   0.0020
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##   0.9700
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##   0.1177
##   0.4138
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##   0.9327
##   0.0041
##   0.0411
##   0.1062
##   0.4784
##   0.0001
##   0.0008
##   0.0020
##   0.0317
##   0.0011
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##   0.0114
##   0.3189
##   <.0001
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##   <.0001
##   0.0067
```

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##    0.0109
##    0.0612
##    0.2135
##    0.4813
##    0.0350
##    0.3524
##    0.9987
##    0.1603
##    0.8940
##    0.9972
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##    1.0000
##    0.1486
##    0.4800
##    0.9675
##    0.7927
##    0.0053
##    0.0516
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##    0.1062
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##    0.0009
##    0.0340
##    0.0020
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##    0.0002
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##    <.0001
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##    0.9993
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##    0.0158
##    0.0827
##    0.5944
##    0.2135
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##    0.8028
##    0.9458
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
```

```
##    1.0000
##    0.9994
##    1.0000
##    1.0000
##    1.0000
##    0.1062
##    0.9191
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##    1.0000
##    0.9999
##    1.0000
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##    1.0000
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##    0.9078
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##    1.0000
##    1.0000
##    1.0000
##    0.9722
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##    1.0000
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##    1.0000
##    1.0000
##    1.0000
##    1.0000
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##    1.0000
##    1.0000
##    1.0000
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##    0.9994
##    1.0000
##    1.0000
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##    0.9982
##    0.9999
##    1.0000
##    1.0000
##    0.0694
##    0.0114
##    0.9916
##    0.9808
##    1.0000
##    1.0000
##    1.0000
```

```
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##    0.9722
##    1.0000
##    1.0000
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##    1.0000
##    1.0000
##    1.0000
##    1.0000
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##    1.0000
##    1.0000
##    0.5711
##    0.9349
##    0.9994
##    1.0000
##    0.0041
##    0.0411
##    0.1062
##    0.4784
##    0.6514
##    0.9691
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##    0.0011
##    0.0150
##    0.0114
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##    0.9987
##    1.0000
##    1.0000
##    1.0000
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##    0.6930
##    0.9722
##    0.9959
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.8940
##    0.9972
##    1.0000
##    1.0000
##    0.6478
##    0.9610
##    1.0000
##    0.9994
##    0.0053
##    0.0516
##    0.5496
##    0.1062
```

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##    1.0000
##    1.0000
##    1.0000
##    0.3637
##    0.7775
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##    0.9722
##    1.0000
##    0.8028
##    0.9458
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    0.9998
##    1.0000
##    1.0000
##    1.0000
##    0.6349
##    0.9921
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.5680
##    0.9963
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9987
##    1.0000
##    1.0000
##    1.0000
##    0.9999
##    1.0000
##    0.6054
##    0.1603
##    1.0000
##    1.0000
##    0.9958
```

```
##    0.9998
##    1.0000
##    1.0000
##    0.5062
##    0.6349
##    0.9994
##    0.9988
##    0.9993
##    1.0000
##    1.0000
##    1.0000
##    0.5135
##    0.5680
##    0.9999
##    0.9996
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9880
##    0.9987
##    1.0000
##    1.0000
##    1.0000
##    0.0142
##    0.2089
##    0.1603
##    0.9827
##    0.6997
##    0.9622
##    0.9998
##    1.0000
##    0.0776
##    0.2814
##    0.6349
##    0.8321
##    0.7650
##    0.9824
##    1.0000
##    1.0000
##    0.0619
##    0.2482
##    0.5680
##    0.8188
##    0.9991
##    1.0000
##    1.0000
##    1.0000
##    0.6479
##    0.9209
##    0.9987
##    0.9996
##    0.0350
##    0.3524
```

```
##   0.9987
##   0.1603
##   0.7821
##   0.9811
##   1.0000
##   0.9998
##   0.1042
##   0.3459
##   0.9074
##   0.6349
##   0.8806
##   0.9957
##   1.0000
##   1.0000
##   0.1118
##   0.3708
##   0.9458
##   0.5680
##   0.9998
##   1.0000
##   1.0000
##   1.0000
##   0.7383
##   0.9558
##   1.0000
##   0.9987
##   1.0000
##   0.8028
##   0.9458
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9998
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9998
##   0.9999
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9999
```

```
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9958
##   0.9998
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9993
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.6997
##   0.9622
##   0.9998
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.7650
##   0.9824
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9991
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
```

```
##    0.7821
##    0.9811
##    1.0000
##    0.9998
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.8806
##    0.9957
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9998
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.8028
##    0.9458
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9682
##    0.9831
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9814
##    0.9913
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9999
##    1.0000
##    0.6054
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9999
```

```
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9999
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.0142
##   0.2089
##   0.1603
##   0.9827
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.8406
##   0.9948
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9999
##   1.0000
##   1.0000
##   1.0000
##   0.0350
##   0.3524
##   0.9987
##   0.1603
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.9371
##   0.9992
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   1.0000
##   0.8028
```

```
##    0.9458
##    0.9613
##    0.8825
##    0.1820
##    0.2095
##    1.0000
##    1.0000
##    0.9682
##    0.9831
##    0.9734
##    0.8963
##    0.3432
##    0.4079
##    1.0000
##    1.0000
##    0.9814
##    0.9913
##    0.9999
##    1.0000
##    1.0000
##    0.9613
##    0.6490
##    0.7005
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9734
##    0.7540
##    0.8128
##    1.0000
##    1.0000
##    0.9999
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9613
##    0.9994
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9734
##    0.9984
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
```

```
##    0.9978
##    0.9613
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9940
##    0.9734
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.8028
##    0.9458
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9946
##    0.9989
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9999
##    1.0000
##    0.6054
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.0142
##    0.2089
##    0.1603
##    0.9827
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9547
##    0.9996
```

```
##    1.0000
##    1.0000
##    0.0350
##    0.3524
##    0.9987
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9761
##    0.9999
##    1.0000
##    1.0000
##    1.0000
##    0.8028
##    0.9458
##    0.9790
##    0.9254
##    0.3370
##    0.4668
##    1.0000
##    1.0000
##    0.9946
##    0.9989
##    0.9999
##    1.0000
##    1.0000
##    0.9790
##    0.7741
##    0.8705
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9790
##    0.9998
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.9968
##    0.9790
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    1.0000
##    0.8028
```

```
##    0.9458
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    0.9999
##    1.0000
##    0.6054
##    0.1603
##    1.0000
##    1.0000
##    1.0000
##    0.0142
##    0.2089
##    0.1603
##    0.9827
##    0.0350
##    0.3524
##    0.9987
##    0.1603
##    1.0000
##    0.8028
##    0.9458
##    0.9999
##    1.0000
##    1.0000
##
## P value adjustment: tukey method for comparing a family of 40 estimates
```