Health Survey Data Analysis

Survey of BMI and physical activity

The National Health and Nutrition Examination Survey (NHANES) data (https://www.cdc.gov/nchs/nhanes/index.htm) includes many measurements related to overall health, physical activity, diet, psychological health, socioeconomic factors and more.This study focus on a common health indicator, Body Mass Index (BMI kg/m2), and how it is related to physical activity.

```
# Load the NHANES and dplyr packages

library(NHANES)
library(dplyr)

# Load the NHANESraw data
data("NHANESraw")
# Take a glimpse at the contents
glimpse(NHANESraw)
```

```
FALSE Rows: 20,293
FALSE Columns: 78
FALSE $ ID                <int> 51624, 51625, 51626, 51627, 51628, 51629, 51630, 5...
FALSE $ SurveyYr          <fct> 2009_10, 2009_10, 2009_10, 2009_10, 2009_10, 2009_...
FALSE $ Gender            <fct> male, male, male, male, female, male, female, fema...
FALSE $ Age               <int> 34, 4, 16, 10, 60, 26, 49, 1, 10, 80, 10, 80, 4, 3...
FALSE $ AgeMonths         <int> 409, 49, 202, 131, 722, 313, 596, 12, 124, NA, 121...
FALSE $ Race1             <fct> White, Other, Black, Black, Black, Mexican, White,...
FALSE $ Race3             <fct> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
FALSE $ Education         <fct> High School, NA, NA, NA, High School, 9 - 11th Gra...
FALSE $ MaritalStatus     <fct> Married, NA, NA, NA, Widowed, Married, LivePartner...
FALSE $ HHIncome          <fct> 25000-34999, 20000-24999, 45000-54999, 20000-24999...
FALSE $ HHIncomeMid       <int> 30000, 22500, 50000, 22500, 12500, 30000, 40000, 4...
FALSE $ Poverty           <dbl> 1.36, 1.07, 2.27, 0.81, 0.69, 1.01, 1.91, 1.36, 2....
FALSE $ HomeRooms         <int> 6, 9, 5, 6, 6, 4, 5, 5, 7, 4, 5, 5, 7, NA, 6, 6, 5...
FALSE $ HomeOwn           <fct> Own, Own, Own, Rent, Rent, Rent, Rent, Rent, Own, ...
FALSE $ Work              <fct> NotWorking, NA, NotWorking, NA, NotWorking, Workin...
FALSE $ Weight            <dbl> 87.4, 17.0, 72.3, 39.8, 116.8, 97.6, 86.7, 9.4, 26...
FALSE $ Length            <dbl> NA, NA, NA, NA, NA, NA, NA, 75.7, NA, NA, NA, NA, ...
FALSE $ HeadCirc          <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
FALSE $ Height            <dbl> 164.7, 105.4, 181.3, 147.8, 166.0, 173.0, 168.4, N...
FALSE $ BMI               <dbl> 32.22, 15.30, 22.00, 18.22, 42.39, 32.61, 30.57, N...
FALSE $ BMICatUnder20yrs  <fct> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
FALSE $ BMI_WHO           <fct> 30.0_plus, 12.0_18.5, 18.5_to_24.9, 12.0_18.5, 30....
FALSE $ Pulse             <int> 70, NA, 68, 68, 72, 72, 86, NA, 70, 88, 84, 54, NA...
FALSE $ BPSysAve          <int> 113, NA, 109, 93, 150, 104, 112, NA, 108, 139, 94,...
FALSE $ BPDiaAve          <int> 85, NA, 59, 41, 68, 49, 75, NA, 53, 43, 45, 60, NA...
```

```
FALSE $ BPSys1           <int> 114, NA, 112, 92, 154, 102, 118, NA, 106, 142, 94,...
FALSE $ BPDia1           <int> 88, NA, 62, 36, 70, 50, 82, NA, 60, 62, 38, 62, NA...
FALSE $ BPSys2           <int> 114, NA, 114, 94, 150, 104, 108, NA, 106, 140, 92,...
FALSE $ BPDia2           <int> 88, NA, 60, 44, 68, 48, 74, NA, 50, 46, 40, 62, NA...
FALSE $ BPSys3           <int> 112, NA, 104, 92, 150, 104, 116, NA, 110, 138, 96,...
FALSE $ BPDia3           <int> 82, NA, 58, 38, 68, 50, 76, NA, 56, 40, 50, 58, NA...
FALSE $ Testosterone     <dbl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
FALSE $ DirectChol       <dbl> 1.29, NA, 1.55, 1.89, 1.16, 1.16, 1.16, NA, 1.58, ...
FALSE $ TotChol          <dbl> 3.49, NA, 4.97, 4.16, 5.22, 4.14, 6.70, NA, 4.14, ...
FALSE $ UrineVol1        <int> 352, NA, 281, 139, 30, 202, 77, NA, 39, 128, 109, ...
FALSE $ UrineFlow1       <dbl> NA, NA, 0.415, 1.078, 0.476, 0.563, 0.094, NA, 0.3...
FALSE $ UrineVol2        <int> NA, NA, NA, NA, 246, NA, NA, NA, NA, NA, NA, NA, N...
FALSE $ UrineFlow2       <dbl> NA, NA, NA, NA, 2.51, NA, NA, NA, NA, NA, NA, NA, ...
FALSE $ Diabetes         <fct> No, No, No, No, Yes, No, No, No, No, No, No, Yes, ...
FALSE $ DiabetesAge      <int> NA, NA, NA, NA, 56, NA, NA, NA, NA, NA, NA, 70, NA...
FALSE $ HealthGen        <fct> Good, NA, Vgood, NA, Fair, Good, Good, NA, NA, Exc...
FALSE $ DaysPhysHlthBad  <int> 0, NA, 2, NA, 20, 2, 0, NA, NA, 0, NA, 0, NA, NA, ...
FALSE $ DaysMentHlthBad  <int> 15, NA, 0, NA, 25, 14, 10, NA, NA, 0, NA, 0, NA, N...
FALSE $ LittleInterest   <fct> Most, NA, NA, NA, Most, None, Several, NA, NA, Non...
FALSE $ Depressed        <fct> Several, NA, NA, NA, Most, Most, Several, NA, NA, ...
FALSE $ nPregnancies     <int> NA, NA, NA, NA, 1, NA, 2, NA, NA, NA, NA, NA, NA, ...
FALSE $ nBabies          <int> NA, NA, NA, NA, 1, NA, 2, NA, NA, NA, NA, NA, NA, ...
FALSE $ Age1stBaby       <int> NA, NA, NA, NA, NA, NA, 27, NA, NA, NA, NA, NA, NA...
FALSE $ SleepHrsNight    <int> 4, NA, 8, NA, 4, 4, 8, NA, NA, 6, NA, 9, NA, 7, NA...
FALSE $ SleepTrouble     <fct> Yes, NA, No, NA, No, No, Yes, NA, NA, No, NA, No, ...
FALSE $ PhysActive       <fct> No, NA, Yes, NA, No, Yes, No, NA, NA, Yes, NA, No,...
FALSE $ PhysActiveDays   <int> NA, NA, 5, NA, NA, 2, NA, NA, NA, 4, NA, NA, NA, N...
FALSE $ TVHrsDay         <fct> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
FALSE $ CompHrsDay       <fct> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
FALSE $ TVHrsDayChild    <int> NA, 4, NA, 1, NA, NA, NA, NA, 1, NA, 3, NA, 2, NA,...
FALSE $ CompHrsDayChild  <int> NA, 1, NA, 1, NA, NA, NA, NA, 0, NA, 0, NA, 1, NA,...
FALSE $ Alcohol12PlusYr  <fct> Yes, NA, NA, NA, No, Yes, Yes, NA, NA, Yes, NA, No...
FALSE $ AlcoholDay       <int> NA, NA, NA, NA, NA, 19, 2, NA, NA, 1, NA, NA, NA, ...
FALSE $ AlcoholYear      <int> 0, NA, NA, NA, 0, 48, 20, NA, NA, 52, NA, 0, NA, N...
FALSE $ SmokeNow         <fct> No, NA, NA, NA, Yes, No, Yes, NA, NA, No, NA, No, ...
FALSE $ Smoke100         <fct> Yes, NA, NA, NA, Yes, Yes, Yes, NA, NA, Yes, NA, Y...
FALSE $ SmokeAge         <int> 18, NA, NA, NA, 16, 15, 38, NA, NA, 16, NA, 21, NA...
FALSE $ Marijuana        <fct> Yes, NA, NA, NA, NA, Yes, Yes, NA, NA, NA, NA, NA,...
FALSE $ AgeFirstMarij    <int> 17, NA, NA, NA, NA, 10, 18, NA, NA, NA, NA, NA, NA...
FALSE $ RegularMarij     <fct> No, NA, NA, NA, NA, Yes, No, NA, NA, NA, NA, NA, N...
FALSE $ AgeRegMarij      <int> NA, NA, NA, NA, NA, 12, NA, NA, NA, NA, NA, NA, NA...
FALSE $ HardDrugs        <fct> Yes, NA, NA, NA, No, Yes, Yes, NA, NA, NA, NA, NA,...
FALSE $ SexEver          <fct> Yes, NA, NA, NA, Yes, Yes, Yes, NA, NA, NA, NA, NA...
FALSE $ SexAge           <int> 16, NA, NA, NA, 15, 9, 12, NA, NA, NA, NA, NA, NA,...
FALSE $ SexNumPartnLife  <int> 8, NA, NA, NA, 4, 10, 10, NA, NA, NA, NA, NA, NA, ...
FALSE $ SexNumPartYear   <int> 1, NA, NA, NA, NA, 1, 1, NA, NA, NA, NA, NA, NA, N...
FALSE $ SameSex          <fct> No, NA, NA, NA, No, No, Yes, NA, NA, NA, NA, NA, N...
FALSE $ SexOrientation   <fct> Heterosexual, NA, NA, NA, NA, Heterosexual, Hetero...
FALSE $ WTINT2YR         <dbl> 80100.544, 53901.104, 13953.078, 11664.899, 20090....
FALSE $ WTMEC2YR         <dbl> 81528.772, 56995.035, 14509.279, 12041.635, 21000....
FALSE $ SDMVPSU          <int> 1, 2, 1, 2, 2, 1, 2, 2, 2, 1, 1, 1, 2, 2, 1, 1, 1,...
FALSE $ SDMVSTRA         <int> 83, 79, 84, 86, 75, 88, 85, 86, 88, 77, 86, 79, 84...
FALSE $ PregnantNow      <fct> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA...
```

Visualize survey weight and strata variables

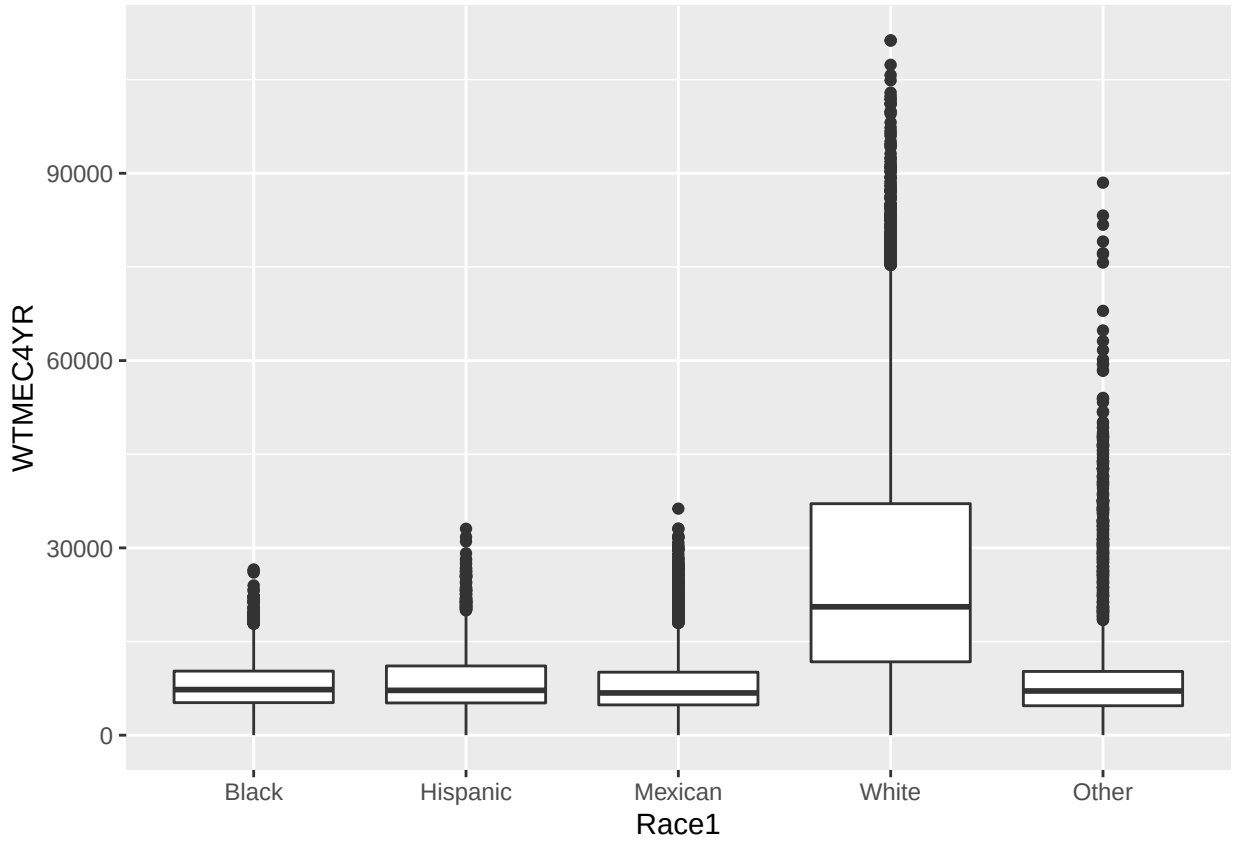
```
# Load the ggplot2 package
library(ggplot2)

# Use mutate to create a 4-year weight variable and call it WTMEC4YR
NHANESraw <- NHANESraw %>% mutate(WTMEC4YR = WTMEC2YR/2)

# Calculate the sum of this weight variable
NHANESraw %>% summarize(sum(WTMEC4YR))
```

```
FALSE # A tibble: 1 x 1
FALSE   `sum(WTMEC4YR)`
FALSE              <dbl>
FALSE 1      304267200.
```

```
# Plot the sample weights using boxplots, with Race1 on the x-axis
ggplot(NHANESraw, aes(x = Race1, y = WTMEC4YR)) + geom_boxplot()
```



Specify the survey design

```
# Load the survey package
library(survey)

# Specify the survey design
```

```r
nhanes_design <- svydesign(
    data = NHANESraw,
    strata = ~SDMVSTRA,
    id = ~SDMVPSU,
    nest = TRUE,
    weights = ~WTMEC4YR)

# Print a summary of this design
summary(nhanes_design)
```

```
FALSE Stratified 1 - level Cluster Sampling design (with replacement)
FALSE With (62) clusters.
FALSE svydesign(data = NHANESraw, strata = ~SDMVSTRA, id = ~SDMVPSU,
FALSE     nest = TRUE, weights = ~WTMEC4YR)
FALSE Probabilities:
FALSE      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
FALSE 8.986e-06 5.664e-05 1.054e-04       Inf 1.721e-04       Inf
FALSE Stratum Sizes:
FALSE             75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90  91
FALSE obs        803 785 823 829 696 751 696 724 713 683 592 946 598 647 251 862 998
FALSE design.PSU   2   2   2   2   2   2   2   2   2   2   2   3   2   2   2   3   3
FALSE actual.PSU   2   2   2   2   2   2   2   2   2   2   2   3   2   2   2   3   3
FALSE             92  93  94  95  96  97  98  99 100 101 102 103
FALSE obs        875 602 688 722 676 608 708 682 700 715 624 296
FALSE design.PSU   3   2   2   2   2   2   2   2   2   2   2   2
FALSE actual.PSU   3   2   2   2   2   2   2   2   2   2   2   2
FALSE Data variables:
FALSE  [1] "ID"               "SurveyYr"         "Gender"           "Age"
FALSE  [5] "AgeMonths"        "Race1"            "Race3"            "Education"
FALSE  [9] "MaritalStatus"    "HHIncome"         "HHIncomeMid"      "Poverty"
FALSE [13] "HomeRooms"        "HomeOwn"          "Work"             "Weight"
FALSE [17] "Length"           "HeadCirc"         "Height"           "BMI"
FALSE [21] "BMICatUnder20yrs" "BMI_WHO"          "Pulse"            "BPSysAve"
FALSE [25] "BPDiaAve"         "BPSys1"           "BPDia1"           "BPSys2"
FALSE [29] "BPDia2"           "BPSys3"           "BPDia3"           "Testosterone"
FALSE [33] "DirectChol"       "TotChol"          "UrineVol1"        "UrineFlow1"
FALSE [37] "UrineVol2"        "UrineFlow2"       "Diabetes"         "DiabetesAge"
FALSE [41] "HealthGen"        "DaysPhysHlthBad"  "DaysMentHlthBad"  "LittleInterest"
FALSE [45] "Depressed"        "nPregnancies"     "nBabies"          "Age1stBaby"
FALSE [49] "SleepHrsNight"    "SleepTrouble"     "PhysActive"       "PhysActiveDays"
FALSE [53] "TVHrsDay"         "CompHrsDay"       "TVHrsDayChild"    "CompHrsDayChild"
FALSE [57] "Alcohol12PlusYr"  "AlcoholDay"       "AlcoholYear"      "SmokeNow"
FALSE [61] "Smoke100"         "SmokeAge"         "Marijuana"        "AgeFirstMarij"
FALSE [65] "RegularMarij"     "AgeRegMarij"      "HardDrugs"        "SexEver"
FALSE [69] "SexAge"           "SexNumPartnLife"  "SexNumPartYear"   "SameSex"
FALSE [73] "SexOrientation"   "WTINT2YR"         "WTMEC2YR"         "SDMVPSU"
FALSE [77] "SDMVSTRA"         "PregnantNow"      "WTMEC4YR"
```

Subset the data

```r
# Select adults of Age >= 20 with subset
nhanes_adult <- subset(nhanes_design, Age >= 20)

# Print a summary of this subset
summary(nhanes_adult)
```

```
FALSE Stratified 1 - level Cluster Sampling design (with replacement)
FALSE With (62) clusters.
FALSE subset(nhanes_design, Age >= 20)
FALSE Probabilities:
FALSE      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
FALSE 8.986e-06 4.303e-05 8.107e-05       Inf 1.240e-04       Inf
FALSE Stratum Sizes:
FALSE             75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90  91
FALSE obs        471 490 526 500 410 464 447 400 411 395 357 512 327 355 153 509 560
FALSE design.PSU   2   2   2   2   2   2   2   2   2   2   2   3   2   2   2   3   3
FALSE actual.PSU   2   2   2   2   2   2   2   2   2   2   2   3   2   2   2   3   3
FALSE             92  93  94  95  96  97  98  99 100 101 102 103
FALSE obs        483 376 368 454 362 315 414 409 377 460 308 165
FALSE design.PSU   3   2   2   2   2   2   2   2   2   2   2   2
FALSE actual.PSU   3   2   2   2   2   2   2   2   2   2   2   2
FALSE Data variables:
FALSE  [1] "ID"                "SurveyYr"          "Gender"            "Age"
FALSE  [5] "AgeMonths"         "Race1"             "Race3"             "Education"
FALSE  [9] "MaritalStatus"     "HHIncome"          "HHIncomeMid"       "Poverty"
FALSE [13] "HomeRooms"         "HomeOwn"           "Work"              "Weight"
FALSE [17] "Length"            "HeadCirc"          "Height"            "BMI"
FALSE [21] "BMICatUnder20yrs" "BMI_WHO"           "Pulse"             "BPSysAve"
FALSE [25] "BPDiaAve"          "BPSys1"            "BPDia1"            "BPSys2"
FALSE [29] "BPDia2"            "BPSys3"            "BPDia3"            "Testosterone"
FALSE [33] "DirectChol"        "TotChol"           "UrineVol1"         "UrineFlow1"
FALSE [37] "UrineVol2"         "UrineFlow2"        "Diabetes"          "DiabetesAge"
FALSE [41] "HealthGen"         "DaysPhysHlthBad"   "DaysMentHlthBad"  "LittleInterest"
FALSE [45] "Depressed"         "nPregnancies"      "nBabies"           "Age1stBaby"
FALSE [49] "SleepHrsNight"     "SleepTrouble"      "PhysActive"        "PhysActiveDays"
FALSE [53] "TVHrsDay"          "CompHrsDay"        "TVHrsDayChild"     "CompHrsDayChild"
FALSE [57] "Alcohol12PlusYr"  "AlcoholDay"        "AlcoholYear"       "SmokeNow"
FALSE [61] "Smoke100"          "SmokeAge"          "Marijuana"         "AgeFirstMarij"
FALSE [65] "RegularMarij"      "AgeRegMarij"       "HardDrugs"         "SexEver"
FALSE [69] "SexAge"            "SexNumPartnLife"   "SexNumPartYear"    "SameSex"
FALSE [73] "SexOrientation"    "WTINT2YR"          "WTMEC2YR"          "SDMVPSU"
FALSE [77] "SDMVSTRA"          "PregnantNow"       "WTMEC4YR"
```

```r
# Compare the number of observations in the full data to the adult data
nrow(nhanes_design)
```

```
FALSE [1] 20293
```

```r
nrow(nhanes_adult)
```

```
FALSE [1] 11778
```

Visualizing BMI

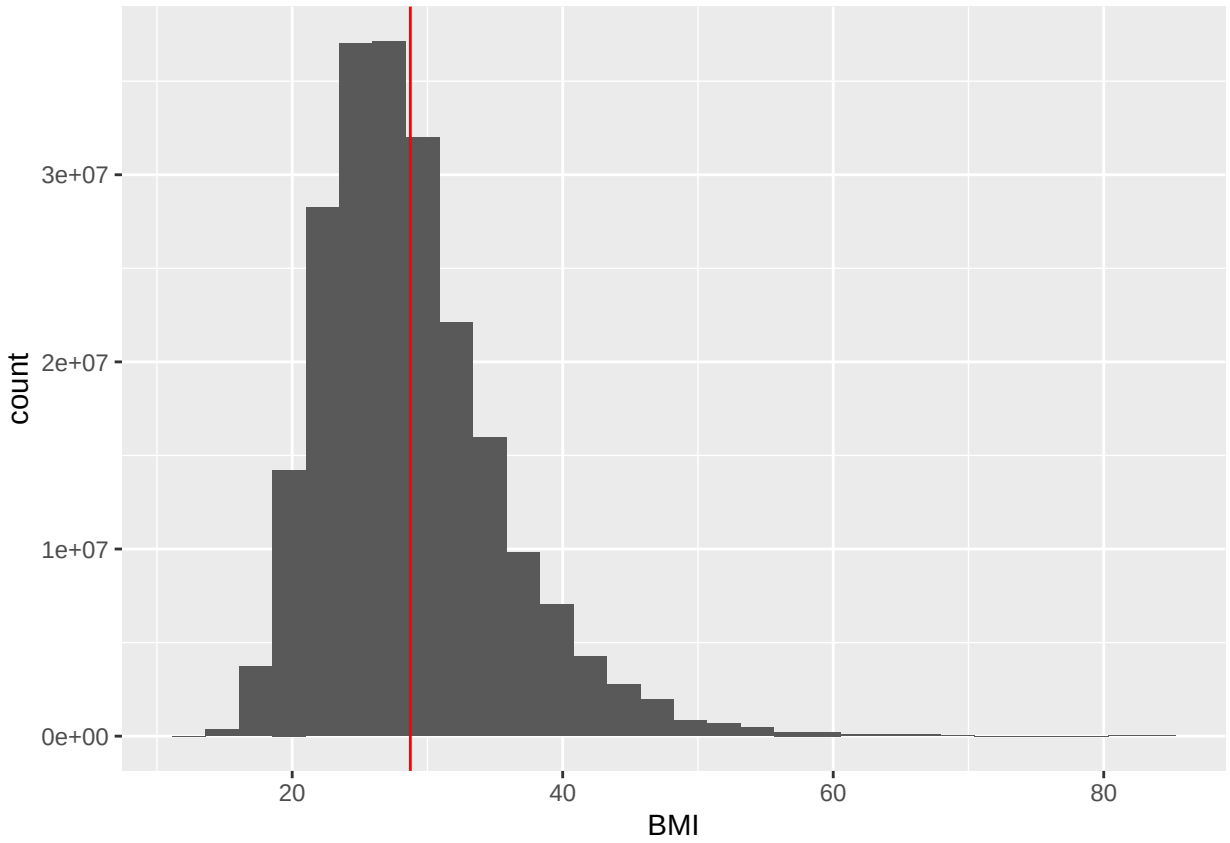
```
# Calculate the mean BMI in NHANESraw
bmi_mean_raw <- NHANESraw %>%
    filter(Age >= 20) %>%
    summarize(mean(BMI, na.rm=TRUE))
bmi_mean_raw
```

```
FALSE # A tibble: 1 x 1
FALSE   `mean(BMI, na.rm = TRUE)`
FALSE                       <dbl>
FALSE 1                      29.0
```

```
# Calculate the survey-weighted mean BMI of US adults
bmi_mean <- svymean(~BMI, design = nhanes_adult, na.rm = TRUE)
bmi_mean
```

```
FALSE       mean     SE
FALSE BMI 28.734 0.1235
```

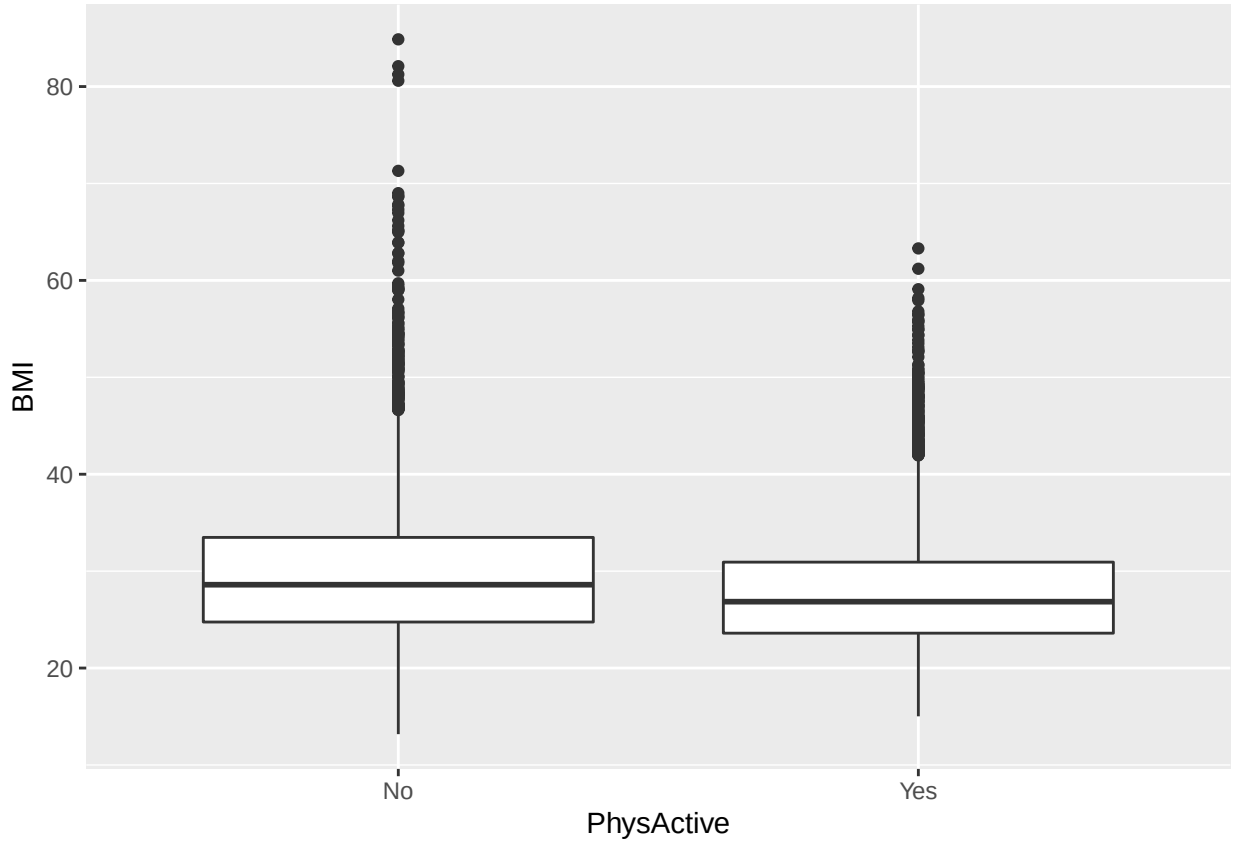
```
# Draw a weighted histogram of BMI in the US population
NHANESraw %>%
  filter(Age >= 20) %>%
    ggplot(mapping = aes(x = BMI, weight = WTMEC4YR)) +
    geom_histogram()+
    geom_vline(xintercept = coef(bmi_mean), color="red")
```



The distribution of BMI

```
# Load the broom library
library(broom)

# Make a boxplot of BMI stratified by physically active status
NHANESraw %>%
  filter(Age>=20) %>%
    ggplot(mapping = aes(x = PhysActive, y = BMI, weight = WTMEC4YR)) +
    geom_boxplot()
```




```
# Conduct a t-test comparing mean BMI between physically active status
survey_ttest <- svyttest(BMI~PhysActive, design = nhanes_adult)

# Use broom to show the tidy results
tidy(survey_ttest)
```

```
# A tibble: 1 x 8
  estimate statistic  p.value parameter conf.low conf.high method    alternative
     <dbl>     <dbl>    <dbl>     <dbl>    <dbl>     <dbl> <chr>     <chr>
1    -1.85     -9.72 4.56e-11        32    -2.22     -1.47 Design-b~ two.sided
```

The relationship between smoking and physical activity

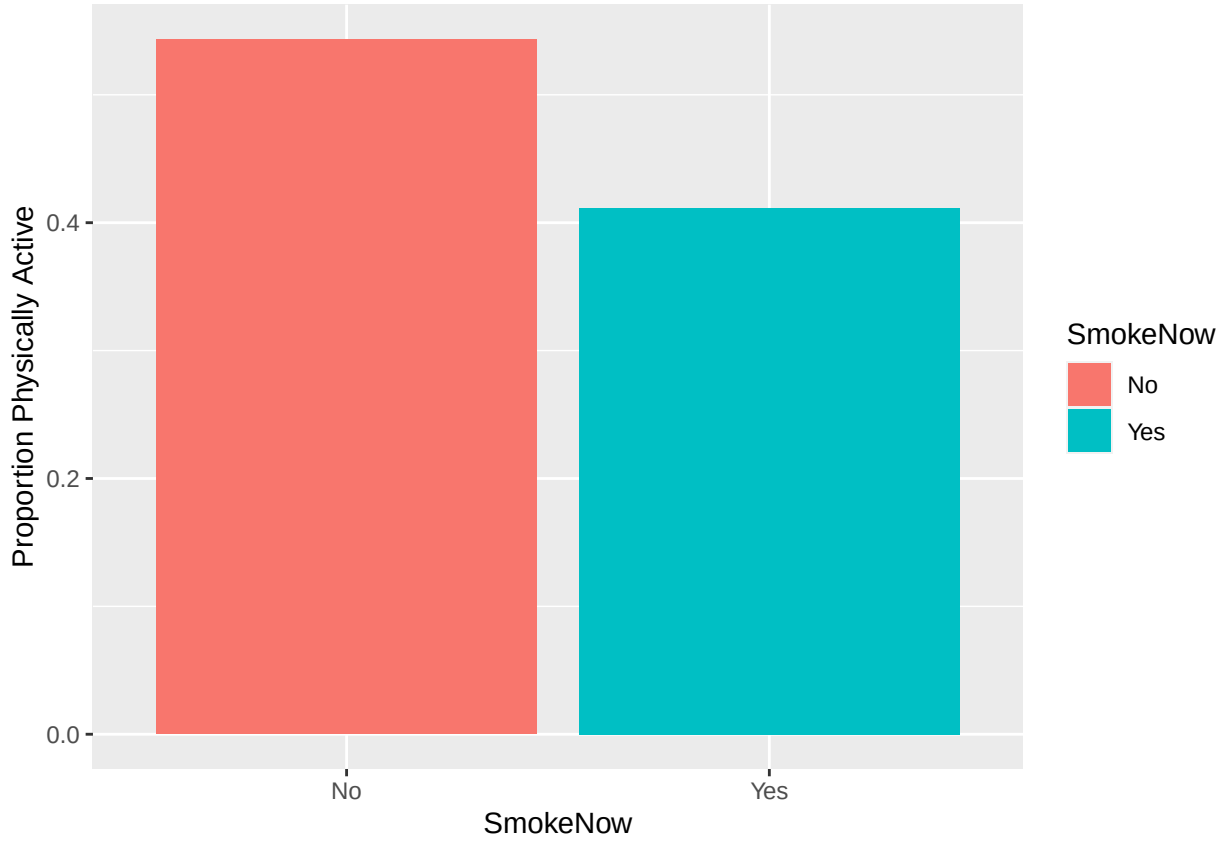
```
# Estimate the proportion who are physically active by current smoking status
phys_by_smoke <- svyby(~PhysActive, by = ~SmokeNow,
                       FUN = svymean,
                       design = nhanes_adult,
                       keep.names = FALSE)

# Print the table
phys_by_smoke
```

```
  SmokeNow PhysActiveNo PhysActiveYes se.PhysActiveNo se.PhysActiveYes
```

```
FALSE 1       No    0.4566990     0.5433010      0.01738054       0.01738054
FALSE 2      Yes    0.5885421     0.4114579      0.01163246       0.01163246
```

```r
# Plot the proportions with y-label
ggplot(data = phys_by_smoke,
       aes(y = PhysActiveYes, x = SmokeNow, fill = SmokeNow)) +
    geom_col() +
    ylab("Proportion Physically Active")
```



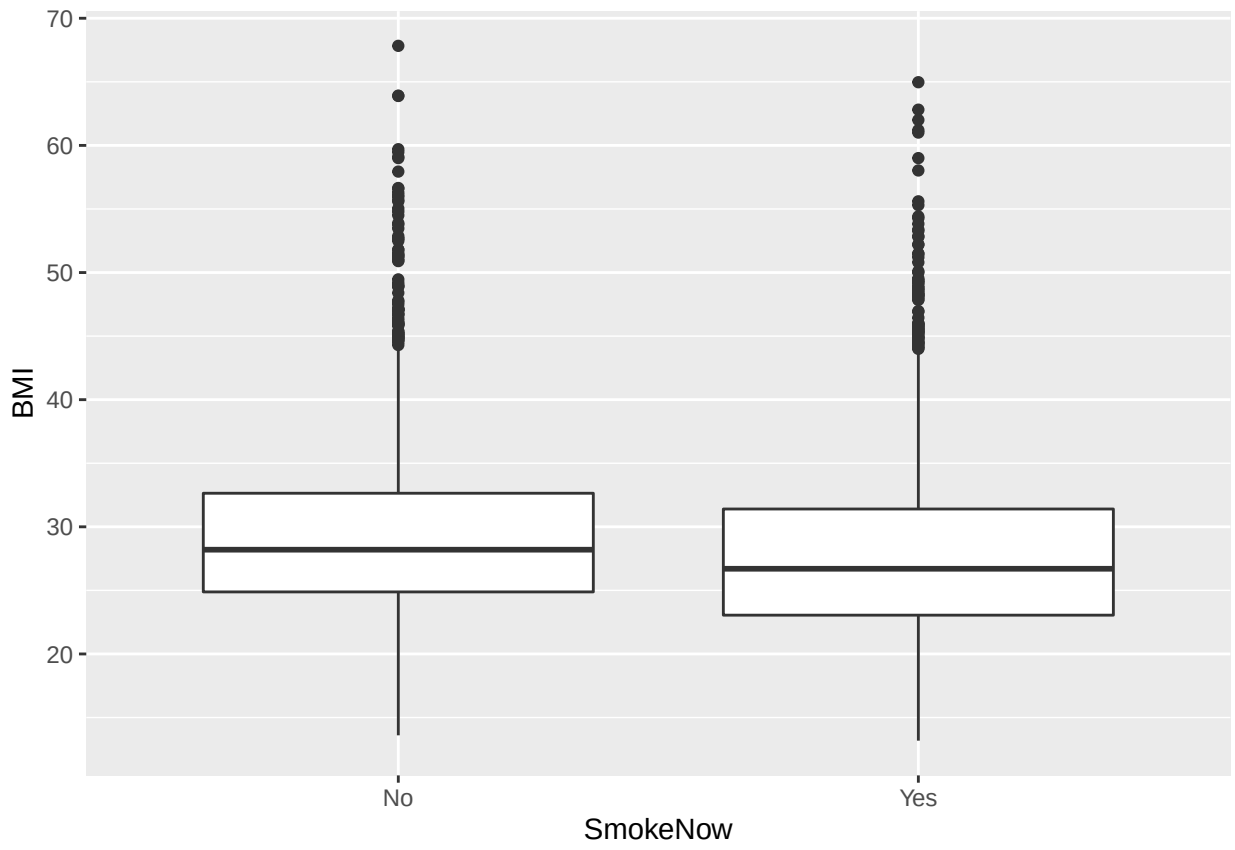
The relationship between smoking with BMI

```r
# Estimate mean BMI by current smoking status
BMI_by_smoke <- svyby(~BMI, by = ~SmokeNow,
      FUN = svymean,
      design = nhanes_adult,
      na.rm = TRUE)
BMI_by_smoke
```

```
FALSE     SmokeNow      BMI        se
FALSE No        No 29.25734 0.1915138
FALSE Yes      Yes 27.74873 0.1652377
```

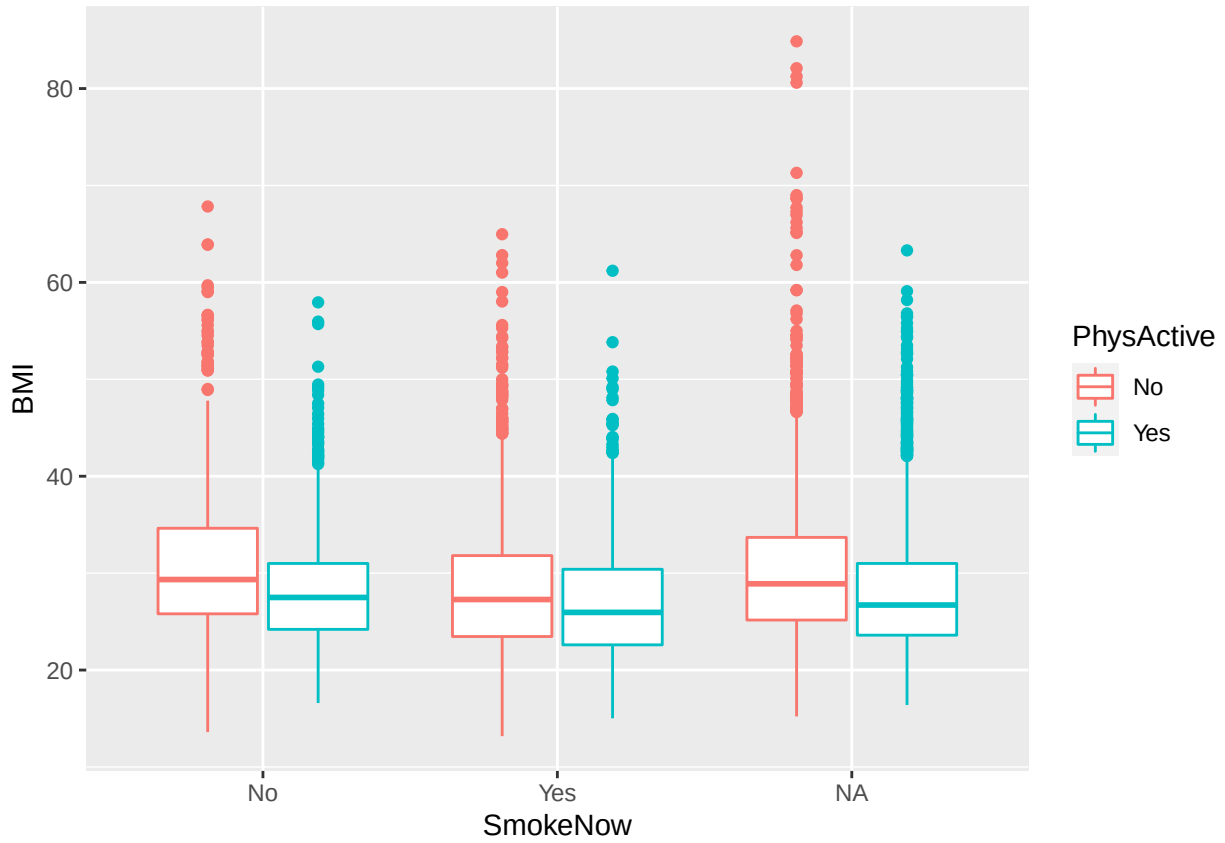
```r
# Plot the distribution of BMI by current smoking status
NHANESraw %>%
  filter(Age>=20, !is.na(SmokeNow)) %>%
```

```
    ggplot(mapping = aes(x = SmokeNow, y = BMI, weight = WTMEC4YR)) +
    geom_boxplot()
```



Compare BMI by physical activity stratified by smoking status

```
# Plot the distribution of BMI by smoking and physical activity status
NHANESraw %>%
  filter(Age>=20) %>%
    ggplot(mapping = aes(x = SmokeNow,
                         y = BMI,
                         weight = WTMEC4YR,
                         color = PhysActive)) +
    geom_boxplot()
```



Weighted linear regression method A special case of generalized linear models (GLMs).

```
# Fit a multiple regression model
mod1 <- svyglm(BMI ~ PhysActive*SmokeNow, design = nhanes_adult)

# Tidy the model results
tidy_mod1 <- tidy(mod1)
tidy_mod1
```

```
FALSE # A tibble: 4 x 5
FALSE   term                      estimate std.error statistic  p.value
FALSE   <chr>                        <dbl>     <dbl>     <dbl>    <dbl>
FALSE 1 (Intercept)                  30.5      0.210    146.   2.62e-44
FALSE 2 PhysActiveYes                -2.35     0.236     -9.97 4.96e-11
FALSE 3 SmokeNowYes                  -2.24     0.267     -8.40 2.26e- 9
FALSE 4 PhysActiveYes:SmokeNowYes     1.00     0.344      2.92 6.52e- 3
```

```
# Calculate expected mean difference in BMI for activity within non-smokers
diff_non_smoke <- tidy_mod1 %>%
    filter(term=="PhysActiveYes") %>%
    select(estimate)
diff_non_smoke
```

```
FALSE # A tibble: 1 x 1
FALSE   estimate
FALSE      <dbl>
FALSE 1    -2.35
```

```r
# Calculate expected mean difference in BMI for activity within smokers
diff_smoke <- tidy_mod1 %>%
    filter(term%in%c("PhysActiveYes","PhysActiveYes:SmokeNowYes")) %>%
    summarize(estimate = sum(estimate))
diff_smoke
```

```
FALSE # A tibble: 1 x 1
FALSE   estimate
FALSE      <dbl>
FALSE 1    -1.35
```

The interaction between physical activity and smoking has a small p-value, which suggests the association does vary by smoking status. The difference between physically active and non-physically active people is larger in magnitude in the non-smoker population. # Adjust for other possible confounders

```r
# Adjust mod1 for other possible confounders
mod2 <- svyglm(BMI ~ PhysActive*SmokeNow + Race1 + Alcohol12PlusYr + Gender,
               design = nhanes_adult)

# Tidy the output
tidy(mod2)
```

```
FALSE # A tibble: 10 x 5
FALSE    term                       estimate std.error statistic  p.value
FALSE    <chr>                         <dbl>     <dbl>     <dbl>    <dbl>
FALSE  1 (Intercept)                   33.2      0.316   105.    1.75e-33
FALSE  2 PhysActiveYes                 -2.11     0.273    -7.75  5.56e- 8
FALSE  3 SmokeNowYes                   -2.23     0.303    -7.34  1.40e- 7
FALSE  4 Race1Hispanic                 -1.47     0.420    -3.49  1.88e- 3
FALSE  5 Race1Mexican                  -0.191    0.464    -0.412 6.84e- 1
FALSE  6 Race1White                    -2.08     0.320    -6.49  1.04e- 6
FALSE  7 Race1Other                    -3.11     0.620    -5.01  4.09e- 5
FALSE  8 Alcohol12PlusYrYes            -0.855    0.358    -2.39  2.50e- 2
FALSE  9 Gendermale                    -0.256    0.230    -1.11  2.78e- 1
FALSE 10 PhysActiveYes:SmokeNowYes      0.737    0.387     1.90  6.92e- 2
```