Polycystic Ovary Syndrome (PCOS)

1. Problem Statement

The goal of this analysis is to use the Polycystic Ovary Syndrome (PCOS) dataset from Kaggle (https://www.kaggle.com/datasets/hasaanrana/diet-exercise-and-pcos-insights) to determine if there are any factors that could be linked to having the disease.

For more information about PCOS, here is a link to the Mayo Clinic (https://www.mayoclinic.org/diseases-conditions/pcos/symptoms-causes/syc-20353439).

2. Data Loading and Exploration

```
library('dplyr')
library('ggplot2')
library('tidyr')
library('rmarkdown')
```

```
pcos_data_raw <- read.csv('pcos_data.csv')
```

```
dim(pcos_data_raw)
```

```
## [1] 173  36
```

The dataset contains 173 rows and 36 columns.

```
head(pcos_data_raw)
```

```
##            Age Weight_kg Height_ft Marital_Status PCOS Family_History_PCOS
## 1        20-25        66    157.48      Unmarried   No                  No
## 2 Less than 20        56    165.10      Unmarried   No                  No
## 3 Less than 20        89    167.64      Unmarried   No                 Yes
## 4        20-25        55    160.02      Unmarried   No                 Yes
## 5 Less than 20        55    160.02      Unmarried   No                  No
## 6 Less than 20        45    160.02      Unmarried   No                  No
##   Menstrual_Irregularity Hormonal_Imbalance Hyperandrogenism Hirsutism
## 1                    Yes                 No               No        No
## 2                     No                 No               No        No
## 3                     No                 No               No       Yes
## 4                     No                Yes               No       Yes
## 5                     No                 No               No        No
## 6                    Yes                Yes               No        No
##   Mental_Health          Conception_Difficulty Insulin_Resistance Diabetes
```

```
## 1           Yes                            No                No       No
## 2            No                            No                No       No
## 3           Yes                            No                No       No
## 4           Yes Yes, not diagnosed by a doctor                No       No
## 5           Yes                            No                No       No
## 6           Yes                            No                No       No
##   Childhood_Trauma Cardiovascular_Disease Diet_Bread_Cereals Diet_Milk_Products
## 1               No                    No                 7                  7
## 2               No                    No                 4                  4
## 3              Yes                    No                 6                  2
## 4              Yes                    No                 2                  3
## 5              Yes                    No                 4                  7
## 6              Yes                    No                 7                  3
##   Diet_Fruits Diet_Vegetables Diet_Starchy_Vegetables
## 1           2               2                       3
## 2           4               4                       4
## 3           1               3                       2
## 4           1               2                       5
## 5           2               3                       4
## 6           2               4                       3
##   Diet_NonStarchy_Vegetables Diet_Fats Diet_Sweets Diet_Fried_Food
## 1                          1         7           3               3
## 2                          2         4           0               1
## 3                          1         7           1               3
## 4                          3         5           5               5
## 5                          4         6           2               3
## 6                          5         4           1               2
##   Diet_Tea_Coffee Diet_Multivitamin Vegetarian Exercise_Frequency
## 1               7                 0         No             Rarely
## 2               0                 0         No              Daily
## 3               7                 0         No             Rarely
## 4               7                 1         No              Never
## 5               5                 0         No              Daily
## 6               7                 0         No             Rarely
##                              Exercise_Type    Exercise_Duration
## 1 Cardio (e.g., running, cycling, swimming)           30 minutes
## 2                             No Exercise Less than 30 minutes
## 3 Cardio (e.g., running, cycling, swimming) Less than 30 minutes
## 4                             No Exercise       Not Applicable
## 5 Cardio (e.g., running, cycling, swimming) 30 minutes to 1 hour
## 6                             No Exercise       Not Applicable
##         Sleep_Hours Stress_Level Smoking Exercise_Benefit PCOS_Medication
## 1 Less than 6 hours           No      No         Somewhat             No.
## 2         6-8 hours           No      No         Somewhat             No.
## 3         6-8 hours          Yes      No         Somewhat             No.
## 4         6-8 hours          Yes      No         Somewhat             No.
## 5         6-8 hours          Yes      No       Not at All             No.
## 6         6-8 hours          Yes      No         Not Much             No.
```

```r
colnames(pcos_data_raw)
```

```
##  [1] "Age"                       "Weight_kg"
##  [3] "Height_ft"                 "Marital_Status"
##  [5] "PCOS"                      "Family_History_PCOS"
```

```
##  [7] "Menstrual_Irregularity"     "Hormonal_Imbalance"
##  [9] "Hyperandrogenism"           "Hirsutism"
## [11] "Mental_Health"              "Conception_Difficulty"
## [13] "Insulin_Resistance"         "Diabetes"
## [15] "Childhood_Trauma"           "Cardiovascular_Disease"
## [17] "Diet_Bread_Cereals"         "Diet_Milk_Products"
## [19] "Diet_Fruits"                "Diet_Vegetables"
## [21] "Diet_Starchy_Vegetables"    "Diet_NonStarchy_Vegetables"
## [23] "Diet_Fats"                  "Diet_Sweets"
## [25] "Diet_Fried_Food"            "Diet_Tea_Coffee"
## [27] "Diet_Multivitamin"          "Vegetarian"
## [29] "Exercise_Frequency"         "Exercise_Type"
## [31] "Exercise_Duration"          "Sleep_Hours"
## [33] "Stress_Level"               "Smoking"
## [35] "Exercise_Benefit"           "PCOS_Medication"
```

```
summary(pcos_data_raw)
```

```
##      Age              Weight_kg        Height_ft     Marital_Status
##  Length:173         Min.   : 36.00   Min.   :124.5   Length:173
##  Class :character   1st Qu.: 49.00   1st Qu.:157.5   Class :character
##  Mode  :character   Median : 55.00   Median :160.0   Mode  :character
##                     Mean   : 56.55   Mean   :160.6
##                     3rd Qu.: 64.00   3rd Qu.:165.1
##                     Max.   :115.00   Max.   :182.9
##      PCOS           Family_History_PCOS Menstrual_Irregularity
##  Length:173         Length:173          Length:173
##  Class :character   Class :character    Class :character
##  Mode  :character   Mode  :character    Mode  :character
##
##
##
##  Hormonal_Imbalance Hyperandrogenism    Hirsutism         Mental_Health
##  Length:173         Length:173         Length:173         Length:173
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##  Conception_Difficulty Insulin_Resistance   Diabetes         Childhood_Trauma
##  Length:173            Length:173         Length:173         Length:173
##  Class :character      Class :character   Class :character   Class :character
##  Mode  :character      Mode  :character   Mode  :character   Mode  :character
##
##
##
##  Cardiovascular_Disease Diet_Bread_Cereals Diet_Milk_Products  Diet_Fruits
##  Length:173             Min.   :0.000      Min.   :0.000      Min.   :0.000
##  Class :character       1st Qu.:4.000      1st Qu.:1.000      1st Qu.:1.000
##  Mode  :character       Median :7.000      Median :3.000      Median :3.000
##                         Mean   :5.445      Mean   :3.647      Mean   :3.035
##                         3rd Qu.:7.000      3rd Qu.:7.000      3rd Qu.:4.000
##                         Max.   :7.000      Max.   :7.000      Max.   :7.000
##  Diet_Vegetables Diet_Starchy_Vegetables Diet_NonStarchy_Vegetables
```

```
##  Min.   :0.000   Min.   :0.000           Min.   :0.000
##  1st Qu.:2.000   1st Qu.:2.000           1st Qu.:1.000
##  Median :3.000   Median :3.000           Median :2.000
##  Mean   :3.439   Mean   :3.069           Mean   :2.451
##  3rd Qu.:5.000   3rd Qu.:4.000           3rd Qu.:3.000
##  Max.   :7.000   Max.   :7.000           Max.   :7.000
##    Diet_Fats      Diet_Sweets    Diet_Fried_Food Diet_Tea_Coffee
##  Min.   :0.000   Min.   :0.000   Min.   :0.000   Min.   :0.000
##  1st Qu.:2.000   1st Qu.:2.000   1st Qu.:1.000   1st Qu.:2.000
##  Median :5.000   Median :3.000   Median :3.000   Median :6.000
##  Mean   :4.532   Mean   :3.618   Mean   :3.179   Mean   :4.549
##  3rd Qu.:7.000   3rd Qu.:6.000   3rd Qu.:5.000   3rd Qu.:7.000
##  Max.   :7.000   Max.   :7.000   Max.   :7.000   Max.   :7.000
##  Diet_Multivitamin  Vegetarian        Exercise_Frequency Exercise_Type
##  Min.   :0.000     Length:173         Length:173         Length:173
##  1st Qu.:0.000     Class :character   Class :character   Class :character
##  Median :0.000     Mode  :character   Mode  :character   Mode  :character
##  Mean   :1.393
##  3rd Qu.:2.000
##  Max.   :7.000
##  Exercise_Duration  Sleep_Hours        Stress_Level         Smoking
##  Length:173         Length:173         Length:173         Length:173
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##  Exercise_Benefit   PCOS_Medication
##  Length:173         Length:173
##  Class :character   Class :character
##  Mode  :character   Mode  :character
##
##
##
```

```
count(pcos_data_raw, PCOS, sort = TRUE)
```

```
##                                PCOS   n
## 1                                No 134
## 2                               Yes  38
## 3 No, Yes, not diagnosed by a doctor   1
```

The dataset contains 134 women without PCOS, 38 with PCOS, and one entry with both values.

3. Data Cleaning and Preparation

3.1 Dealing with Missing and Duplicated Values

```
sum(is.na(pcos_data_raw))
```

```
## [1] 0
```

The dataset does not contain any missing values.

```
sum(duplicated(pcos_data_raw))
```

```
## [1] 0
```

The dataset does not contain any duplicated rows.

3.2 Adding and Modifying Columns

```
summary(pcos_data_raw$Height_ft)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   124.5   157.5   160.0   160.6   165.1   182.9
```

The column above is called "Height_ft", but the values range from 124 to 182. That range is not possible for a human. According to the dataset's author, this column is actually in cm. The column name will be changed to reflect that.

```
pcos_data_clean <- pcos_data_raw
```

```
pcos_data_clean <- rename(pcos_data_clean, Height_cm = Height_ft)
```

```
head(pcos_data_clean)
```

```
##            Age Weight_kg Height_cm Marital_Status PCOS Family_History_PCOS
## 1        20-25        66    157.48      Unmarried   No                  No
## 2 Less than 20        56    165.10      Unmarried   No                  No
## 3 Less than 20        89    167.64      Unmarried   No                 Yes
## 4        20-25        55    160.02      Unmarried   No                 Yes
## 5 Less than 20        55    160.02      Unmarried   No                  No
## 6 Less than 20        45    160.02      Unmarried   No                  No
##   Menstrual_Irregularity Hormonal_Imbalance Hyperandrogenism Hirsutism
## 1                    Yes                 No               No        No
## 2                     No                 No               No        No
## 3                     No                 No               No       Yes
## 4                     No                Yes               No       Yes
## 5                     No                 No               No        No
## 6                    Yes                Yes               No        No
##   Mental_Health          Conception_Difficulty Insulin_Resistance Diabetes
## 1           Yes                             No                No       No
## 2            No                             No                No       No
## 3           Yes                             No                No       No
## 4           Yes Yes, not diagnosed by a doctor                No       No
## 5           Yes                             No                No       No
## 6           Yes                             No                No       No
##   Childhood_Trauma Cardiovascular_Disease Diet_Bread_Cereals Diet_Milk_Products
```

```
## 1              No                    No                 7                 7
## 2              No                    No                 4                 4
## 3             Yes                    No                 6                 2
## 4             Yes                    No                 2                 3
## 5             Yes                    No                 4                 7
## 6             Yes                    No                 7                 3
##   Diet_Fruits Diet_Vegetables Diet_Starchy_Vegetables
## 1           2               2                       3
## 2           4               4                       4
## 3           1               3                       2
## 4           1               2                       5
## 5           2               3                       4
## 6           2               4                       3
##   Diet_NonStarchy_Vegetables Diet_Fats Diet_Sweets Diet_Fried_Food
## 1                          1         7           3               3
## 2                          2         4           0               1
## 3                          1         7           1               3
## 4                          3         5           5               5
## 5                          4         6           2               3
## 6                          5         4           1               2
##   Diet_Tea_Coffee Diet_Multivitamin Vegetarian Exercise_Frequency
## 1               7                 0         No             Rarely
## 2               0                 0         No              Daily
## 3               7                 0         No             Rarely
## 4               7                 1         No              Never
## 5               5                 0         No              Daily
## 6               7                 0         No             Rarely
##                              Exercise_Type    Exercise_Duration
## 1 Cardio (e.g., running, cycling, swimming)           30 minutes
## 2                              No Exercise Less than 30 minutes
## 3 Cardio (e.g., running, cycling, swimming) Less than 30 minutes
## 4                              No Exercise       Not Applicable
## 5 Cardio (e.g., running, cycling, swimming) 30 minutes to 1 hour
## 6                              No Exercise       Not Applicable
##         Sleep_Hours Stress_Level Smoking Exercise_Benefit PCOS_Medication
## 1 Less than 6 hours           No      No         Somewhat             No.
## 2         6-8 hours           No      No         Somewhat             No.
## 3         6-8 hours          Yes      No         Somewhat             No.
## 4         6-8 hours          Yes      No         Somewhat             No.
## 5         6-8 hours          Yes      No       Not at All             No.
## 6         6-8 hours          Yes      No         Not Much             No.
```

Since this study will be used within the USA, new columns will be added to convert the kg and cm columns to lbs and in respectively.

```
pcos_data_clean <- mutate(pcos_data_clean, Height_in = Height_cm / 2.54, Weight_lb = Weight_kg * 2.204)
# 2.54 cm in an inch
# 2.204 kg in a lb
```

```
head(select(pcos_data_clean, Weight_kg, Weight_lb, Height_cm, Height_in))
```

```
##   Weight_kg Weight_lb Height_cm Height_in
## 1        66   145.464    157.48        62
```

```
## 2        56   123.424    165.10        65
## 3        89   196.156    167.64        66
## 4        55   121.220    160.02        63
## 5        55   121.220    160.02        63
## 6        45    99.180    160.02        63
```

The Weight_kg and Height_cm columns will now be dropped from the dataset.

```
pcos_data_clean <- select(pcos_data_clean, -c(Weight_kg, Height_cm))
```

```
head(pcos_data_clean)
```

```
##            Age Marital_Status PCOS Family_History_PCOS Menstrual_Irregularity
## 1        20-25      Unmarried   No                  No                     Yes
## 2 Less than 20      Unmarried   No                  No                      No
## 3 Less than 20      Unmarried   No                 Yes                      No
## 4        20-25      Unmarried   No                 Yes                      No
## 5 Less than 20      Unmarried   No                  No                      No
## 6 Less than 20      Unmarried   No                  No                     Yes
##   Hormonal_Imbalance Hyperandrogenism Hirsutism Mental_Health
## 1                 No               No        No           Yes
## 2                 No               No        No            No
## 3                 No               No       Yes           Yes
## 4                Yes               No       Yes           Yes
## 5                 No               No        No           Yes
## 6                Yes               No        No           Yes
##            Conception_Difficulty Insulin_Resistance Diabetes Childhood_Trauma
## 1                             No                 No       No               No
## 2                             No                 No       No               No
## 3                             No                 No       No              Yes
## 4 Yes, not diagnosed by a doctor                 No       No              Yes
## 5                             No                 No       No              Yes
## 6                             No                 No       No              Yes
##   Cardiovascular_Disease Diet_Bread_Cereals Diet_Milk_Products Diet_Fruits
## 1                     No                 7                  7           2
## 2                     No                 4                  4           4
## 3                     No                 6                  2           1
## 4                     No                 2                  3           1
## 5                     No                 4                  7           2
## 6                     No                 7                  3           2
##   Diet_Vegetables Diet_Starchy_Vegetables Diet_NonStarchy_Vegetables Diet_Fats
## 1               2                       3                         1         7
## 2               4                       4                         2         4
## 3               3                       2                         1         7
## 4               2                       5                         3         5
## 5               3                       4                         4         6
## 6               4                       3                         5         4
##   Diet_Sweets Diet_Fried_Food Diet_Tea_Coffee Diet_Multivitamin Vegetarian
## 1           3              3               7                 0         No
## 2           0              1               0                 0         No
## 3           1              3               7                 0         No
## 4           5              5               7                 1         No
## 5           2              3               5                 0         No
```

```
## 6          1               2               7                 0         No
##   Exercise_Frequency                            Exercise_Type
## 1             Rarely Cardio (e.g., running, cycling, swimming)
## 2              Daily                                No Exercise
## 3             Rarely Cardio (e.g., running, cycling, swimming)
## 4              Never                               No Exercise
## 5              Daily Cardio (e.g., running, cycling, swimming)
## 6             Rarely                               No Exercise
##      Exercise_Duration       Sleep_Hours Stress_Level Smoking Exercise_Benefit
## 1           30 minutes Less than 6 hours           No      No         Somewhat
## 2 Less than 30 minutes         6-8 hours           No      No         Somewhat
## 3 Less than 30 minutes         6-8 hours          Yes      No         Somewhat
## 4       Not Applicable         6-8 hours          Yes      No         Somewhat
## 5 30 minutes to 1 hour         6-8 hours          Yes      No       Not at All
## 6       Not Applicable         6-8 hours          Yes      No         Not Much
##   PCOS_Medication Height_in Weight_lb
## 1             No.        62   145.464
## 2             No.        65   123.424
## 3             No.        66   196.156
## 4             No.        63   121.220
## 5             No.        63   121.220
## 6             No.        63    99.180
```

A common measure for if someone is at a healthy weight for their height is body mass index (BMI). The formula for this using English units is:

$$BMI = 703 * \frac{weight(lb)}{height^2(in)}$$

This column will be added to the dataset.

```
pcos_data_clean <- mutate(pcos_data_clean, BMI = 703 * (Weight_lb / (Height_in ^ 2)))
```

```
head(select(pcos_data_clean, Weight_lb, Height_in, BMI))
```

```
##   Weight_lb Height_in      BMI
## 1   145.464        62 26.60281
## 2   123.424        65 20.53659
## 3   196.156        66 31.65695
## 4   121.220        63 21.47081
## 5   121.220        63 21.47081
## 6    99.180        63 17.56703
```

Since the new columns we added to the end of the dataframe, the will be rearranged to the second through fourth columns.

```
pcos_data_clean <- select(pcos_data_clean, c(1, 35, 36, 37, 2:34))
```

```
head(pcos_data_clean)
```

```
##            Age Height_in Weight_lb      BMI Marital_Status PCOS
```

```
## 1        20-25        62   145.464 26.60281      Unmarried   No
## 2 Less than 20        65   123.424 20.53659      Unmarried   No
## 3 Less than 20        66   196.156 31.65695      Unmarried   No
## 4        20-25        63   121.220 21.47081      Unmarried   No
## 5 Less than 20        63   121.220 21.47081      Unmarried   No
## 6 Less than 20        63    99.180 17.56703      Unmarried   No
##   Family_History_PCOS Menstrual_Irregularity Hormonal_Imbalance
## 1                  No                    Yes                 No
## 2                  No                     No                 No
## 3                 Yes                     No                 No
## 4                 Yes                     No                Yes
## 5                  No                     No                 No
## 6                  No                    Yes                Yes
##   Hyperandrogenism Hirsutism Mental_Health          Conception_Difficulty
## 1               No        No           Yes                             No
## 2               No        No            No                             No
## 3               No       Yes           Yes                             No
## 4               No       Yes           Yes Yes, not diagnosed by a doctor
## 5               No        No           Yes                             No
## 6               No        No           Yes                             No
##   Insulin_Resistance Diabetes Childhood_Trauma Cardiovascular_Disease
## 1                 No       No               No                    No
## 2                 No       No               No                    No
## 3                 No       No              Yes                    No
## 4                 No       No              Yes                    No
## 5                 No       No              Yes                    No
## 6                 No       No              Yes                    No
##   Diet_Bread_Cereals Diet_Milk_Products Diet_Fruits Diet_Vegetables
## 1                  7                  7           2               2
## 2                  4                  4           4               4
## 3                  6                  2           1               3
## 4                  2                  3           1               2
## 5                  4                  7           2               3
## 6                  7                  3           2               4
##   Diet_Starchy_Vegetables Diet_NonStarchy_Vegetables Diet_Fats Diet_Sweets
## 1                       3                          1         7           3
## 2                       4                          2         4           0
## 3                       2                          1         7           1
## 4                       5                          3         5           5
## 5                       4                          4         6           2
## 6                       3                          5         4           1
##   Diet_Fried_Food Diet_Tea_Coffee Diet_Multivitamin Vegetarian
## 1               3               7                 0         No
## 2               1               0                 0         No
## 3               3               7                 0         No
## 4               5               7                 1         No
## 5               3               5                 0         No
## 6               2               7                 0         No
##   Exercise_Frequency                          Exercise_Type
## 1             Rarely Cardio (e.g., running, cycling, swimming)
## 2              Daily                                No Exercise
## 3             Rarely Cardio (e.g., running, cycling, swimming)
## 4              Never                                No Exercise
## 5              Daily Cardio (e.g., running, cycling, swimming)
```

```
## 6             Rarely                                  No Exercise
##      Exercise_Duration       Sleep_Hours Stress_Level Smoking Exercise_Benefit
## 1           30 minutes Less than 6 hours           No      No         Somewhat
## 2 Less than 30 minutes         6-8 hours           No      No         Somewhat
## 3 Less than 30 minutes         6-8 hours          Yes      No         Somewhat
## 4       Not Applicable         6-8 hours          Yes      No         Somewhat
## 5 30 minutes to 1 hour         6-8 hours          Yes      No       Not at All
## 6       Not Applicable         6-8 hours          Yes      No         Not Much
##   PCOS_Medication
## 1             No.
## 2             No.
## 3             No.
## 4             No.
## 5             No.
## 6             No.
```

The Marital_Status column will be checked to make sure the selections are valid.

```
count(pcos_data_clean, Marital_Status)
```

```
##   Marital_Status   n
## 1        Married  16
## 2      Unmarried 156
## 3          Widow   1
```

According to the CDC (https://www.cdc.gov/bmi/adult-calculator/bmi-categories.html), there are ranges within BMI that can be used to categorize a person's health as follows:

- Less than 18.5: Underweight
- 18.5 - 24.9: Healthy Weight
- 25 - 29.9: Overweight
- 30 - 34.5: Class 1 Obesity
- 35 - 39.9: Class 2 Obesity
- 40+: Class 3 Obesity

A new column with this category will be added to make it easier to compare people based on BMI.

```
BMI_groups <- cut(pcos_data_clean$BMI, breaks = c(0, 18.4, 24.9, 29.9, 34.5, 39.9, 100),
                  labels = c("Underweight",
                             "Healthy Weight",
                             "Overweight",
                             "Class 1 Obesity",
                             "Class 2 Obesity",
                             "Class 3 Obesity"))
```

```
print(table(BMI_groups))
```

```
## BMI_groups
##     Underweight  Healthy Weight      Overweight Class 1 Obesity Class 2 Obesity
##              41              92              30               8               1
## Class 3 Obesity
##               1
```

```r
count(pcos_data_clean, BMI < 18.4)
```

```
##   BMI < 18.4   n
## 1      FALSE 132
## 2       TRUE  41
```

```r
pcos_data_clean$BMI_Cat <- BMI_groups
```

```r
head(select(pcos_data_clean, BMI_Cat, BMI))
```

```
##           BMI_Cat      BMI
## 1      Overweight 26.60281
## 2  Healthy Weight 20.53659
## 3 Class 1 Obesity 31.65695
## 4  Healthy Weight 21.47081
## 5  Healthy Weight 21.47081
## 6     Underweight 17.56703
```

```r
pcos_data_clean <- select(pcos_data_clean, 1:4, 38, 5:37)
```

```r
head(pcos_data_clean)
```

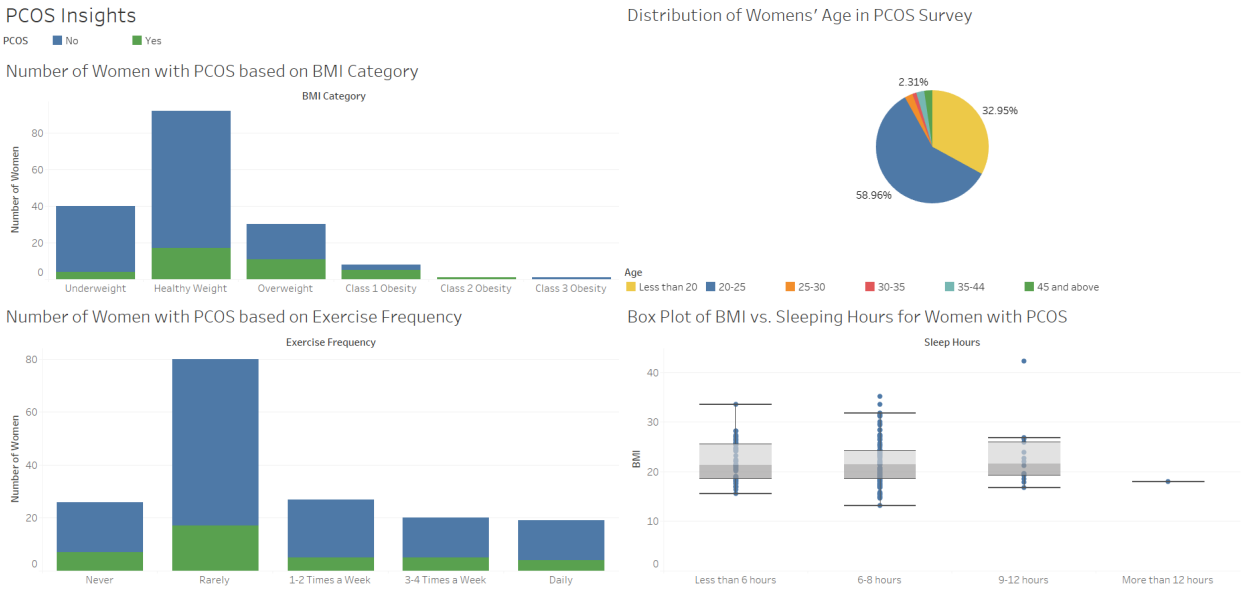
```
##            Age Height_in Weight_lb      BMI         BMI_Cat Marital_Status PCOS
## 1        20-25        62   145.464 26.60281      Overweight      Unmarried   No
## 2 Less than 20        65   123.424 20.53659  Healthy Weight      Unmarried   No
## 3 Less than 20        66   196.156 31.65695 Class 1 Obesity      Unmarried   No
## 4        20-25        63   121.220 21.47081  Healthy Weight      Unmarried   No
## 5 Less than 20        63   121.220 21.47081  Healthy Weight      Unmarried   No
## 6 Less than 20        63    99.180 17.56703     Underweight      Unmarried   No
##   Family_History_PCOS Menstrual_Irregularity Hormonal_Imbalance
## 1                  No                    Yes                 No
## 2                  No                     No                 No
## 3                 Yes                     No                 No
## 4                 Yes                     No                Yes
## 5                  No                     No                 No
## 6                  No                    Yes                Yes
##   Hyperandrogenism Hirsutism Mental_Health          Conception_Difficulty
## 1               No        No           Yes                             No
## 2               No        No            No                             No
## 3               No       Yes           Yes                             No
## 4               No       Yes           Yes Yes, not diagnosed by a doctor
## 5               No        No           Yes                             No
## 6               No        No           Yes                             No
##   Insulin_Resistance Diabetes Childhood_Trauma Cardiovascular_Disease
## 1                 No       No               No                    No
## 2                 No       No               No                    No
## 3                 No       No              Yes                    No
## 4                 No       No              Yes                    No
## 5                 No       No              Yes                    No
## 6                 No       No              Yes                    No
##   Diet_Bread_Cereals Diet_Milk_Products Diet_Fruits Diet_Vegetables
```

```
## 1                  7                  7           2              2
## 2                  4                  4           4              4
## 3                  6                  2           1              3
## 4                  2                  3           1              2
## 5                  4                  7           2              3
## 6                  7                  3           2              4
##   Diet_Starchy_Vegetables Diet_NonStarchy_Vegetables Diet_Fats Diet_Sweets
## 1                       3                          1         7           3
## 2                       4                          2         4           0
## 3                       2                          1         7           1
## 4                       5                          3         5           5
## 5                       4                          4         6           2
## 6                       3                          5         4           1
##   Diet_Fried_Food Diet_Tea_Coffee Diet_Multivitamin Vegetarian
## 1               3               7                 0         No
## 2               1               0                 0         No
## 3               3               7                 0         No
## 4               5               7                 1         No
## 5               3               5                 0         No
## 6               2               7                 0         No
##   Exercise_Frequency                          Exercise_Type
## 1             Rarely Cardio (e.g., running, cycling, swimming)
## 2              Daily                                No Exercise
## 3             Rarely Cardio (e.g., running, cycling, swimming)
## 4              Never                               No Exercise
## 5              Daily Cardio (e.g., running, cycling, swimming)
## 6             Rarely                               No Exercise
##      Exercise_Duration       Sleep_Hours Stress_Level Smoking Exercise_Benefit
## 1           30 minutes Less than 6 hours           No      No         Somewhat
## 2 Less than 30 minutes         6-8 hours           No      No         Somewhat
## 3 Less than 30 minutes         6-8 hours          Yes      No         Somewhat
## 4       Not Applicable         6-8 hours          Yes      No         Somewhat
## 5 30 minutes to 1 hour         6-8 hours          Yes      No       Not at All
## 6       Not Applicable         6-8 hours          Yes      No         Not Much
##   PCOS_Medication
## 1             No.
## 2             No.
## 3             No.
## 4             No.
## 5             No.
## 6             No.
```

```
write.csv(pcos_data_clean,"pcos_data_clean.csv", row.names = FALSE)
```

4. Data Visualization in Tableau

Here is a dashboard of some of the insights using Tableau.



5. Analysis

5.1 General Questions

5.2 Inferential Statistics

6. Conclusion