Megan Pokal
Final Project
530 – Matthew M.

```
!pip install statsmodels

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!pip install empiricaldist

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from empiricaldist import Pmf, Cdf

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# Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import pearsonr, ttest_ind
from statsmodels.formula.api import ols

---

import zipfile
import os

# Path to the zip file
zip_file_path = 'Fitbit.zip'
extracted_folder = 'path_to_extracted_files/'

# Extract the zip file
with zipfile.ZipFile(zip_file_path, 'r') as zip_ref:
    zip_ref.extractall(extracted_folder)

# List the files in the extracted folder to verify
extracted_files = os.listdir(extracted_folder)
print(extracted_files)
```

Output:

```
['mturkfitbit_export_4.12.16-5.12.16', 'mturkfitbit_export_3.12.16-4.11.16']
```

```
import pandas as pd
import os

# Extracted Folder
extracted_folder = 'path_to_extracted_files/'

# Load each of the CSV files
daily_activity = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/dailyActivity_merged.csv'))
heart_rate = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/heartrate_seconds_merged.csv'))
hourly_calories = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/hourlyCalories_merged.csv'))
hourly_intensities = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/hourlyIntensities_merged.csv'))
hourly_steps = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/hourlySteps_merged.csv'))
minute_calories = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteCaloriesNarrow_merged.csv'))
minute_intensities = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteIntensitiesNarrow_merged.csv'))
minute_mets = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteMETsNarrow_merged.csv'))
minute_sleep = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteSleep_merged.csv'))
minute_steps = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteStepsNarrow_merged.csv'))
weight_log = pd.read_csv(os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/weightLogInfo_merged.csv'))

# Check the first few rows of each dataframe
print(daily_activity.head())
print(heart_rate.head())
print(hourly_calories.head())
print(hourly_intensities.head())
print(hourly_steps.head())
print(minute_calories.head())
print(minute_intensities.head())
print(minute_mets.head())
print(minute_sleep.head())
print(minute_steps.head())
print(weight_log.head())
```

Output:

```
          Id ActivityDate  TotalSteps  TotalDistance  TrackerDistance  \
0  1503960366   3/25/2016      11004          7.11           7.11
1  1503960366   3/26/2016      17609         11.55          11.55
2  1503960366   3/27/2016      12736          8.53           8.53
3  1503960366   3/28/2016      13231          8.93           8.93
4  1503960366   3/29/2016      12041          7.85           7.85

   LoggedActivitiesDistance  VeryActiveDistance  ModeratelyActiveDistance  \
0                  0.0             2.57                  0.46
1                  0.0             6.92                  0.73
2                  0.0             4.66                  0.16
3                  0.0             3.19                  0.79
4                  0.0             2.16                  1.09

   LightActiveDistance  SedentaryActiveDistance  VeryActiveMinutes  \
0              4.07                 0.0              33
1              3.91                 0.0              89
2              3.71                 0.0              56
3              4.95                 0.0              39
4              4.61                 0.0              28

   FairlyActiveMinutes  LightlyActiveMinutes  SedentaryMinutes  Calories
0               12               205               804      1819
1               17               274               588      2154
2                5              268               605     1944
3               20               224              1080      1932
4               28               243               763      1886
          Id               Time  Value
0  2022484408  4/1/2016 7:54:00 AM     93
1  2022484408  4/1/2016 7:54:05 AM     91
2  2022484408  4/1/2016 7:54:10 AM     96
3  2022484408  4/1/2016 7:54:15 AM     98
4  2022484408  4/1/2016 7:54:20 AM    100
          Id          ActivityHour  Calories
0  1503960366  3/12/2016 12:00:00 AM        48
1  1503960366   3/12/2016 1:00:00 AM        48
2  1503960366   3/12/2016 2:00:00 AM        48
3  1503960366   3/12/2016 3:00:00 AM        48
4  1503960366   3/12/2016 4:00:00 AM        48
          Id          ActivityHour  TotalIntensity  AverageIntensity
```

```
0  1503960366  3/12/2016 12:00:00 AM            0            0.0
1  1503960366   3/12/2016 1:00:00 AM            0            0.0
2  1503960366   3/12/2016 2:00:00 AM            0            0.0
3  1503960366   3/12/2016 3:00:00 AM            0            0.0
4  1503960366   3/12/2016 4:00:00 AM            0            0.0
           Id          ActivityHour  StepTotal
0  1503960366  3/12/2016 12:00:00 AM         0
1  1503960366   3/12/2016 1:00:00 AM         0
2  1503960366   3/12/2016 2:00:00 AM         0
3  1503960366   3/12/2016 3:00:00 AM         0
4  1503960366   3/12/2016 4:00:00 AM         0
           Id        ActivityMinute  Calories
0  1503960366  3/12/2016 12:00:00 AM    0.7973
1  1503960366  3/12/2016 12:01:00 AM    0.7973
2  1503960366  3/12/2016 12:02:00 AM    0.7973
3  1503960366  3/12/2016 12:03:00 AM    0.7973
4  1503960366  3/12/2016 12:04:00 AM    0.7973
           Id        ActivityMinute  Intensity
0  1503960366  3/12/2016 12:00:00 AM          0
1  1503960366  3/12/2016 12:01:00 AM          0
2  1503960366  3/12/2016 12:02:00 AM          0
3  1503960366  3/12/2016 12:03:00 AM          0
4  1503960366  3/12/2016 12:04:00 AM          0
           Id        ActivityMinute  METs
0  1503960366  3/12/2016 12:00:00 AM    10
1  1503960366  3/12/2016 12:01:00 AM    10
2  1503960366  3/12/2016 12:02:00 AM    10
3  1503960366  3/12/2016 12:03:00 AM    10
4  1503960366  3/12/2016 12:04:00 AM    10
           Id                  date  value        logId
0  1503960366  3/13/2016 2:39:30 AM      1  11114919637
1  1503960366  3/13/2016 2:40:30 AM      1  11114919637
2  1503960366  3/13/2016 2:41:30 AM      1  11114919637
3  1503960366  3/13/2016 2:42:30 AM      1  11114919637
4  1503960366  3/13/2016 2:43:30 AM      1  11114919637
           Id        ActivityMinute  Steps
0  1503960366  3/12/2016 12:00:00 AM      0
1  1503960366  3/12/2016 12:01:00 AM      0
2  1503960366  3/12/2016 12:02:00 AM      0
3  1503960366  3/12/2016 12:03:00 AM      0
4  1503960366  3/12/2016 12:04:00 AM      0
           Id                  Date   WeightKg  WeightPounds   Fat  \
0  1503960366  4/5/2016 11:59:59 PM   53.299999    117.506384  22.0
1  1927972279  4/10/2016 6:33:26 PM  129.600006    285.719105   NaN
```

```
2  2347167796  4/3/2016 11:59:59 PM   63.400002    139.773078  10.0
3  2873212765  4/6/2016 11:59:59 PM   56.700001    125.002104   NaN
4  2873212765  4/7/2016 11:59:59 PM   57.200001    126.104416   NaN

        BMI  IsManualReport         LogId
0  22.969999           True  1459900799000
1  46.169998          False  1460313206000
2  24.770000           True  1459727999000
3  21.450001           True  1459987199000
4  21.650000           True  1460073599000
```

```
import os

# Verify paths
files = [
    'dailyActivity_merged.csv',
    'heartrate_seconds_merged.csv',
    'hourlyCalories_merged.csv',
    'hourlyIntensities_merged.csv',
    'hourlySteps_merged.csv',
    'minuteCaloriesNarrow_merged.csv',
    'minuteIntensitiesNarrow_merged.csv',
    'minuteMETsNarrow_merged.csv',
    'minuteSleep_merged.csv',
    'minuteStepsNarrow_merged.csv',
    'weightLogInfo_merged.csv'
]

for file in files:
    file_path = os.path.join(extracted_folder, 'mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/', file)
    if not os.path.exists(file_path):
        print(f"File not found: {file_path}")
    else:
        print(f"Found: {file_path}")
```

Output:

```
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/dailyActivity_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/heartrate_seconds_merged.csv
```

```
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/hourlyCalories_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/hourlyIntensities_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/hourlySteps_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteCaloriesNarrow_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteIntensitiesNarrow_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteMETsNarrow_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteSleep_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/minuteStepsNarrow_merged.csv
Found: path_to_extracted_files/mturkfitbit_export_3.12.16-4.11.16/Fitabase Data 3.12.16-4.11.16/weightLogInfo_merged.csv
```

```
# Check for missing values and data types
print(daily_activity.info())
print(daily_activity.describe())

# Display first few rows
print(daily_activity.head())
```

Output:

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 457 entries, 0 to 456
Data columns (total 15 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Id                        457 non-null    int64  
 1   ActivityDate              457 non-null    object 
 2   TotalSteps                457 non-null    int64  
 3   TotalDistance             457 non-null    float64
 4   TrackerDistance           457 non-null    float64
 5   LoggedActivitiesDistance  457 non-null    float64
 6   VeryActiveDistance        457 non-null    float64
 7   ModeratelyActiveDistance  457 non-null    float64
 8   LightActiveDistance       457 non-null    float64
 9   SedentaryActiveDistance   457 non-null    float64
 10  VeryActiveMinutes         457 non-null    int64
 11  FairlyActiveMinutes       457 non-null    int64
 12  LightlyActiveMinutes      457 non-null    int64
 13  SedentaryMinutes          457 non-null    int64
 14  Calories                  457 non-null    int64
dtypes: float64(7), int64(7), object(1)
memory usage: 53.7+ KB
None
                 Id    TotalSteps  TotalDistance  TrackerDistance  \
count  4.570000e+02    457.000000     457.000000       457.000000
mean   4.628595e+09   6546.562363       4.663523         4.609847
std    2.293781e+09   5398.493064       4.082072         4.068540
min    1.503960e+09      0.000000       0.000000         0.000000
25%    2.347168e+09   1988.000000       1.410000         1.280000
50%    4.057193e+09   5986.000000       4.090000         4.090000
75%    6.391747e+09  10198.000000       7.160000         7.110000
max    8.877689e+09  28497.000000      27.530001        27.530001

       LoggedActivitiesDistance  VeryActiveDistance  ModeratelyActiveDistance  \
count                457.000000          457.000000                457.000000
mean                   0.179427            1.180897                  0.478643
std                    0.849232            2.487159                  0.830995
min                    0.000000            0.000000                  0.000000
25%                    0.000000            0.000000                  0.000000
50%                    0.000000            0.000000                  0.020000
75%                    0.000000            1.310000                  0.670000
max                    6.727057           21.920000                  6.400000

       LightActiveDistance  SedentaryActiveDistance  VeryActiveMinutes  \
count           457.000000               457.000000         457.000000
mean              2.890197                 0.001904          16.623632
std               2.237523                 0.008487          28.919704
min               0.000000                 0.000000           0.000000
25%               0.870000                 0.000000           0.000000
50%               2.930000                 0.000000           0.000000
75%               4.460000                 0.000000          25.000000
max              12.510000                 0.100000         202.000000

       FairlyActiveMinutes  LightlyActiveMinutes  SedentaryMinutes  \
count           457.000000            457.000000        457.000000
mean             13.070022            170.070022        995.282276
std              36.208635            122.205372        337.021404
min               0.000000              0.000000         32.000000
```

```
25%          0.000000          64.000000       728.000000
50%          1.000000         181.000000      1057.000000
75%         16.000000         257.000000      1285.000000
max        660.000000         720.000000      1440.000000

        Calories
count   457.000000
mean   2189.452954
std     815.484523
min       0.000000
25%    1776.000000
50%    2062.000000
75%    2667.000000
max    4562.000000
           Id ActivityDate  TotalSteps  TotalDistance  TrackerDistance  \
0  1503960366    3/25/2016       11004           7.11             7.11
1  1503960366    3/26/2016       17609          11.55            11.55
2  1503960366    3/27/2016       12736           8.53             8.53
3  1503960366    3/28/2016       13231           8.93             8.93
4  1503960366    3/29/2016       12041           7.85             7.85

   LoggedActivitiesDistance  VeryActiveDistance  ModeratelyActiveDistance  \
0                       0.0                2.57                      0.46
1                       0.0                6.92                      0.73
2                       0.0                4.66                      0.16
3                       0.0                3.19                      0.79
4                       0.0                2.16                      1.09

   LightActiveDistance  SedentaryActiveDistance  VeryActiveMinutes  \
0                 4.07                      0.0                 33
1                 3.91                      0.0                 89
2                 3.71                      0.0                 56
3                 4.95                      0.0                 39
4                 4.61                      0.0                 28

   FairlyActiveMinutes  LightlyActiveMinutes  SedentaryMinutes  Calories
0                   12                   205               804      1819
1                   17                   274               588      2154
2                    5                   268               605      1944
3                   20                   224              1080      1932
4                   28                   243               763      1886
```

```
print(daily_activity.columns)
```

Output:

```
Index(['Id', 'ActivityDate', 'TotalSteps', 'TotalDistance', 'TrackerDistance',
       'LoggedActivitiesDistance', 'VeryActiveDistance',
       'ModeratelyActiveDistance', 'LightActiveDistance',
       'SedentaryActiveDistance', 'VeryActiveMinutes', 'FairlyActiveMinutes',
       'LightlyActiveMinutes', 'SedentaryMinutes', 'Calories'],
      dtype='object')
```

```
# Convert 'ActivityDate' to a datetime object
daily_activity['ActivityDate'] = pd.to_datetime(daily_activity['ActivityDate'], format='%m/%d/%Y')

# Verify the conversion
print(daily_activity['ActivityDate'].head())
```

Output:

```
0   2016-03-25
1   2016-03-26
2   2016-03-27
3   2016-03-28
4   2016-03-29
Name: ActivityDate, dtype: datetime64[ns]
```

```
import pandas as pd
import zipfile

# Path to the zip file
zip_path = '/Users/meganpokal/PycharmProjects/JupyterProject1/models/Fitbit.zip'

# Define the file name inside the zip
file_name = 'mturkfitbit_export_4.12.16-5.12.16/Fitabase Data 4.12.16-5.12.16/dailyActivity_merged.csv'

# Extract the CSV file from the zip file
with zipfile.ZipFile(zip_path, 'r') as z:
    # Read the CSV file into a pandas DataFrame
    with z.open(file_name) as f:
        daily_activity = pd.read_csv(f)

# Check the first few rows of the daily activity data
print(daily_activity.head())
```

Output:

```
           Id ActivityDate  TotalSteps  TotalDistance  TrackerDistance  \
0  1503960366    4/12/2016       13162           8.50             8.50
1  1503960366    4/13/2016       10735           6.97             6.97
2  1503960366    4/14/2016       10460           6.74             6.74
3  1503960366    4/15/2016        9762           6.28             6.28
4  1503960366    4/16/2016       12669           8.16             8.16

   LoggedActivitiesDistance  VeryActiveDistance  ModeratelyActiveDistance  \
0                       0.0                1.88                      0.55
1                       0.0                1.57                      0.69
2                       0.0                2.44                      0.40
3                       0.0                2.14                      1.26
4                       0.0                2.71                      0.41

   LightActiveDistance  SedentaryActiveDistance  VeryActiveMinutes  \
0                 6.06                      0.0                 25
1                 4.71                      0.0                 21
2                 3.91                      0.0                 30
3                 2.83                      0.0                 29
4                 5.04                      0.0                 36

   FairlyActiveMinutes  LightlyActiveMinutes  SedentaryMinutes  Calories
0                   13                   328               728      1985
1                   19                   217               776      1797
2                   11                   181              1218      1776
3                   34                   209               726      1745
4                   10                   221               773      1863
```

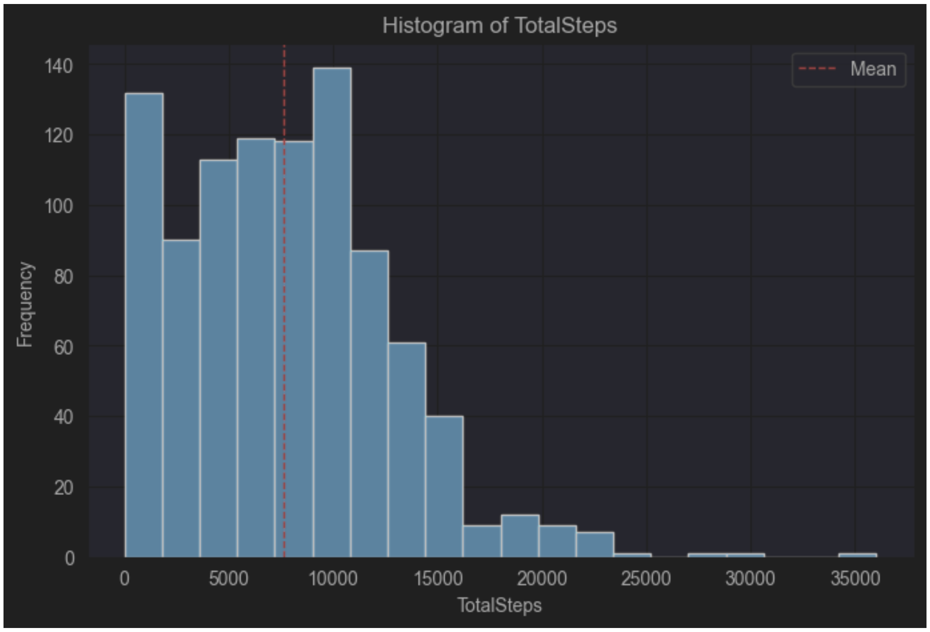
```
import pandas as pd
import zipfile

# Path to the zip file
zip_path = '/Users/meganpokal/PycharmProjects/JupyterProject1/models/Fitbit.zip'
```

```
# File name inside the zip
file_name = 'mturkfitbit_export_4.12.16-5.12.16/Fitabase Data 4.12.16-
5.12.16/dailyActivity_merged.csv'

# Access CSV file directly
with zipfile.ZipFile(zip_path, 'r') as zip_ref:
    with zip_ref.open(file_name) as file:
        daily_activity = pd.read_csv(file)

# Convert 'ActivityDate' to a datetime object
daily_activity['ActivityDate'] = pd.to_datetime(daily_activity['ActivityDate'],
format='%m/%d/%Y')

# 5 Variables
variables = ['TotalSteps', 'TotalDistance', 'VeryActiveMinutes', 'SedentaryMinutes', 'Calories']
daily_data = daily_activity[variables]

# Exploratory Data Analysis
for var in variables:
    plt.figure(figsize=(8, 5))
    plt.hist(daily_data[var], bins=20, edgecolor='black')
    plt.title(f'Histogram of {var}')
    plt.xlabel(var)
    plt.ylabel('Frequency')
    plt.axvline(daily_data[var].mean(), color='red', linestyle='dashed', linewidth=1, label='Mean')
    plt.legend()
    plt.show()

    # Descriptive statistics
    print(f'Descriptive Statistics for {var}:')
    print(daily_data[var].describe())
    print(f'Mode: {daily_data[var].mode().values}')

    # Outlier Detection using IQR
    q1 = daily_data[var].quantile(0.25)
    q3 = daily_data[var].quantile(0.75)
    iqr = q3 - q1
    lower_bound = q1 - 1.5 * iqr
    upper_bound = q3 + 1.5 * iqr
    outliers = daily_data[(daily_data[var] < lower_bound) | (daily_data[var] > upper_bound)]
    print(f"Number of outliers in {var}: {len(outliers)}\n")

# Dail_data copy
daily_data = daily_data.copy()
```

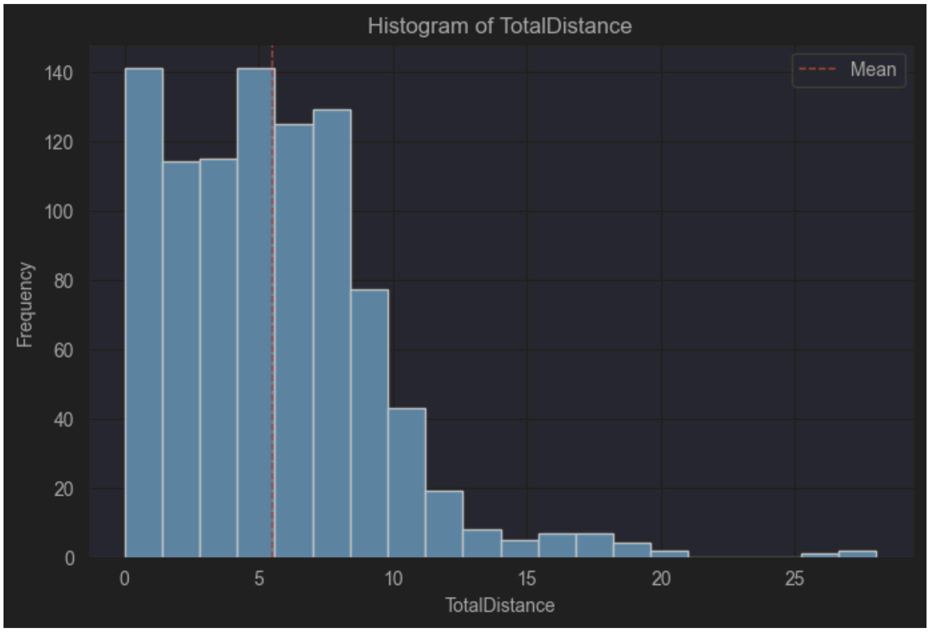
```
# PMF Example: Compare TotalSteps <10k vs. ≥10k
daily_data.loc[:, 'StepCategory'] = np.where(daily_data['TotalSteps'] >= 10000, '10k+ Steps',
'<10k Steps')
pmf = Pmf.from_seq(daily_data['StepCategory'])
pmf.bar()
plt.title('PMF of Step Categories')
plt.xlabel('Step Category')
plt.ylabel('Probability')
plt.show()

# Analytical Distribution (Normal Distribution Fit)
sns.histplot(daily_data['Calories'], kde=True, stat="density", linewidth=0)
mu, std = stats.norm.fit(daily_data['Calories'])
xmin, xmax = plt.xlim()
x = np.linspace(xmin, xmax, 100)
p = stats.norm.pdf(x, mu, std)
plt.plot(x, p, 'k', linewidth=2, label='Normal Distribution')
plt.title('Calories Burned - Analytical Distribution')
plt.xlabel('Calories')
plt.ylabel('Density')
plt.legend()
plt.show()

# Scatter Plots and Correlation Analysis
plt.figure(figsize=(8, 5))
plt.scatter(daily_data['TotalSteps'], daily_data['Calories'])
plt.xlabel('Total Steps')
plt.ylabel('Calories Burned')
plt.title('Correlation between Steps and Calories')
plt.grid()
plt.show()

# Correlation Analysis
correlation = daily_data['TotalSteps'].corr(daily_data['Calories'])
print(f'Pearson Correlation between Steps and Calories: {correlation}')

# Hypothesis Testing (Example: Steps vs. Calories)
t_stat, p_value = stats.ttest_ind(daily_data['TotalSteps'], daily_data['Calories'],
equal_var=False)
print(f"T-statistic: {t_stat}, P-value: {p_value}")

# Regression Analysis (Calories ~ Steps + VeryActiveMinutes)
daily_data['VeryActiveMinutes'] = daily_data['VeryActiveMinutes'].fillna(0)
```

```
model = ols('Calories ~ TotalSteps + VeryActiveMinutes', data=daily_data).fit()
print(model.summary())
```

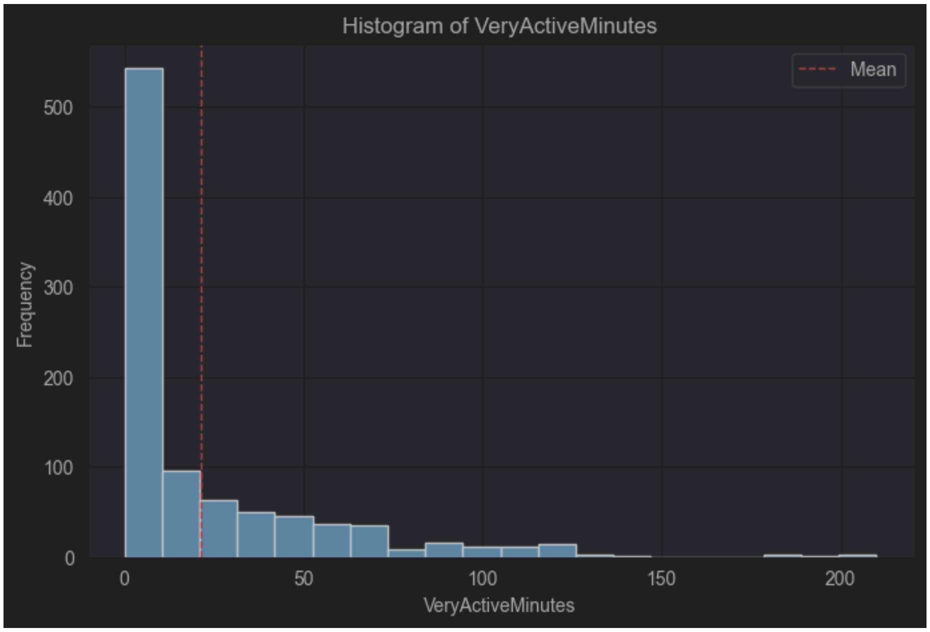
Output:



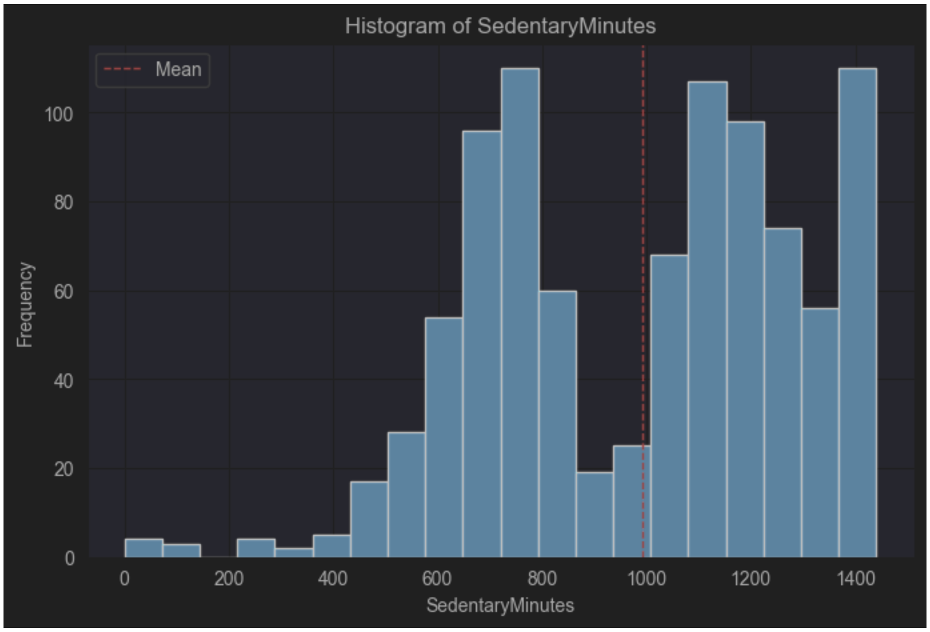
```
<Figure size 800x500 with 1 Axes>
Descriptive Statistics for TotalSteps:
count      940.000000
mean      7637.910638
std       5087.150742
min          0.000000
25%       3789.750000
50%       7405.500000
75%      10727.000000
max      36019.000000
Name: TotalSteps, dtype: float64
Mode: [0]
Number of outliers in TotalSteps: 12
```



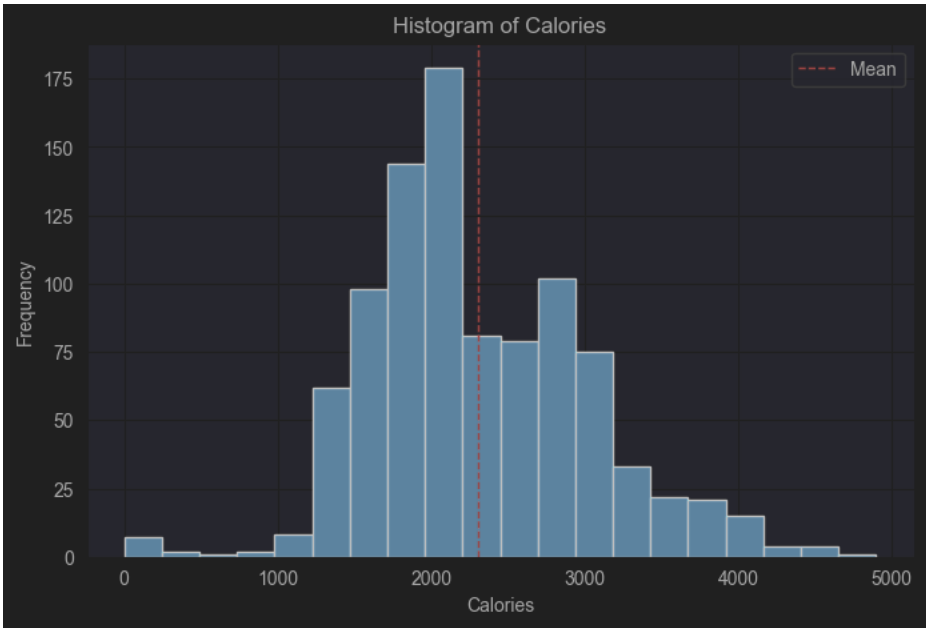
```
<Figure size 800x500 with 1 Axes>
Descriptive Statistics for TotalDistance:
count    940.000000
mean       5.489702
std        3.924606
min        0.000000
25%        2.620000
50%        5.245000
75%        7.712500
max       28.030001
Name: TotalDistance, dtype: float64
Mode: [0.]
Number of outliers in TotalDistance: 23
```



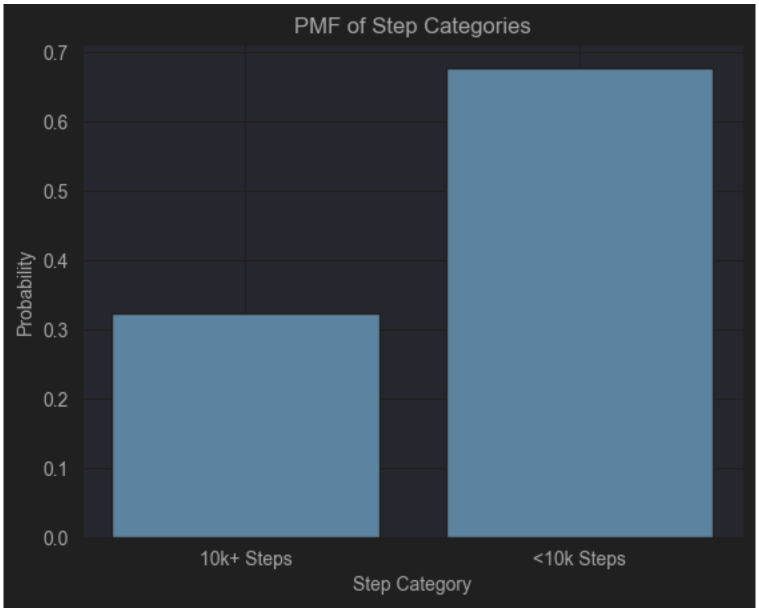
```
<Figure size 800x500 with 1 Axes>
Descriptive Statistics for VeryActiveMinutes:
count    940.000000
mean      21.164894
std       32.844803
min        0.000000
25%        0.000000
50%        4.000000
75%       32.000000
max      210.000000
Name: VeryActiveMinutes, dtype: float64
Mode: [0]
Number of outliers in VeryActiveMinutes: 65
```

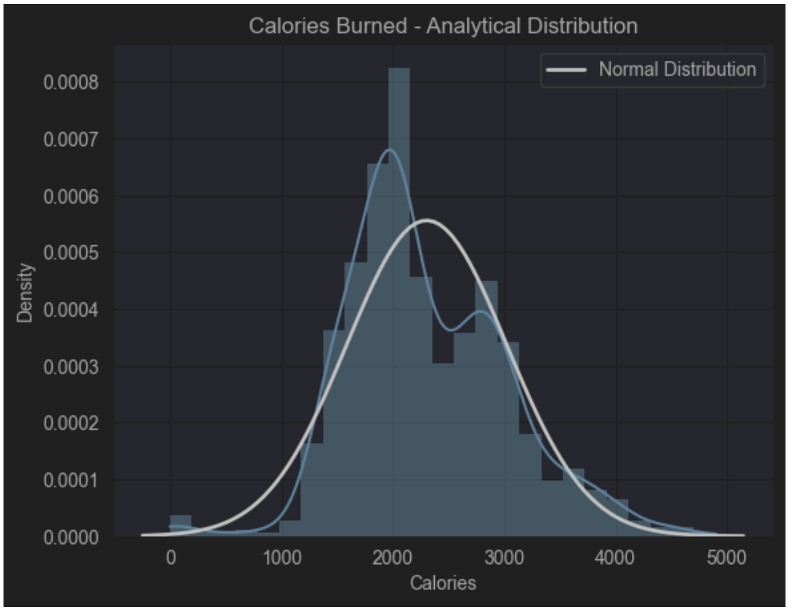


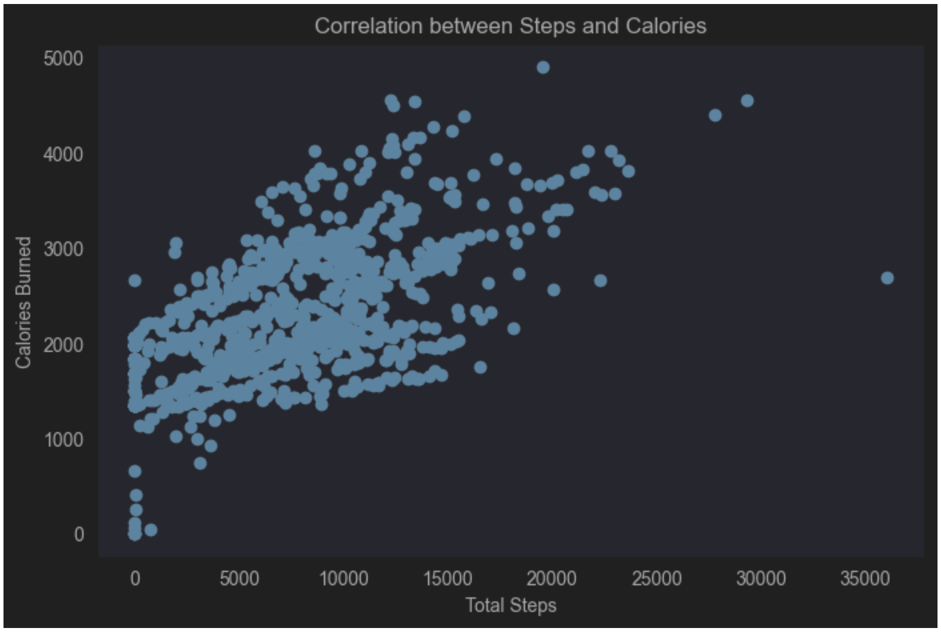
```
<Figure size 800x500 with 1 Axes>
Descriptive Statistics for SedentaryMinutes:
count     940.000000
mean      991.210638
std       301.267437
min         0.000000
25%       729.750000
50%      1057.500000
75%      1229.500000
max      1440.000000
Name: SedentaryMinutes, dtype: float64
Mode: [1440]
Number of outliers in SedentaryMinutes: 0
```



```
<Figure size 800x500 with 1 Axes>
Descriptive Statistics for Calories:
count     940.000000
mean     2303.609574
std       718.166862
min         0.000000
25%      1828.500000
50%      2134.000000
75%      2793.250000
max      4900.000000
Name: Calories, dtype: float64
Mode: [1980]
Number of outliers in Calories: 16
```


PMF of Step Categories
Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
10k+ Steps
<10k Steps
Step Category


Calories Burned - Analytical Distribution
Normal Distribution
Density
0.0000
0.0001
0.0002
0.0003
0.0004
0.0005
0.0006
0.0007
0.0008
0
1000
2000
3000
4000
5000
Calories

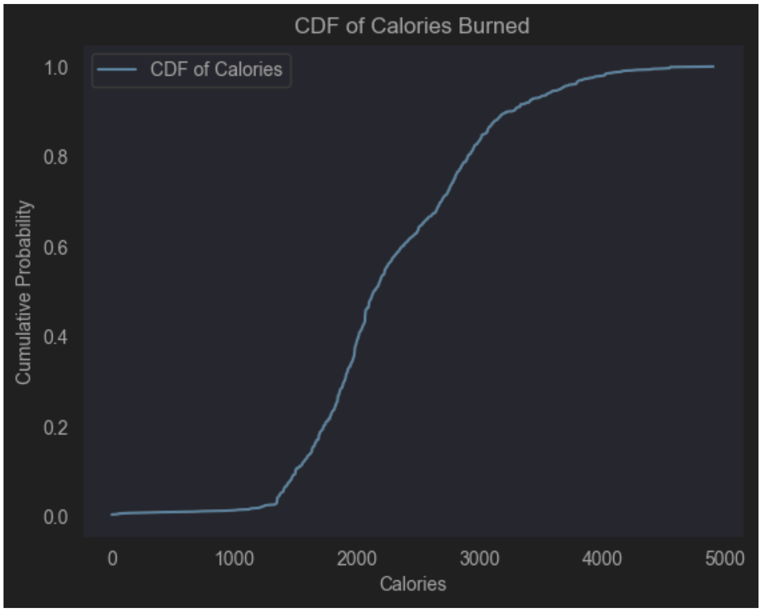


```
<Figure size 640x480 with 1 Axes>
<Figure size 640x480 with 1 Axes>
<Figure size 800x500 with 1 Axes>
Pearson Correlation between Steps and Calories: 0.5915680862453356
T-statistic: 31.833304006141603, P-value: 4.1151334940087283e-153
                            OLS Regression Results
==============================================================================
Dep. Variable:               Calories   R-squared:                       0.438
Model:                            OLS   Adj. R-squared:                  0.437
Method:                 Least Squares   F-statistic:                     365.3
Date:                Thu, 20 Feb 2025   Prob (F-statistic):          5.08e-118
Time:                        19:43:22   Log-Likelihood:                -7244.5
No. Observations:                 940   AIC:                         1.449e+04
Df Residuals:                     937   BIC:                         1.451e+04
Df Model:                           2
Covariance Type:            nonrobust
=====================================================================================
                        coef    std err          t      P>|t|      [0.025      0.975]
-------------------------------------------------------------------------------------
Intercept          1767.9820     32.821     53.867      0.000    1703.571    1832.393
TotalSteps            0.0460      0.005      9.908      0.000       0.037       0.055
VeryActiveMinutes     8.7152      0.719     12.126      0.000       7.305      10.126
==============================================================================
Omnibus:                        8.444   Durbin-Watson:                   0.560
Prob(Omnibus):                  0.015   Jarque-Bera (JB):                9.758
Skew:                          -0.143   Prob(JB):                      0.00760
```

```
Kurtosis:                       3.409   Cond. No.                     1.71e+04
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 1.71e+04. This might indicate that there are
strong multicollinearity or other numerical problems.
```

```
# CDF of Calories
from empiricaldist import Cdf

# Create CDF from the 'Calories' data
cdf = Cdf.from_seq(daily_data['Calories'])

# Plot the CDF using the plot method of the Cdf object
cdf.plot(label='CDF of Calories')

# Add labels and title to the plot
plt.xlabel('Calories')
plt.ylabel('Cumulative Probability')
plt.title('CDF of Calories Burned')
plt.grid()
plt.legend()
plt.show()
```

Output:


CDF of Calories Burned
CDF of Calories
Cumulative Probability
0.0
0.2
0.4
0.6
0.8
1.0
0
1000
2000
3000
4000
5000
Calories