NHANES_FPED_EDAipynb

April 4, 2021

Objectives

Perform more exploratory analysis on the input data for the logistic regression model. The goal is to come up with data filters and transformations that can be used to address assumptions about the research question. The model can then be re-evaulated and compared to the intial prediction rate results.

Re-evaluate model with different techniques for constraining the observation space:

Use subsets of meals within calorie distribution categories. For example: is there any difference between low calories and high calorie meals?

Explore the possibility of transforming the input data from continuous to categorical.The component variables contain a high amount of 0's with a right tail heavy distribution.

Use only meals that are consumed at home, since eating out is generally more unhealthy

Constrain the non-seafood class to meals containing meat only. This will exclude vegetarian meals and compare seafood consumers to meat consumers.

Use a participant age filter, to look for adult participants only.

Attempt a classification of meals that contain both meat and seafood.

Convert input variables to standard units (some are in grams, some are in cups, etc.)

Input from research collaborators:

```
Obtain a more educated selection of input variables.

Attempt to weight the observations, to adjust for the survey design methods.
```

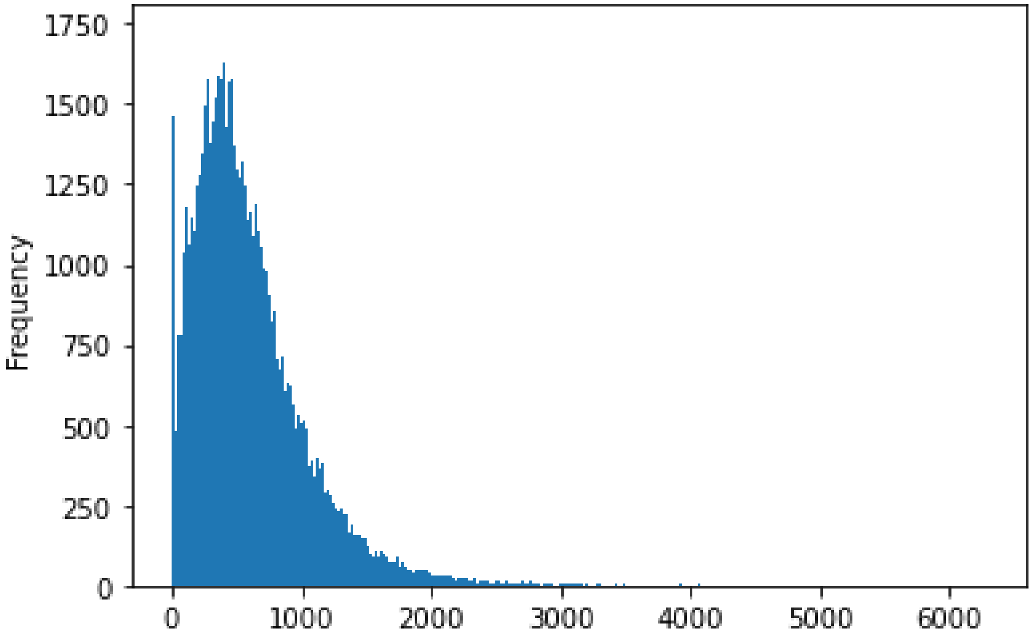
Section 1: Meal Energy Statistics

```
[19]: import pandas as pd

      #Read data frame and add plant pf total variable
      df = pd.read_csv('../../Data/nhanes_full_pre_proc.csv')
      df['PF_PLANT_D_TOTAL'] =␣
       ↪df['PF_EGGS']+df['PF_SOY']+df['PF_NUTSDS']+df['PF_LEGUMES']

      df['DR1IKCAL'].plot.hist(bins=500)
```

```
[19]: 981
```



The plot above is displaying the distribution of the KCAL variable. One apparent potential issue is the left most bar, indicating meals where this variable is equal to 0.

[24]:
```
zero_kcal_meals = df[df['DR1IKCAL']==0]
len(zero_kcal_meals)
```

[24]:
```
981
```

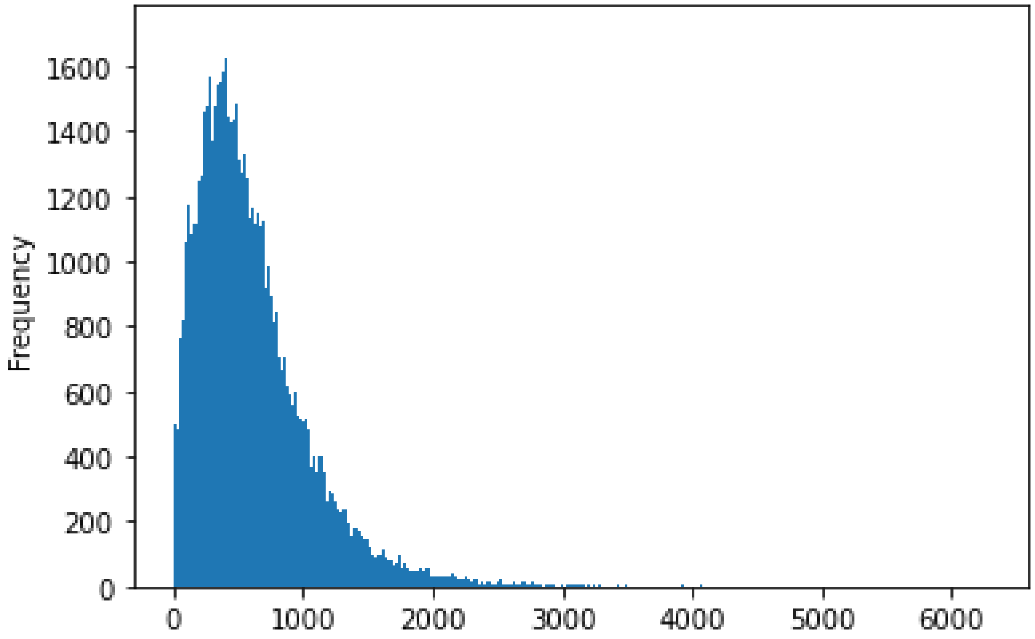
Indeed, there are 981 meals where KCAL = 0.

[96]:
```
zero_kcal_meals[['SEQN', 'DR1.030Z', 'DR1.020', 'DR1IKCAL']].head(5)
```

[96]:
```
      SEQN  DR1.030Z  DR1.020  DR1IKCAL
361  31330         3    90000       0.0
413  31364        14    86400       0.0
489  31411        15    54000       0.0
490  31411        15    70200       0.0
491  31411        15    75600       0.0
```

[72]:
```
#Filter out 0 KCAL meals
df = df[df['DR1IKCAL'] > 0]
df['DR1IKCAL'].plot.hist(bins=500)
```

[72]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7feaa52b32b0>
```



[58]:
```
#Obtain statistics for KCAL
df['DR1IKCAL'].describe()
```

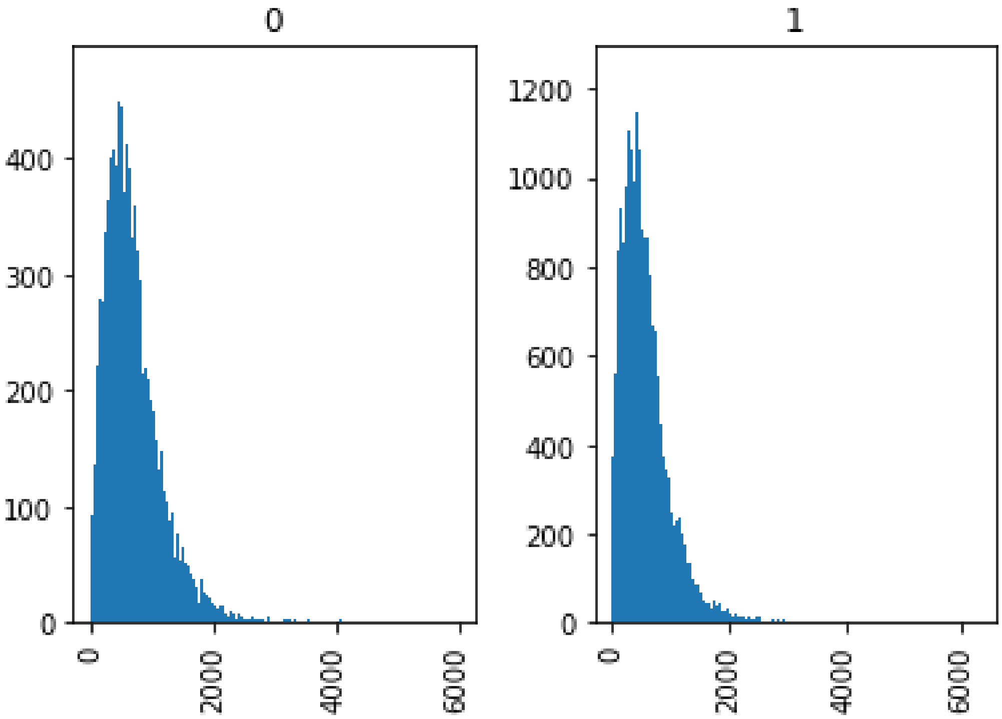
[58]:
```
count    101731.000000
mean        605.018942
std         445.749113
min           1.000000
25%         297.000000
50%         508.000000
75%         798.000000
max        6264.000000
Name: DR1IKCAL, dtype: float64
```

[69]:
```
#Home vs Out Meals
df.groupby('eathome')['DR1IKCAL'].describe()
```

[69]:
```
           count        mean         std  min    25%    50%    75%     max
eathome
0        32830.0  687.545111  476.684325  1.0  360.0  587.0  899.0  5957.0
1        68901.0  565.696811  424.626035  1.0  271.0  471.0  751.0  6264.0
```

[77]:
```
#Home vs Out Meals
df['DR1IKCAL'].hist(bins=500, by=df['eathome'])
```

```
[77]: array([<matplotlib.axes._subplots.AxesSubplot object at 0x7feacb564ee0>,
              <matplotlib.axes._subplots.AxesSubplot object at 0x7feaa686e6d0>],
             dtype=object)
```



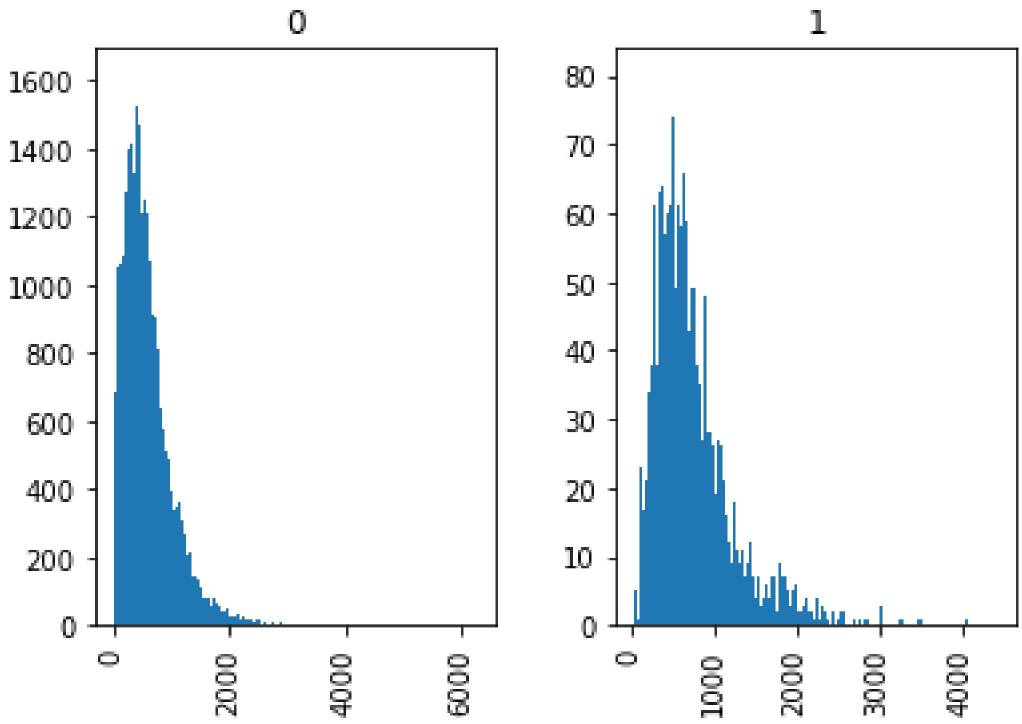
```
[78]: #Seafood vs non seafood meals
      df.groupby('seafood_meal')['DR1IKCAL'].describe()
```

```
[78]:                  count        mean         std   min    25%    50%    75%  \
      seafood_meal
      0              95782.0  595.879560  442.124805   1.0  289.0  499.0  789.0
      1               5949.0  752.167759  477.014340  40.0  431.0  643.0  943.0

                       max
      seafood_meal
      0             6264.0
      1             4451.0
```

```
[79]: #Seafood vs non seafood meals
      df['DR1IKCAL'].hist(bins=500, by=df['seafood_meal'])
```

```
[79]: array([<matplotlib.axes._subplots.AxesSubplot object at 0x7feacebd8eb0>,
              <matplotlib.axes._subplots.AxesSubplot object at 0x7feacdc885b0>],
             dtype=object)
```



[81]:
```
#Seafood vs non seafood home and out
df.groupby(['seafood_meal','eathome'])['DR1IKCAL'].describe()
```

[81]:
```
                        count        mean         std   min      25%    50%  \
seafood_meal eathome
0            0        30638.0  675.534695  470.570282   1.0   352.00  576.0
             1        65144.0  558.416800  422.941684   1.0   265.00  463.5
1            0         2192.0  855.416971  527.356298  50.0   495.75  736.0
             1         3757.0  691.927602  433.886534  40.0   403.00  599.0

                          75%     max
seafood_meal eathome
0            0         885.00  5957.0
             1         743.00  6264.0
1            0        1073.25  4451.0
             1         860.00  3509.0
```

Section 1: Meal Energy Grouping

Create meal energy grouping based on quantiles from the ‘KCAL’ variable.

[99]:
```
#Create meal energy category based on quantiles from KCAL
df.loc[df['DR1IKCAL'] < df['DR1IKCAL'].describe()['25%'], 'meal_energy'] = "Low"
df.loc[(df['DR1IKCAL'] > df['DR1IKCAL'].describe()['25%'])
```

```
        & (df['DR1IKCAL'] < df['DR1IKCAL'].describe()['50%']), 'meal_energy'] =␣
 ↪"Medium-Low"
df.loc[(df['DR1IKCAL'] > df['DR1IKCAL'].describe()['50%'])
        & (df['DR1IKCAL'] < df['DR1IKCAL'].describe()['75%']), 'meal_energy'] =␣
 ↪"Medium-High"
df.loc[df['DR1IKCAL'] > df['DR1IKCAL'].describe()['75%'], 'meal_energy'] =␣
 ↪"High"

#Display top of new meal energy category
df[['SEQN', 'DR1IKCAL','meal_energy']].head(20)
```

```
[99]:      SEQN  DR1IKCAL  meal_energy
      0   31127     447.0   Medium-Low
      1   31127     264.0          Low
      2   31128     861.0         High
      3   31129     867.0         High
      4   31129    1150.0         High
      5   31131     253.0          Low
      6   31131      88.0          Low
      7   31132     130.0          Low
      8   31132     836.0         High
      9   31132     491.0   Medium-Low
      10  31133     843.0         High
      11  31133     448.0   Medium-Low
      12  31134     963.0         High
      13  31134    1181.0         High
      14  31135     332.0   Medium-Low
      15  31135     501.0   Medium-Low
      16  31137     720.0  Medium-High
      17  31137     813.0         High
      18  31138     314.0   Medium-Low
      19  31138     204.0          Low
```

Section 1: Questions

1. Why are there so many meals with 0 KCAL?
2. Why are the KCAL values so large? Looking at the statistics, these seem more like calories instead of kilo-calories.
3. Is the grouping method for this variable adequate?

```
[ ]:
```