Prediction Challenge - Training Data Summary

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0.1 Assignment 1 : Training Data Summary

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The goal of the prediction challenge is to build a predictor for the number of drinks per day in the last 30 days. Here we conduct an initial exploration of the data to get a feel for the information available.

```
In [1]: import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
        import math
```

0.2.1 Basic Information of Data

```
In [2]: df = pd.read_csv('nlsy training set.csv')

In [3]: df.head()
```

Out[3]:

	Unnamed: 0	E5011701	E5011702	E5011703	E5011704	E5011705	E5011706	\
0	6328	-4	-4	2	2	2	1	
1	388	-4	-4	-4	-4	-4	-4	
2	7655	-4	-4	-4	2	2	4	
3	3517	-4	-4	-4	2	2	2	
4	8540	-4	-4	-4	-4	-4	-4	

	E5011707	E5011708	E5011709	...	Z9122600	Z9141400	Z9141500	Z9141600	\
0	1	2	2	...	16	-4	-4	-4	
1	-4	2	2	...	17	7500	0	0	
2	4	2	2	...	16	-4	-4	-4	
3	1	1	2	...	16	-4	-4	-4	
4	2	2	2	...	16	-4	-4	-4	

	Z9141700	Z9141800	Z9141900	Z9142000	Z9142100	diag.id
0	-4	-4	-4	-4	-4	6328
1	6	0	7500	0	18	388
2	-4	-4	-4	-4	-4	7655
3	-4	-4	-4	-4	-4	3517

```
        4        -4        -4        -4        -4        -4     8540

        [5 rows x 4887 columns]
```

```
In [4]: df.shape
```

```
Out[4]: (7187, 4887)
```

```
In [5]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7187 entries, 0 to 7186
Columns: 4887 entries, Unnamed: 0 to diag.id
dtypes: int64(4887)
memory usage: 268.0 MB
```

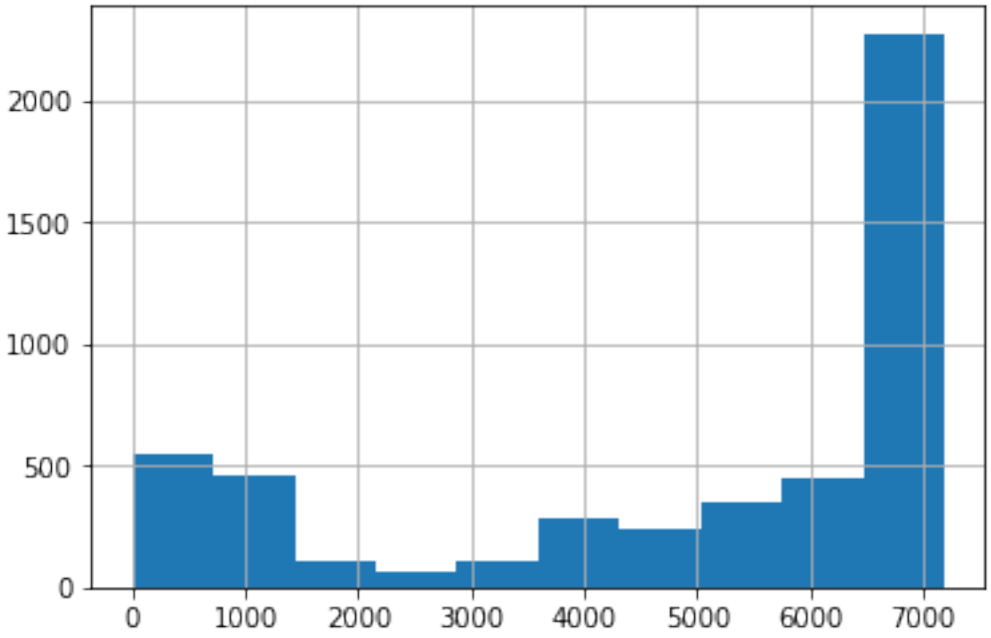
Data contains 7187 observations with 4887 variables. Of which, 4886 are predictor variables and 1 will be the target variable. From the meta data file, we see that all the variables are categorical (both nominal and ordinal) and are coded as integers. As seen in the dataframe summary information above and the dataframe snapshot, all variables are coded as integers and the missing values are coded as negative integers.

From a quick overview of the meta data, we see that it includes time series variables such as monthly school attendance from 1997 to 2009 and college enrollment from 1997 to 2016 and some are ordinal categorical variables such as year of first pregnancy. However, there are so many variables for manual inspection, so using a feature selection algorithm would be a good next step.

0.2.2 Exploring Data Missingness

Since the negative variables indicate missing variables, to check the number of missing variables per column the data frame is filtered where the value is less than zero and the histogram is plotted, as shown below.

```
In [6]: missing = df.where(df < 0).count()
        ax = missing.hist()
```



For as many as 1000 variables, most observation is missing yet all IDs are present. The percentage of missing data is calculated as shown below. From which, we see, approximately 69% of the data is missing. This data set is a high-dimensional data with sparse observations, so machine learning is a good tool for prediction.

```
In [7]: (sum(missing) * 100) / (7187 * 4887)

Out[7]: 69.03836358015059
```

0.2.3 Exploring the Target Variable

The target variable in the data is, "U1031900" and the following exploration summarizes the key characteristics of the responses recorded for this variable.

Descriptive Statistics of Target Variable

```
In [8]: df['U1031900'].describe()

Out[8]: count    7187.000000
        mean       -0.637123
        std         4.702855
        min        -5.000000
        25%        -4.000000
        50%        -2.000000
        75%         2.000000
        max        70.000000
        Name: U1031900, dtype: float64
```

```
In [9]: print("The unique values coded in the target variable: \n", df['U1031900'].unique())
        print(' ')
        print("The maximum value in the target variable: \n", df['U1031900'].max())
```

```
The unique values coded in the target variable:
 [-4  5 -5  7  2  1 -2  8  4  3  6 20 10 12 30 19 -1 15  0 45 60 28 50 18
 35 22 14 25  9 70 65 16 23]

The maximum value in the target variable:
 70
```

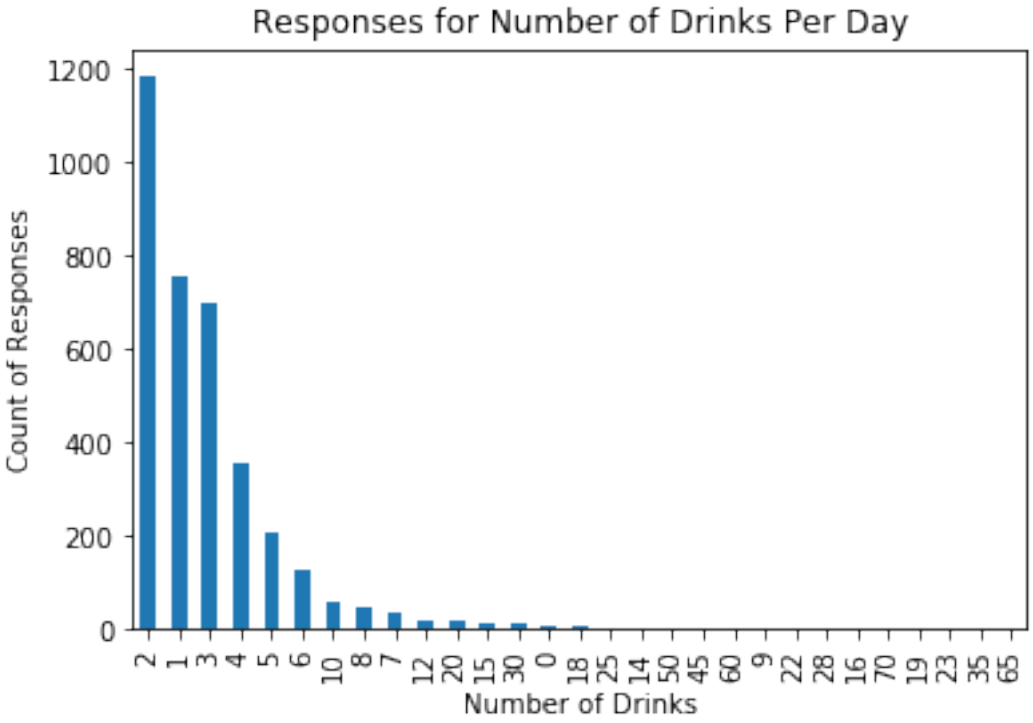
```
In [10]: df['U1031900'].mode()
```

```
Out[10]: 0   -4
         dtype: int64
```

The range of target variable is: minimum drinks = 0, maximum drinks = 70. While the much of the data is missing a response, of the responses, the most common response is 2 drinks. The unique values, shown above, shows a quick sample of the numbers of responses collected. The plot below shows the distribution of the reponses recieved.

```
In [11]: f_df = df[df['U1031900'] >= 0]
         ax = f_df['U1031900'].value_counts().plot('bar', title="Responses for Number of Drinks
         ax.set_xlabel("Number of Drinks")
         ax.set_ylabel("Count of Responses")
```

```
Out[11]: Text(0,0.5,'Count of Responses')
```



Missingness Specifically looking at the target variable (U1031900), about 50% of the target variable value is missing as calculated below and the plot shows the missing data by type.

```
In [12]: sum(df['U1031900'] < 0) * 100 / len(df['U1031900'])

Out[12]: 50.67482955336023

In [13]: f_df = df[df['U1031900'] < 0]

         fig, ax = plt.subplots()
         ax = f_df['U1031900'].value_counts().plot('barh', title="Missing Responses in Predicto
         #ax.set_ylabel("Reason")
         ax.set_xlabel("Count of Responses")

         a=ax.get_yticks().tolist();
         a[0]='VALID SKIP';
         a[1] = 'NON-INTERVIEW';
         a[2] = 'DONT KNOW';
         a[3] = 'REFUSAL';
         ax.set_yticklabels(a);
```