Investigate_a_Dataset

June 5, 2022

> **Tip**: Welcome to the Investigate a Dataset project! You will find tips in quoted sections like this to help organize your approach to your investigation. Once you complete this project, remove these **Tip** sections from your report before submission. First things first, you might want to double-click this Markdown cell and change the title so that it reflects your dataset and investigation.

1 Project: patient Data Analysis

1.1 Table of Contents

You have chosen a suitable name for the project

Questions are to be explored and answer : 1- How does age affect patients' confinement? 2- Does the patient's gender affect the attendance of the medical examination? 3- Neighborhoods and their population affects the attendance rate? 4- Do forgotten messages affect the attendance rate in the medical examination?

```
In [1]: # Use this cell to set up import statements for all of the packages that you
        #   plan to use.
        import numpy as np
        import pandas as pd
        import matplotlib.pyplot as plt
        import seaborn as sns
        % matplotlib inline
        # Remember to include a 'magic word' so that your visualizations are plotted
        #   inline with the notebook. See this page for more:
        #   http://ipython.readthedocs.io/en/stable/interactive/magics.html
```

```
In [6]: # Upgrade pandas to use dataframe.explode() function.
        !pip install --upgrade pandas==0.25.0
```

```
Requirement already up-to-date: pandas==0.25.0 in /opt/conda/lib/python3.6/site-packages (0.25.0
Requirement already satisfied, skipping upgrade: numpy>=1.13.3 in /opt/conda/lib/python3.6/site-
Requirement already satisfied, skipping upgrade: python-dateutil>=2.6.1 in /opt/conda/lib/python
Requirement already satisfied, skipping upgrade: pytz>=2017.2 in /opt/conda/lib/python3.6/site-p
Requirement already satisfied, skipping upgrade: six>=1.5 in /opt/conda/lib/python3.6/site-packa
```

1.1.1 General

```
In [2]: # Load your data and print out a few lines. Perform operations to inspect data
        #   types and look for instances of missing or possibly errant data.
        df = pd.read_csv("noshowappointments-kagglev2-may-2016.csv")
        df.head()
```

```
Out[2]:       PatientId  AppointmentID Gender          ScheduledDay  \
        0  2.987250e+13        5642903      F  2016-04-29T18:38:08Z
        1  5.589978e+14        5642503      M  2016-04-29T16:08:27Z
        2  4.262962e+12        5642549      F  2016-04-29T16:19:04Z
        3  8.679512e+11        5642828      F  2016-04-29T17:29:31Z
        4  8.841186e+12        5642494      F  2016-04-29T16:07:23Z

                 AppointmentDay  Age      Neighbourhood  Scholarship  Hipertension  \
        0  2016-04-29T00:00:00Z   62    JARDIM DA PENHA            0             1
        1  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             0
        2  2016-04-29T00:00:00Z   62      MATA DA PRAIA            0             0
        3  2016-04-29T00:00:00Z    8  PONTAL DE CAMBURI            0             0
        4  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             1

           Diabetes  Alcoholism  Handcap  SMS_received No-show
        0         0           0        0             0      No
        1         0           0        0             0      No
        2         0           0        0             0      No
        3         0           0        0             0      No
        4         1           0        0             0      No
```

I reviewed the first 5 rows to get an overview of the project

```
In [25]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 110527 entries, 0 to 110526
Data columns (total 14 columns):
PatientId         110527 non-null float64
AppointmentID     110527 non-null int64
Gender            110527 non-null object
ScheduledDay      110527 non-null object
AppointmentDay    110527 non-null object
Age               110527 non-null int64
Neighbourhood     110527 non-null object
Scholarship       110527 non-null int64
Hipertension      110527 non-null int64
Diabetes          110527 non-null int64
```

```
Alcoholism        110527 non-null int64
Handcap           110527 non-null int64
SMS_received      110527 non-null int64
No-show           110527 non-null object
dtypes: float64(1), int64(8), object(5)
memory usage: 11.8+ MB
```

Here I wanted to see all the information about the data to find out the missing data

```
In [12]: df.duplicated()
```

```
Out[12]: 0         False
         1         False
         2         False
         3         False
         4         False
                   ...
         110522    False
         110523    False
         110524    False
         110525    False
         110526    False
         Length: 110527, dtype: bool
```

Here there are no duplicate rows

```
In [6]: df.drop(['AppointmentDay','ScheduledDay'],axis=1 , inplace=True)
```

Here I have deleted receiving values because I will not need them in the analysis

```
In [7]: df.head()
```

```
Out[7]:        PatientId  AppointmentID Gender  Age      Neighbourhood  Scholarship  \
        0  2.987250e+13        5642903      F   62    JARDIM DA PENHA            0
        1  5.589978e+14        5642503      M   56    JARDIM DA PENHA            0
        2  4.262962e+12        5642549      F   62      MATA DA PRAIA            0
        3  8.679512e+11        5642828      F    8  PONTAL DE CAMBURI            0
        4  8.841186e+12        5642494      F   56    JARDIM DA PENHA            0

           Hipertension  Diabetes  Alcoholism  Handcap  SMS_received No-show
        0             1         0           0        0             0      No
        1             0         0           0        0             0      No
        2             0         0           0        0             0      No
        3             0         0           0        0             0      No
        4             1         1           0        0             0      No
```

```
In [8]: df.drop(['AppointmentID','PatientId'],axis=1 , inplace=True)
```

Here I have deleted receiving values because I will not need them in the analysis

```
In [9]: df.head()

Out[9]:   Gender  Age      Neighbourhood  Scholarship  Hipertension  Diabetes  \
        0      F   62    JARDIM DA PENHA            0             1         0
        1      M   56    JARDIM DA PENHA            0             0         0
        2      F   62      MATA DA PRAIA            0             0         0
        3      F    8  PONTAL DE CAMBURI            0             0         0
        4      F   56    JARDIM DA PENHA            0             1         1

           Alcoholism  Handcap  SMS_received No-show
        0           0        0             0      No
        1           0        0             0      No
        2           0        0             0      No
        3           0        0             0      No
        4           0        0             0      No
```

```
In [10]: df.describe()

Out[10]:                  Age    Scholarship   Hipertension       Diabetes  \
         count  110527.000000  110527.000000  110527.000000  110527.000000
         mean       37.088874       0.098266       0.197246       0.071865
         std        23.110205       0.297675       0.397921       0.258265
         min        -1.000000       0.000000       0.000000       0.000000
         25%        18.000000       0.000000       0.000000       0.000000
         50%        37.000000       0.000000       0.000000       0.000000
         75%        55.000000       0.000000       0.000000       0.000000
         max       115.000000       1.000000       1.000000       1.000000

                   Alcoholism        Handcap   SMS_received
         count  110527.000000  110527.000000  110527.000000
         mean        0.030400       0.022248       0.321026
         std         0.171686       0.161543       0.466873
         min         0.000000       0.000000       0.000000
         25%         0.000000       0.000000       0.000000
         50%         0.000000       0.000000       0.000000
         75%         0.000000       0.000000       1.000000
         max         1.000000       4.000000       1.000000
```

There I wanted to do a quick analysis of the data and the time that there was an age was -1

```
In [9]: age=df.query('Age=="-1"')
        age

Out[9]:           PatientId  AppointmentID Gender          ScheduledDay  \
        99832  4.659432e+14        5775010      F  2016-06-06T08:58:13Z

                     AppointmentDay  Age Neighbourhood  Scholarship  Hipertension  \
        99832  2016-06-06T00:00:00Z   -1         ROMÃO            0             0
```

```
       Diabetes  Alcoholism  Handcap  SMS_received No-show
99832         0           0        0             0      No
```

I select the text that I will delete from the file

1.1.2 Data Cleaning

> **Tip**: Make sure that you keep your reader informed on the steps that you are taking in your investigation. Follow every code cell, or every set of related code cells, with a markdown cell to describe to the reader what was found in the preceding cell(s). Try to make it so that the reader can then understand what they will be seeing in the following cell(s).

```
In [28]: df.drop(index=99832, inplace=True)
```

```
In [13]: df.head()
```

```
Out[13]:       PatientId  AppointmentID Gender          ScheduledDay  \
         0  2.987250e+13        5642903      F  2016-04-29T18:38:08Z
         1  5.589978e+14        5642503      M  2016-04-29T16:08:27Z
         2  4.262962e+12        5642549      F  2016-04-29T16:19:04Z
         3  8.679512e+11        5642828      F  2016-04-29T17:29:31Z
         4  8.841186e+12        5642494      F  2016-04-29T16:07:23Z

                 AppointmentDay  Age      Neighbourhood  Scholarship  Hipertension  \
         0  2016-04-29T00:00:00Z   62    JARDIM DA PENHA            0             1
         1  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             0
         2  2016-04-29T00:00:00Z   62      MATA DA PRAIA            0             0
         3  2016-04-29T00:00:00Z    8  PONTAL DE CAMBURI            0             0
         4  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             1

            Diabetes  Alcoholism  Handcap  SMS_received No-show
         0         0           0        0             0      No
         1         0           0        0             0      No
         2         0           0        0             0      No
         3         0           0        0             0      No
         4         1           0        0             0      No
```

I dropped the age by -1 for proper analysis

```
In [11]: df['Noshow'].value_counts(normalize=True)
```

```
Out[11]: No     0.798067
         Yes    0.201933
         Name: Noshow, dtype: float64
```

I divided the No Show and Show to see how many people attended and how many did not attend to ever put my questions

```
In [4]: df.rename(columns={'No-show':'Noshow'},inplace=True)
In [8]: df.head()

Out[8]:       PatientId  AppointmentID Gender          ScheduledDay  \
        0  2.987250e+13        5642903      F  2016-04-29T18:38:08Z
        1  5.589978e+14        5642503      M  2016-04-29T16:08:27Z
        2  4.262962e+12        5642549      F  2016-04-29T16:19:04Z
        3  8.679512e+11        5642828      F  2016-04-29T17:29:31Z
        4  8.841186e+12        5642494      F  2016-04-29T16:07:23Z

                 AppointmentDay  Age      Neighbourhood  Scholarship  Hipertension  \
        0  2016-04-29T00:00:00Z   62    JARDIM DA PENHA            0             1
        1  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             0
        2  2016-04-29T00:00:00Z   62      MATA DA PRAIA            0             0
        3  2016-04-29T00:00:00Z    8  PONTAL DE CAMBURI            0             0
        4  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             1

           Diabetes  Alcoholism  Handcap  SMS_received Noshow
        0         0           0        0             0     No
        1         0           0        0             0     No
        2         0           0        0             0     No
        3         0           0        0             0     No
        4         1           0        0             0     No
```

```
In [15]: dfshow=df[df['Noshow']=='No']

In [17]: dfshow.head()

Out[17]:       PatientId  AppointmentID Gender          ScheduledDay  \
         0  2.987250e+13        5642903      F  2016-04-29T18:38:08Z
         1  5.589978e+14        5642503      M  2016-04-29T16:08:27Z
         2  4.262962e+12        5642549      F  2016-04-29T16:19:04Z
         3  8.679512e+11        5642828      F  2016-04-29T17:29:31Z
         4  8.841186e+12        5642494      F  2016-04-29T16:07:23Z

                  AppointmentDay  Age      Neighbourhood  Scholarship  Hipertension  \
         0  2016-04-29T00:00:00Z   62    JARDIM DA PENHA            0             1
         1  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             0
         2  2016-04-29T00:00:00Z   62      MATA DA PRAIA            0             0
         3  2016-04-29T00:00:00Z    8  PONTAL DE CAMBURI            0             0
         4  2016-04-29T00:00:00Z   56    JARDIM DA PENHA            0             1

            Diabetes  Alcoholism  Handcap  SMS_received Noshow
         0         0           0        0             0     No
         1         0           0        0             0     No
         2         0           0        0             0     No
         3         0           0        0             0     No
         4         1           0        0             0     No
```

```
In [16]: dfNoshow=df[df['Noshow']!='No']
```

```
In [18]: dfNoshow.head()
```

```
Out[18]:        PatientId  AppointmentID Gender          ScheduledDay  \
         6   7.336882e+14        5630279      F  2016-04-27T15:05:12Z
         7   3.449833e+12        5630575      F  2016-04-27T15:39:58Z
         11  7.542951e+12        5620163      M  2016-04-26T08:44:12Z
         17  1.479497e+13        5633460      F  2016-04-28T09:28:57Z
         20  6.222575e+14        5626083      F  2016-04-27T07:51:14Z

                   AppointmentDay  Age   Neighbourhood  Scholarship  Hipertension  \
         6   2016-04-29T00:00:00Z   23      GOIABEIRAS            0             0
         7   2016-04-29T00:00:00Z   39      GOIABEIRAS            0             0
         11  2016-04-29T00:00:00Z   29  NOVA PALESTINA            0             0
         17  2016-04-29T00:00:00Z   40       CONQUISTA            1             0
         20  2016-04-29T00:00:00Z   30  NOVA PALESTINA            0             0

             Diabetes  Alcoholism  Handcap  SMS_received Noshow
         6          0           0        0             0    Yes
         7          0           0        0             0    Yes
         11         0           0        0             1    Yes
         17         0           0        0             0    Yes
         20         0           0        0             0    Yes
```

## Exploratory Data Analysis

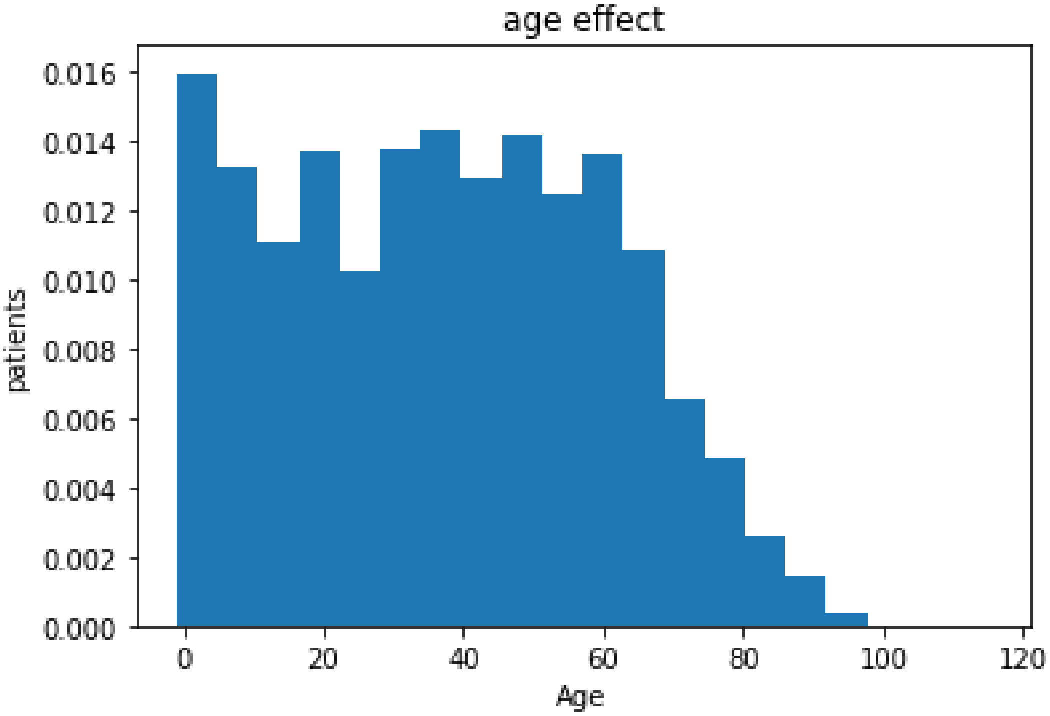
> **Tip**: Now that you've trimmed and cleaned your data, you're ready to move on to exploration. **Compute statistics** and **create visualizations** with the goal of addressing the research questions that you posed in the Introduction section. You should compute the relevant statistics throughout the analysis when an inference is made about the data. Note that at least two or more kinds of plots should be created as part of the exploration, and you must compare and show trends in the varied visualizations.

> **Tip**: - Investigate the stated question(s) from multiple angles. It is recommended that you be systematic with your approach. Look at one variable at a time, and then follow it up by looking at relationships between variables. You should explore at least three variables in relation to the primary question. This can be an exploratory relationship between three variables of interest, or looking at how two independent variables relate to a single dependent variable of interest. Lastly, you should perform both single-variable (1d) and multiple-variable (2d) explorations.

1.1.3 Question 1 : Does age affect me to go for a medical examination?

```
In [9]: # Use this, and more code cells, to explore your data. Don't forget to add
        #   Markdown cells to document your observations and findings.
        plt.hist(df['Age'],bins=20,normed=True)

        plt.xlabel('Age')
plt.ylabel('patients')
plt.title('age effect')
plt.legend()
```

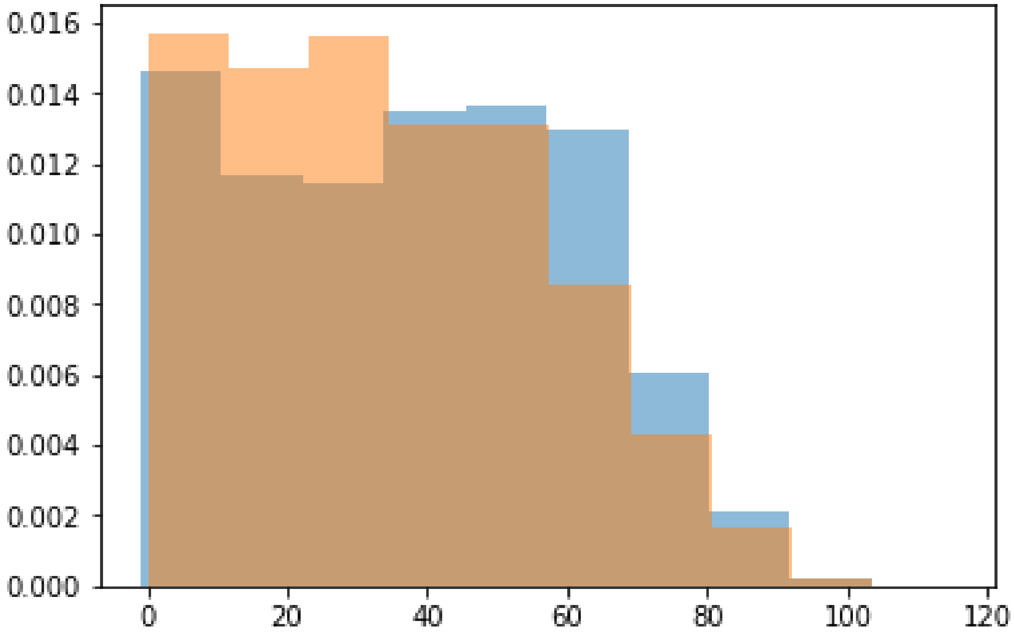


```
In [31]: df['Age'].describe()

Out[31]: count    110526.000000
         mean         37.089219
         std          23.110026
         min           0.000000
         25%          18.000000
         50%          37.000000
         75%          55.000000
         max         115.000000
         Name: Age, dtype: float64
```

From the plan, we see that the age group that goes to the medical examination is children, and it gradually decreases to the age of 20, then increases again to the age of 35, then declines

```
In [22]: plt.hist(dfshow['Age'],normed=True,alpha=0.5)
         plt.hist(dfNoshow['Age'],normed=True,alpha=0.5);
```

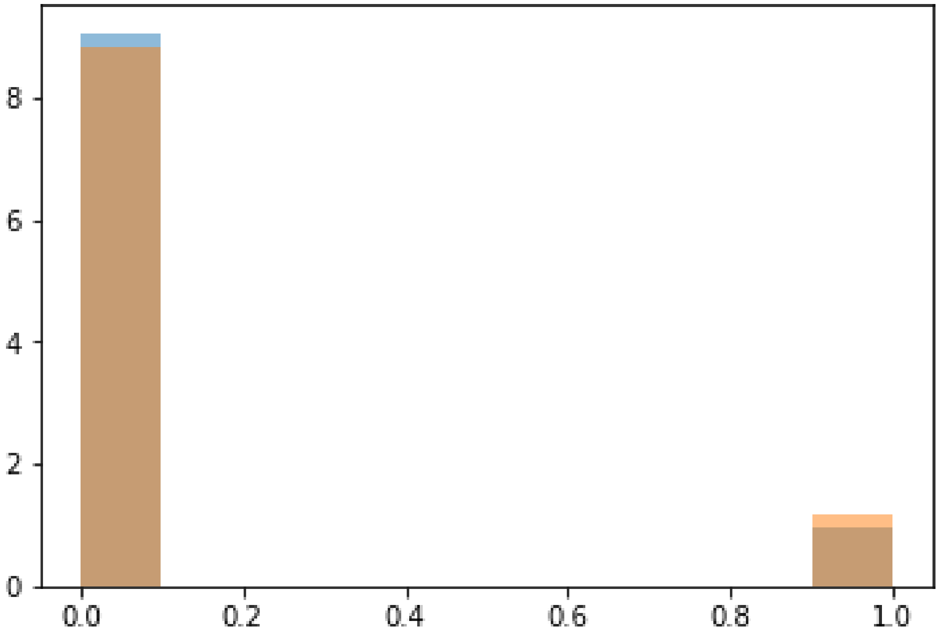


Question 2 :Is the number of people with scholarships higher than others?

```
In [12]: # Continue to explore the data to address your additional research
         #   questions. Add more headers as needed if you have more questions to
         #   investigate.
         df['Scholarship'].value_counts()
```

```
Out[12]: 0    99666
         1    10861
         Name: Scholarship, dtype: int64
```

```
In [23]: plt.hist(dfshow['Scholarship'],normed=True,alpha=0.5)
         plt.hist(dfNoshow['Scholarship'],normed=True,alpha=0.5);
```



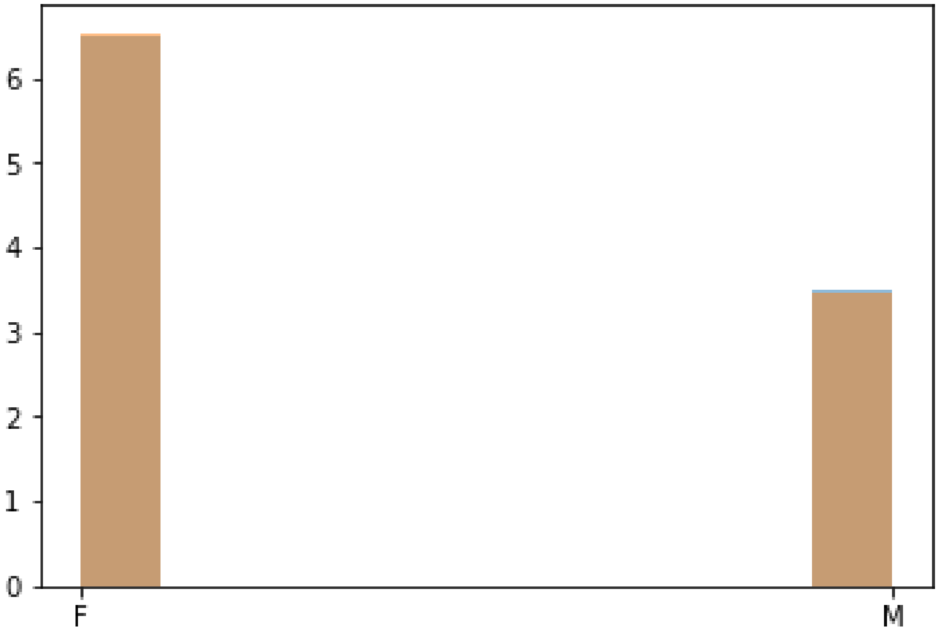
The attendance rate of people who attended through scholarships is almost equal to the people who do not have scholarships

Question 3 : Does gender affect attendance at a medical examination?

```
In [3]: df['Gender'].value_counts()
```

```
Out[3]: F    71840
        M    38687
        Name: Gender, dtype: int64
```

```
In [24]: Gender
```

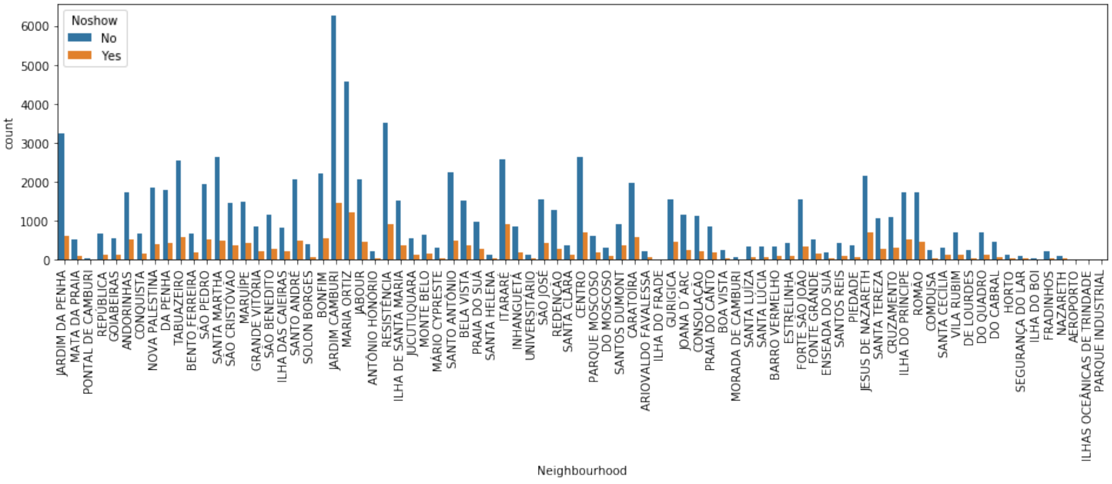


Here we see that the percentage of women who go to the medical examination is equal to the number of women who do not go to the medical examination and the number of men who go to the medical examination is almost equal to the number of men who do not go to the medical examination

Question 4 : Do neighborhoods and population density affect detection?

```
In [13]: plt.figure(figsize=(16,4))
         plt.xticks(rotation=90)
         ax=sns.countplot(x=df.Neighbourhood,hue=df.Noshow)

         plt.show()
```



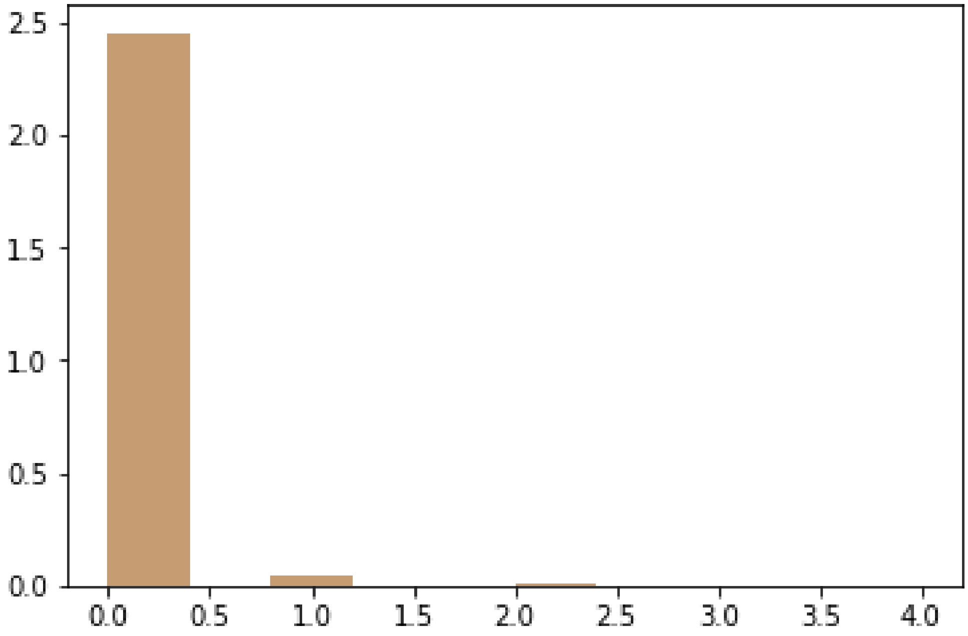
Here we notice the presence of a larger number of residents of certain neighborhoods than other neighborhoods and this is because the population ratio differs in each neighborhood from the other

Question 5: The number of people who have an handcap and their impact on attendance

```
In [11]: df['Handcap'].value_counts()
```

```
Out[11]: 0    108286
         1      2042
         2       183
         3        13
         4         3
         Name: Handcap, dtype: int64
```

```
In [25]: plt.hist(dfshow['Handcap'],normed=True,alpha=0.5)
         plt.hist(dfNoshow['Handcap'],normed=True,alpha=0.5);
```



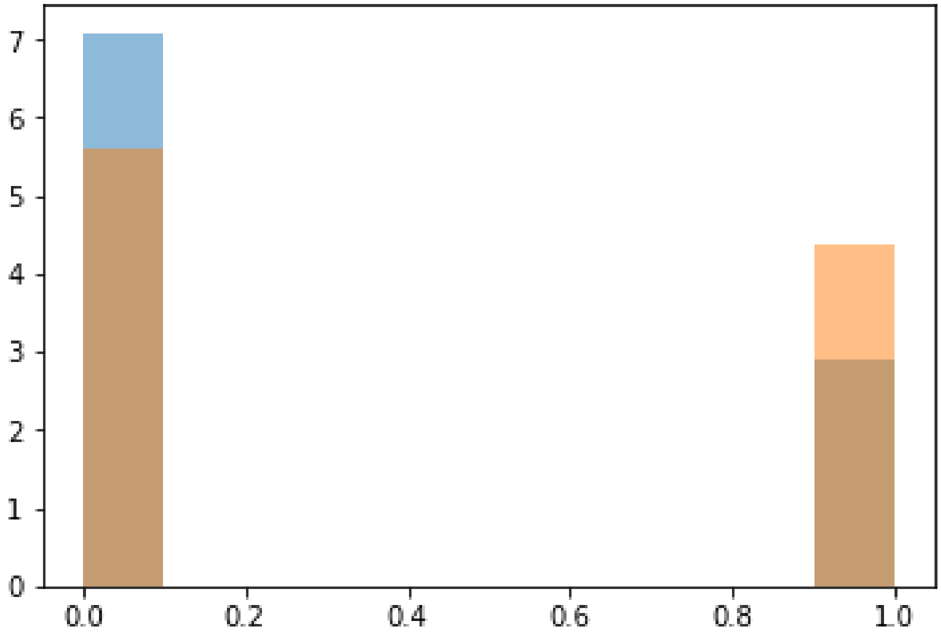
The percentage of the number of people who have a handicap and go for a medical examination is equal to the number of people who have a handicap and do not go

Question 6 : How many people received text messages and their impact on disclosure?

```
In [13]: df['SMS_received'].value_counts()
```

```
Out[13]: 0    75045
         1    35482
         Name: SMS_received, dtype: int64
```

```
In [26]: plt.hist(dfshow['SMS_received'],normed=True,alpha=0.5)
         plt.hist(dfNoshow['SMS_received'],normed=True,alpha=0.5);
```



```
In [ ]: People who did not send a text message had a greater attendance rate than the number of
        And here we see that there is a problem in sending messages where the wrong data is sent
```

Conclusions Results: Our data suggest that 1- From what I reviewed before you, we see that the most important value in which we are good is age, and we have proven age that mainly affects the percentage of attendance, absence, and text messages. 2-The largest number of children goes from infancy to five years old from the age of 60 to 100, it decreases significantly, but the average lifespan is uneven 3- We will show you the messages and we have seen that it is important that the messages are sent correctly even Each patient receives the correct return in the medical examination

Limitations: there are a couple of limitations with our data 1- Data related to the population density in each neighborhood should be recorded because it negatively affects the analysis 2- The data about text messages must be properly processed in order to ensure that patients will get their correct appointments.

```
In [1]: from subprocess import call
        call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])

Out[1]: 0

In [ ]:
```