investigate-a-dataset-on-Medical-Appointment-No-Shows

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1 Project: Medical Appointment No Shows

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## Introduction

A person makes a doctor appointment, receives all the instructions and no-show. Who to blame?

Questions:

Does Show rate differs by gender? males may have higher probability of show up due to social norms that constricts the movement of women. How the scholarship affects the probability of show up? those who were eligible for the scholarship may have shown up more often because the are able to afford the costs or because the fear of loosing the scholarship. AppointmentDay: How delay affects show up?

[1]:
```
# import statements
from numpy import *
from pandas import *
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

## Data Wrangling

link of the dataset Medical Appointment No Shows

[2]:
```
# Load your data and print out a few lines. Perform operations to inspect data
df = read_csv ('KaggleV2-May-2016.csv')
df.head()
```

[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
```

[3]:
```python
#display number of rows and columns
df.shape
```

[3]:
```
(110527, 14)
```

[4]:
```python
#check if there is any misssing values
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 110527 entries, 0 to 110526
Data columns (total 14 columns):
 #   Column          Non-Null Count   Dtype
---  ------          --------------   -----
 0   PatientId       110527 non-null  float64
 1   AppointmentID   110527 non-null  int64
 2   Gender          110527 non-null  object
 3   ScheduledDay    110527 non-null  object
 4   AppointmentDay  110527 non-null  object
 5   Age             110527 non-null  int64
 6   Neighbourhood   110527 non-null  object
 7   Scholarship     110527 non-null  int64
 8   Hipertension    110527 non-null  int64
 9   Diabetes        110527 non-null  int64
 10  Alcoholism      110527 non-null  int64
 11  Handcap         110527 non-null  int64
 12  SMS_received    110527 non-null  int64
 13  No-show         110527 non-null  object
dtypes: float64(1), int64(8), object(5)
memory usage: 11.8+ MB
```

1.1.1 Data Cleaning

[5]:
```
#check if there is any duplicated values
df.drop_duplicates(inplace =True)
df.duplicated().sum()
```

[5]:
```
0
```

[6]:
```
df.isnull().sum()
```

[6]:
```
PatientId         0
AppointmentID     0
Gender            0
ScheduledDay      0
AppointmentDay    0
Age               0
Neighbourhood     0
Scholarship       0
Hipertension      0
Diabetes          0
Alcoholism        0
Handcap           0
SMS_received      0
No-show           0
dtype: int64
```

There is no missing values or duplicates¶

[7]:
```
DataFrame({"min":df.min(), "max":df.max()})
```

[7]:
```
                                 min                   max
PatientId                    39217.8           9.99982e+14
AppointmentID                5030230               5790484
Gender                             F                     M
ScheduledDay    2015-11-10T07:13:56Z  2016-06-08T20:07:23Z
AppointmentDay  2016-04-29T00:00:00Z  2016-06-08T00:00:00Z
Age                               -1                   115
Neighbourhood              AEROPORTO            VILA RUBIM
Scholarship                        0                     1
Hipertension                       0                     1
Diabetes                           0                     1
Alcoholism                         0                     1
Handcap                            0                     4
SMS_received                       0                     1
No-show                           No                   Yes
```

Age can not be -1

[8]:

```
df[df["Age"] < 0]
```

[8]:

```
          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
```

[9]:

```
#drop it and check
df.drop(99832, inplace = True)
df[df["Age"] < 0]
```

[9]:

```
Empty DataFrame
Columns: [PatientId, AppointmentID, Gender, ScheduledDay, AppointmentDay, Age,
Neighbourhood, Scholarship, Hipertension, Diabetes, Alcoholism, Handcap,
SMS_received, No-show]
Index: []
```

[10]:

```
#drop the unused features

df.drop(['PatientId', 'AppointmentID','ScheduledDay','AppointmentDay'], axis=1,␣
 ↪inplace=True)
```

[11]:

```
df.head()
```

[11]:

```
  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
```

## Exploratory Data Analysis

[12]:

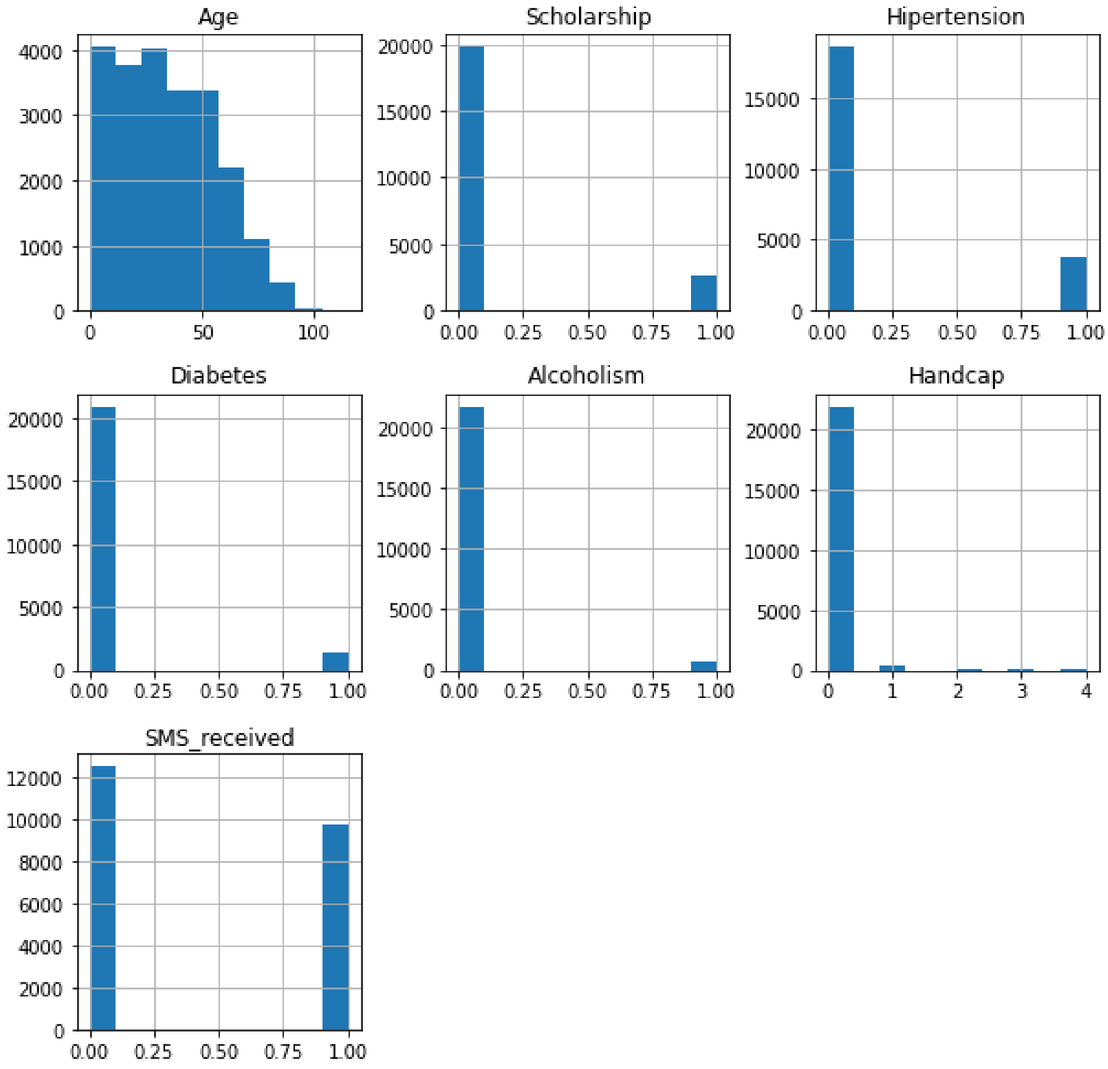
```
noShow=df[df['No-show'] == "Yes"]
```

[13]:

```
attended=df[df['No-show'] == "No"]
```

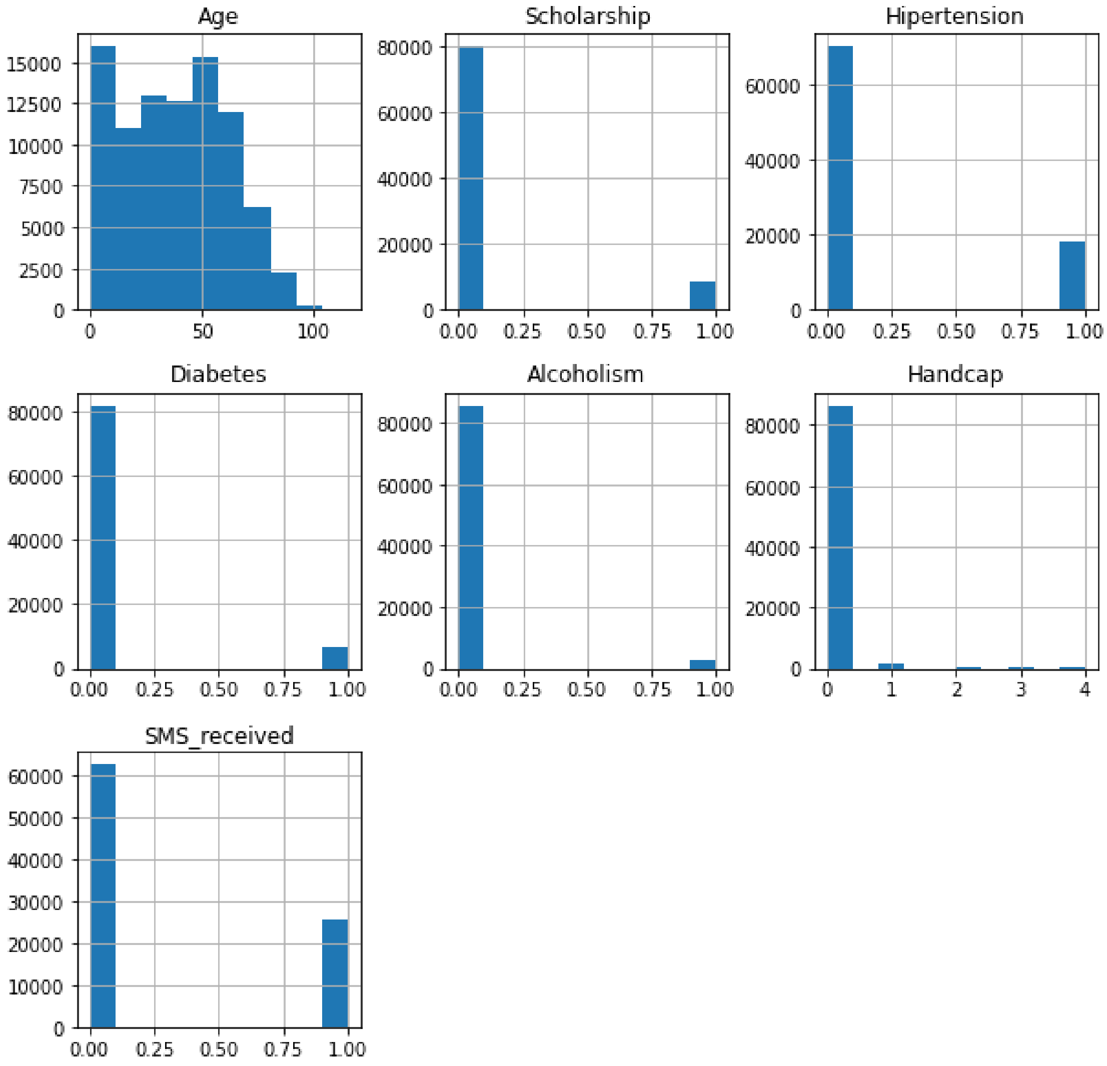
```
[14]: noShow.hist(figsize=(10,10))
```

```
[14]: array([[<AxesSubplot:title={'center':'Age'}>,
              <AxesSubplot:title={'center':'Scholarship'}>,
              <AxesSubplot:title={'center':'Hipertension'}>],
             [<AxesSubplot:title={'center':'Diabetes'}>,
              <AxesSubplot:title={'center':'Alcoholism'}>,
              <AxesSubplot:title={'center':'Handcap'}>],
             [<AxesSubplot:title={'center':'SMS_received'}>, <AxesSubplot:>,
              <AxesSubplot:>]], dtype=object)
```



```
[15]: attended.hist(figsize=(10,10))
```

```
[15]: array([[<AxesSubplot:title={'center':'Age'}>,
              <AxesSubplot:title={'center':'Scholarship'}>,
              <AxesSubplot:title={'center':'Hipertension'}>],
             [<AxesSubplot:title={'center':'Diabetes'}>,
              <AxesSubplot:title={'center':'Alcoholism'}>,
              <AxesSubplot:title={'center':'Handcap'}>],
             [<AxesSubplot:title={'center':'SMS_received'}>, <AxesSubplot:>,
              <AxesSubplot:>]], dtype=object)
```

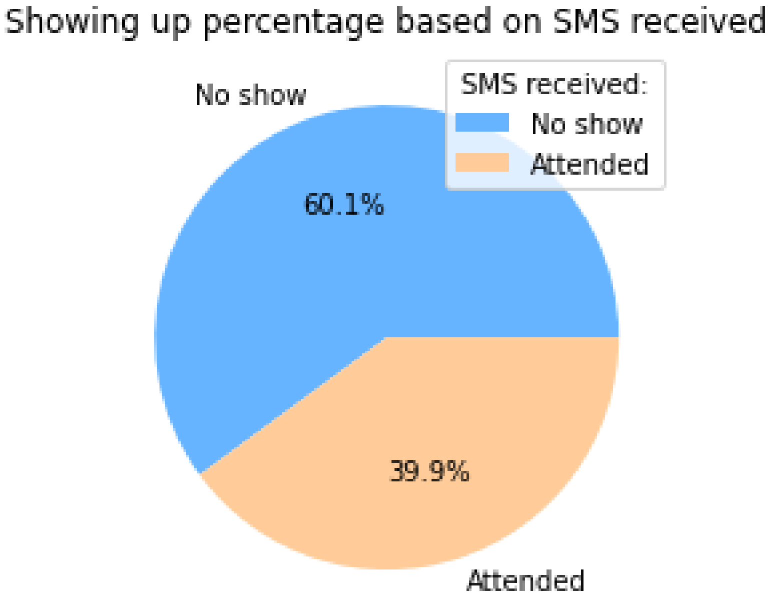


1.2 Research Question 1 How the SMS received attribute effects showing up?

[16]:

```
y = array([noShow['SMS_received'].mean()*100, attended['SMS_received'].
 ↪mean()*100])
mylabels = ["No show", "Attended"]
colors = ['#66b3ff','#ffcc99']
plt.pie(y,labels = mylabels, colors=colors, autopct='%1.1f%%')
plt.legend(title = "SMS received:")
plt.title("Showing up percentage based on SMS received")


plt.show()
```



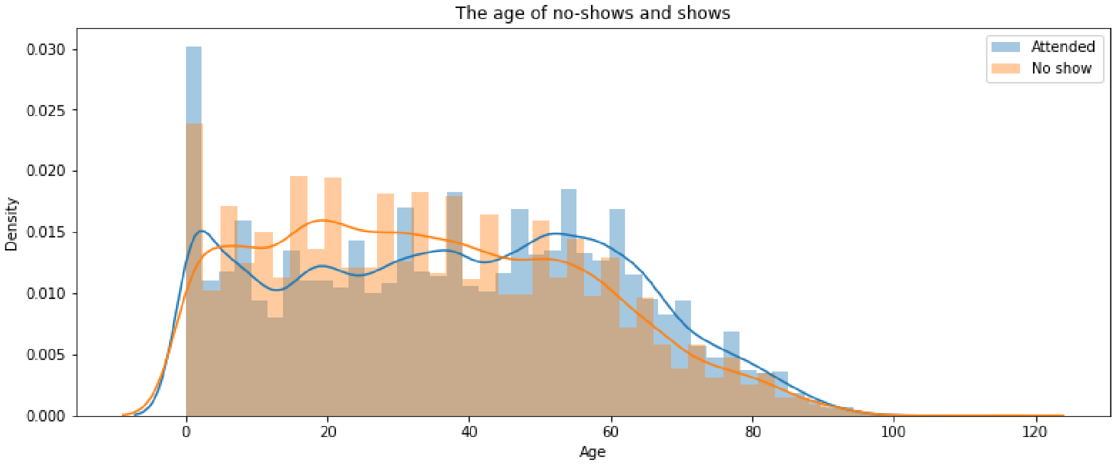
1.2.1 Around 60% of people who received SMS did not show

1.3 Research Question 2 What are the ages of no-shows and shows?¶

[17]:

```
plt.figure(figsize=(13,5))
sns.distplot(attended['Age'], label='Attended')
sns.distplot(noShow['Age'], label='No show')
plt.legend()
plt.title("The age of no-shows and shows")
plt.show()
```

```
C:\Users\96654\anaconda3\lib\site-packages\seaborn\distributions.py:2551:
FutureWarning: `distplot` is a deprecated function and will be removed in a
future version. Please adapt your code to use either `displot` (a figure-level
function with similar flexibility) or `histplot` (an axes-level function for
histograms).
  warnings.warn(msg, FutureWarning)
C:\Users\96654\anaconda3\lib\site-packages\seaborn\distributions.py:2551:
FutureWarning: `distplot` is a deprecated function and will be removed in a
future version. Please adapt your code to use either `displot` (a figure-level
function with similar flexibility) or `histplot` (an axes-level function for
histograms).
  warnings.warn(msg, FutureWarning)
```



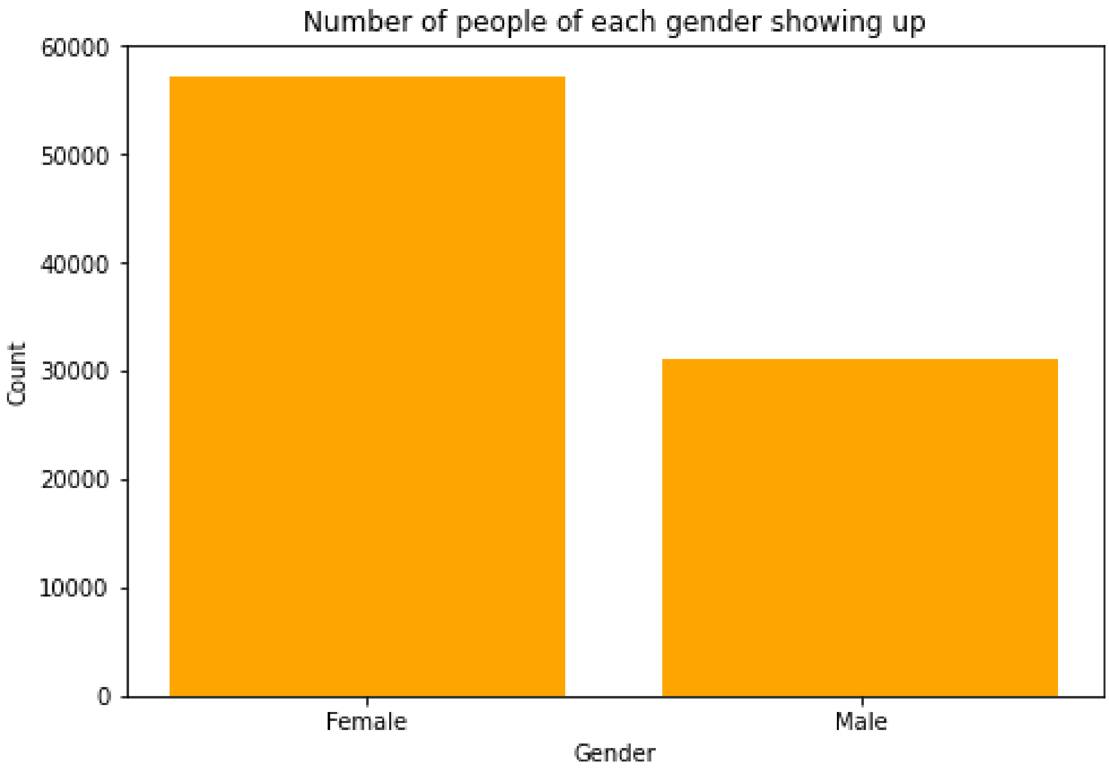
1.3.1 People in general tend to not show to their appointments untill early 40s. As they get older they start to attend appointments

1.4 Research Question 3 How many people of each gender did show??

[30]:
```
fig = plt.figure()
ax = fig.add_axes([0,0,1,1])

attend = ['Female', 'Male']
number = [(attended['Gender']=='F').sum(),(attended['Gender']=='M').sum()]
ax.bar(attend,number, color='orange')
ax.set_ylabel('Count')
ax.set_xlabel('Gender')

ax.set_title('Number of people of each gender showing up')
plt.show()
```



```
[19]: (attended['Gender']=='F').value_counts()
```

```
[19]: True     57245
      False    30962
      Name: Gender, dtype: int64
```

1.4.1 Up to 57245 females have attended thier appointments which is more than males

1.5 Research Question 4 How many people with a scholarship did no-show?

```
[20]: (attended['Scholarship']==1).sum()
```

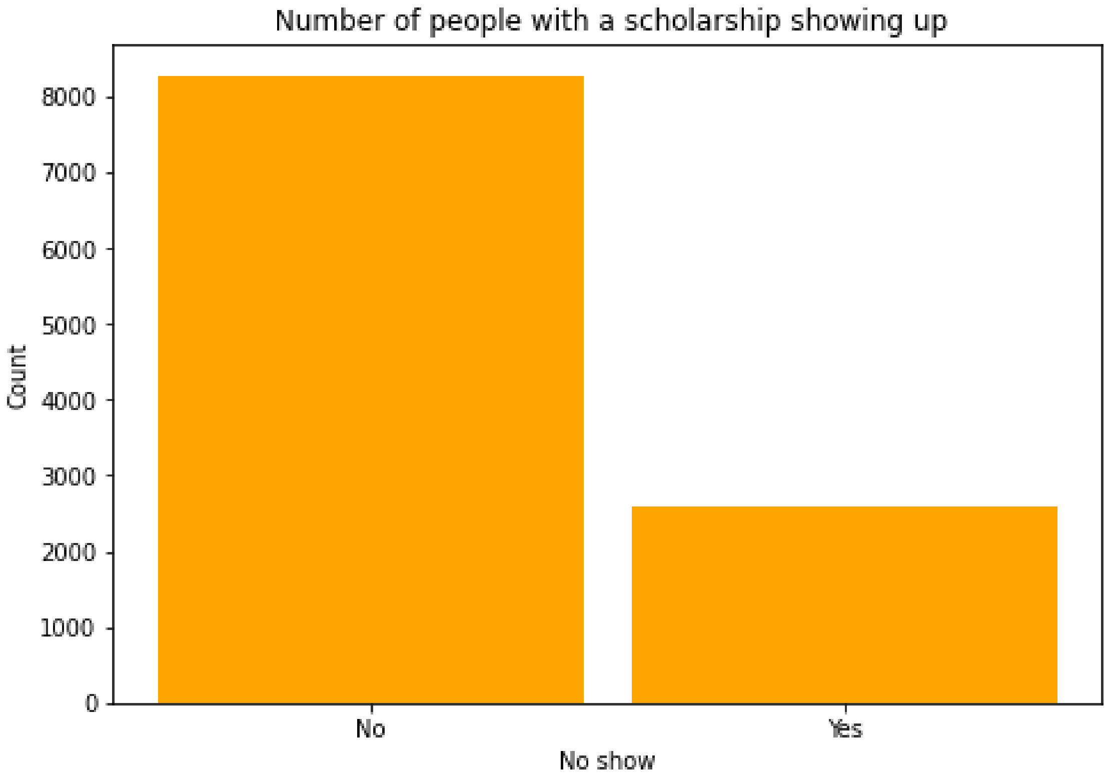
```
[20]: 8283
```

```
[21]: (noShow['Scholarship']==1).sum()
```

```
[21]: 2578
```

```
[22]: fig = plt.figure()
      ax = fig.add_axes([0,0,1,1])
```

```
Scholarship = ['No', 'Yes']
number = [(attended['Scholarship']==1).sum(),(noShow['Scholarship']==1).sum()]
ax.bar(Scholarship,number, width=0.9, color='orange')
ax.set_ylabel('Count')
ax.set_xlabel('No show')
ax.set_title(' Number of people with a scholarship showing up')
plt.show()
```



1.5.1 People with scholarships are more likely to attend their appointments and that is clear from the numbers of people who have attended in the bar chart. Reaching up to 8283 attendees

1.6 Research Question 5 Neighbourhood with the highest no-show?

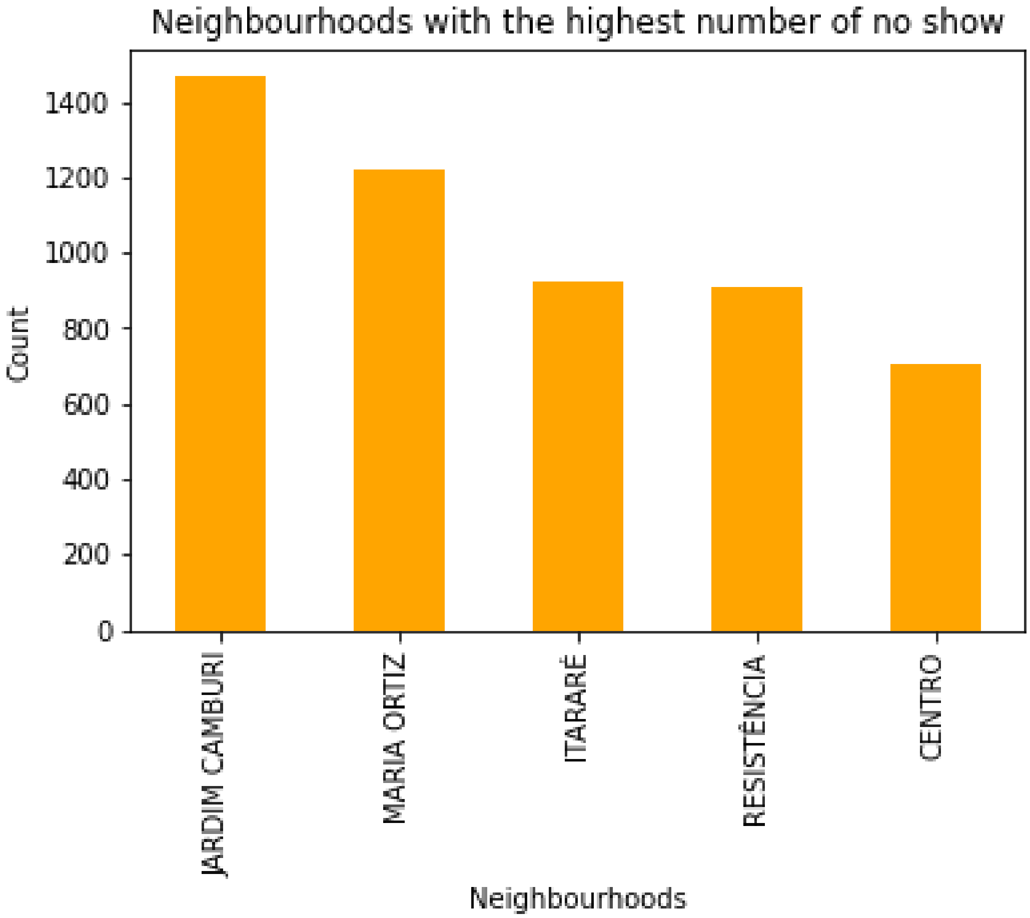
[23]:
```
noShow['Neighbourhood'].value_counts()
```

[23]:
```
JARDIM CAMBURI                 1465
MARIA ORTIZ                    1219
ITARARÉ                         923
RESISTÊNCIA                     906
CENTRO                          703
                               …
```

```
PONTAL DE CAMBURI                 12
ILHA DO BOI                        3
ILHAS OCEÂNICAS DE TRINDADE        2
ILHA DO FRADE                      2
AEROPORTO                          1
Name: Neighbourhood, Length: 80, dtype: int64
```

```
[24]: noShow['Neighbourhood'].value_counts().head().plot(kind='bar', color ='orange',␣
       ↪title= 'Neighbourhoods with the highest number of no show', ylabel='Count',␣
       ↪xlabel='Neighbourhoods')
```

```
[24]: <AxesSubplot:title={'center':'Neighbourhoods with the highest number of no
      show'}, xlabel='Neighbourhoods', ylabel='Count'>
```



1.6.1 JARDIM CAMBURI followed by MARIA ORTIZ have the higtest number of no shows with 1465 and 1219 respectively

1.7 Research Question 6 What percentage of men and women who have scholarships, diabetes, drinks alcohol, and have no-show?

[25]:

```
q4=noShow[noShow['Scholarship'] == 1]
```

[26]:

```
q4=q4[q4['Diabetes'] == 1]
```

[27]:

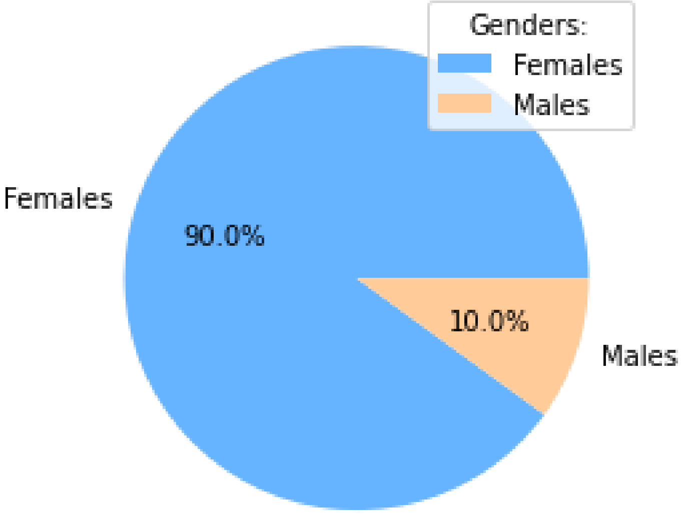
```
q4=q4[q4['Alcoholism'] == 1]
```

[28]:

```
a4 = array([(q4['Gender']=='F').mean(), (q4['Gender']=='M').mean()])
mylabels = ["Females", "Males"]
colors = ['#66b3ff','#ffcc99']

plt.pie(a4,labels = mylabels, colors=colors, autopct='%1.1f%%')
plt.legend(title = "Genders:")

plt.show()
```



1.7.1 90% of women who have scholarships, diabetes, and drinks alcohol did not show

## Conclusions

Around 60% of people who received SMS did not show

People in general tend to not show to their appointments untill early 40s. As they get older they start to attend appointments s

Up to 57245 females have attended thier appointments which is more than males

People with scholarships are more likely to attend their appointments and that is clear from the numbers of people who have attended in the bar chart. Reaching up to 8283 attendees

JARDIM CAMBURI followed by MARIA ORTIZ have the higtest number of no shows with 1465 and 1219 respectively

90% of women who have scholarships, diabetes, and drinks alcohol did not show

1.8 Limitations

The dataset contains negative values for age which can be fixed by putting restrictions for the age input field

It would be more sufficient if there is a column of the specific day of the week the appointment is scheduled instead of just DD/MM?YYYY format. Where it can be easier to see what day of the week people tend to not show