Project: Investigate No-Show Medical Appointment Dataset

Introduction

The No-show Appointments dataset will be the focus of this study. It comprises a 100k-recorded database of medical appointments in Brazil, with the major focus on whether or not the patient showed up for the appointment. We'll look into no-show tendencies and other related characteristics.

- PatientId: Identification number for each patient.
- AppointmentID: Identification number for each appointment made.
- Gender: Is the patient Male or Female.
- ScheduledDay: The day someone registered/called to make the appointment.
- AppointmentDay: The actual day the patient has to visit the doctor.
- Age: How old the patient is.
- Neighbourhood: The location of the hospital/clinic.
- Scholarship: whether or not the patient is enrolled in a Brasilian welfare program that provides financial aid. 0 or 1 for no or yes.
- Hypertension: 0 or 1 for no or yes.
- Diabetes: 0 or 1 for no or yes.
- Handicap: 0 or 1 for no or yes.
- SMS_received: If messages were sent to the patient for a reminder. 0 or 1 for no or yes.
- No-show: Whether the patient made it to the appointment or not. Yes for no-show, No for showing up.

Questions

1. What percentage missed their appointment?
2. How many people received SMS?
3. How many male and female missed their appointment?

In [1]:
```
# Use this cell to set up import statements for all of the packages that you
#   plan to use.

# 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
```

Data Wrangling

In [2]:
```
# Importing libraries
import numpy as np
```

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

%matplotlib inline
```

In [3]:
```
#reading data
df=pd.read_csv("noshowappointments-kagglev2-may-2016 (1).csv", parse_dates = ["Appointm
```

In [4]:
```
# checking the first 5 rows
df.head()
```

Out[4]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scho
0	2.987250e+13	5642903	F	2016-04-29 18:38:08+00:00	2016-04-29 00:00:00+00:00	62	JARDIM DA PENHA	
1	5.589978e+14	5642503	M	2016-04-29 16:08:27+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	
2	4.262962e+12	5642549	F	2016-04-29 16:19:04+00:00	2016-04-29 00:00:00+00:00	62	MATA DA PRAIA	
3	8.679512e+11	5642828	F	2016-04-29 17:29:31+00:00	2016-04-29 00:00:00+00:00	8	PONTAL DE CAMBURI	
4	8.841186e+12	5642494	F	2016-04-29 16:07:23+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	

In [5]:
```
# checking data information
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  datetime64[ns, UTC]
 4   AppointmentDay  110527 non-null  datetime64[ns, UTC]
 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: datetime64[ns, UTC](2), float64(1), int64(8), object(3)
memory usage: 11.8+ MB
```

In [6]:
```
# checking for missing values
```

```
df.isna().sum()
```

Out[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
```

In [7]:
```
# checking for duplicate
df.duplicated ().sum ()
```

Out[7]: 0

In [8]:
```
# checking for summary statistics
df.describe()
```

Out[8]:

	PatientId	AppointmentID	Age	Scholarship	Hipertension	Diabetes	A
count	1.105270e+05	1.105270e+05	110527.000000	110527.000000	110527.000000	110527.000000	110
mean	1.474963e+14	5.675305e+06	37.088874	0.098266	0.197246	0.071865	
std	2.560949e+14	7.129575e+04	23.110205	0.297675	0.397921	0.258265	
min	3.921784e+04	5.030230e+06	-1.000000	0.000000	0.000000	0.000000	
25%	4.172614e+12	5.640286e+06	18.000000	0.000000	0.000000	0.000000	
50%	3.173184e+13	5.680573e+06	37.000000	0.000000	0.000000	0.000000	
75%	9.439172e+13	5.725524e+06	55.000000	0.000000	0.000000	0.000000	
max	9.999816e+14	5.790484e+06	115.000000	1.000000	1.000000	1.000000	

Observations

- I noticed that there is a value of -1 in the age column which is abnormal
- I noticed that the PatientID and AppointmentID are in float and integer formats instead of object format
- I noticed that there are no duplicate data
- I noticed that there are no missing values
- I noticed that Hipertension, Diabetes, Alcoholism, handicap and SMS received are in integers instead of string. ### Data Cleaning (Replace this with more specific notes!)

In [9]:
```
# fetching the observation that has the age of -1.
```

```
df.query('Age==-1')
```

Out[9]:

	PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood
99832	4.659432e+14	5775010	F	2016-06-06 08:58:13+00:00	2016-06-06 00:00:00+00:00	-1	ROMÃO

In [10]:

```
#checking the index
df.query('Age==-1').index
```

Out[10]:

```
Int64Index([99832], dtype='int64')
```

In [11]:

```
#deleting the observation that has age of -1.
df.drop(df.query('Age==-1').index, inplace=True)
```

In [12]:

```
#confirming that that the observation has been dropped.
df.query('Age==-1')
```

Out[12]:

PatientId	AppointmentID	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarshi

In [13]:

```
# to write a function that will convert any data type to string
def convert_dtype(new_dtype, data, features):
    '''this function is used to change any data type to another data type
    old_dtype:string
    new_dtype:string
    data:DataFrame
    features:list '''


    for x in features:
        df[x] = df[x].astype(new_dtype)
```

In [14]:

```
features = ["PatientId", "AppointmentID", "Scholarship", "Hipertension", "Diabetes", "A
convert_dtype('str', df, features)
```

In [15]:

```
#checking if a data type has been changed
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 110526 entries, 0 to 110526
Data columns (total 14 columns):
 #   Column          Non-Null Count   Dtype
---  ------          --------------   -----
 0   PatientId       110526 non-null  object
 1   AppointmentID   110526 non-null  object
 2   Gender          110526 non-null  object
```

```
 3   ScheduledDay    110526 non-null  datetime64[ns, UTC]
 4   AppointmentDay  110526 non-null  datetime64[ns, UTC]
 5   Age             110526 non-null  int64
 6   Neighbourhood   110526 non-null  object
 7   Scholarship     110526 non-null  object
 8   Hipertension    110526 non-null  object
 9   Diabetes        110526 non-null  object
 10  Alcoholism      110526 non-null  object
 11  Handcap         110526 non-null  object
 12  SMS_received    110526 non-null  object
 13  No-show         110526 non-null  object
dtypes: datetime64[ns, UTC](2), int64(1), object(11)
memory usage: 12.6+ MB
```

Exploratory Data Analysis

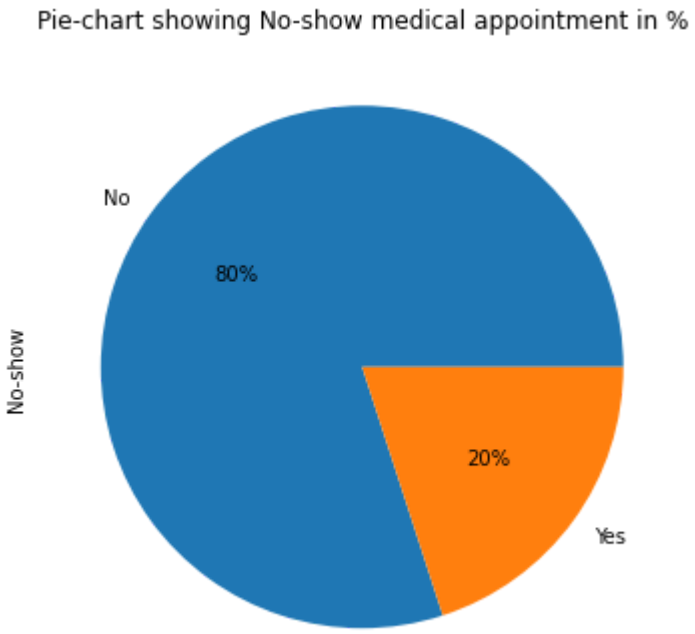
> **Tip**: Now that you've trimmed and cleaned your data, you're ready to move on to exploration. Compute statistics and create visualizations with the goal of addressing the research questions that you posed in the Introduction section. It is recommended that you be systematic with your approach. Look at one variable at a time, and then follow it up by looking at relationships between variables.

What percentage missed their appointment?

In [16]:
```
#checking for the percentage of those that missed their appointment.
No_show_percent=round(df["No-show"].value_counts()/len(df)*100)
No_show_percent
```

Out[16]:
```
No     80.0
Yes    20.0
Name: No-show, dtype: float64
```

In [17]:
```
#plotting a pie-chart to show the percentage.
No_show_percent.plot(kind="pie", autopct="%1.0f%%", figsize=(6,6))
plt.title('Pie-chart showing No-show medical appointment in %');
```



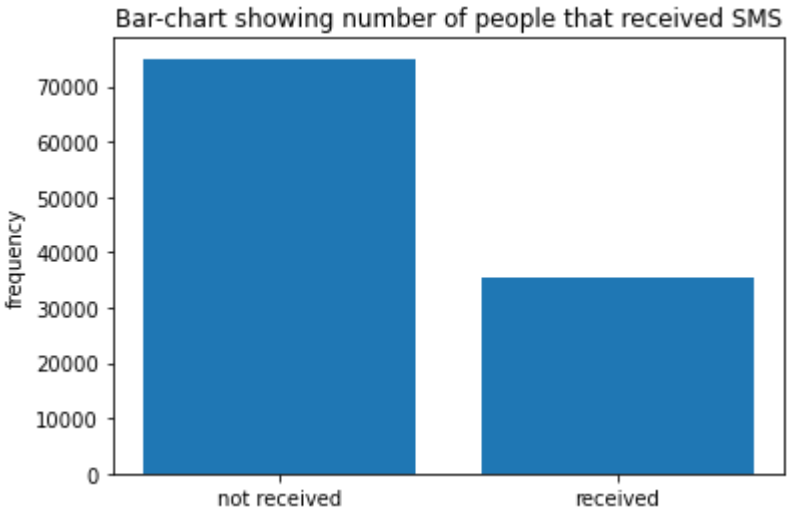
Observation I noticed that 20% of the patients did not show up for the medical appointment while 80% showed up.

How many people received SMS?

In [18]:
```
#checking for how many people received SMS.
SMS_received=round(df["SMS_received"].value_counts())
SMS_received
```

Out[18]:
```
0    75044
1    35482
Name: SMS_received, dtype: int64
```

In [19]:
```
#plotting of bar-chart to represent people that received SMS.
plt.bar([0,1], SMS_received, tick_label=['not received', 'received'])
plt.ylabel("frequency")
plt.title('Bar-chart showing number of people that received SMS');
```



Observation It was noticed that people that received SMS were 75044 while those that did not receive are 35482.

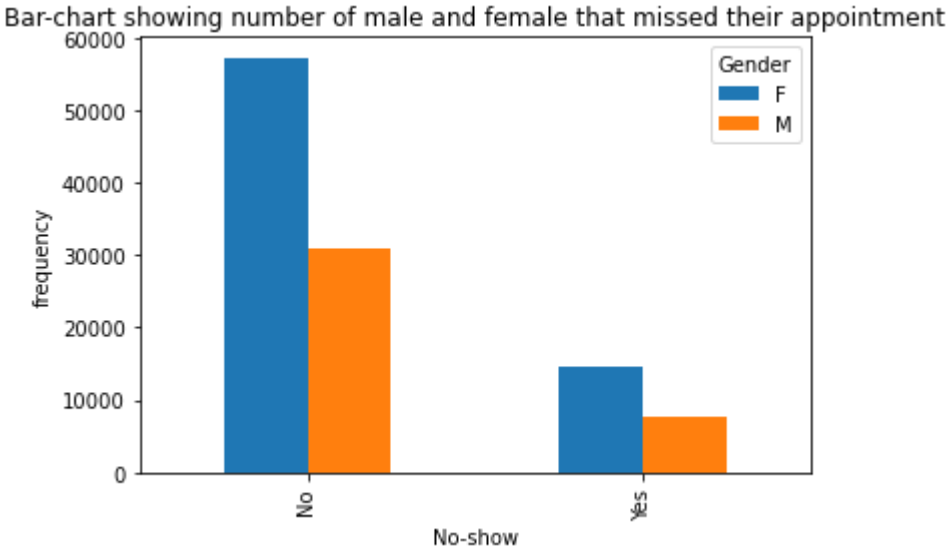
How many male and female missed their appointment?

In [20]:
```
#trying to know how many people missed their appointment.
Gender=df["Gender"].groupby(df["No-show"]).value_counts().unstack()
Gender
```

Out[20]:

Gender	F	M
No-show		
No	57245	30962
Yes	14594	7725

In [21]:
```
#plotting of bar-chart to show both genders that missed their appointment.
Gender.plot(kind='bar')
plt.ylabel("frequency")
plt.title('Bar-chart showing number of male and female that missed their appointment');
```



Observation The number of male and female that did not show up for their medical appointments are 7725 and 14594 respectively.

Conclusion

- I noticed that 20% of the patients did not show up for the medical appointment while 80% showed up.
- It was noticed that people that received SMS were 75044 while those that did not receive are 35482.
- The number of male and female that did not show up for their medical appointments are 7725 and 14594 respectively.

Limitations

- The data collected was only from Brazil and observations may vary based on different countries.
- All observations are tentative.