Investigate_a_Dataset

February 9, 2021

1 Project: Investigate a Dataset _No-show Appointments

1.1 Table of Contents

Introduction

`No-show Appointments`

This dataset collects information from 100k medical appointments in Brazil with various characteristics about the patients.

Questions that are planned to explore :

1) What factors are important for us to know in order to predict if a patient will show up for their scheduled appointment?

2) can we predict the show up with the variables such as hypertension,diabetes,alcoholism etc ?

3) Whether the values of variable handicap helps to predict the show up?

4)Can the show up depends on the variable appointment day ?

Will try to explore with various variable to conclude, which factors play important role in show up for the patients.

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

Data Wrangling

```
In [2]: df=pd.read_csv('noshowappointments.csv')
        df.head(1)
```

```
Out[2]:       PatientId  AppointmentID Gender          ScheduledDay  \
        0  2.987250e+13        5642903      F  2016-04-29T18:38:08Z

                 AppointmentDay  Age    Neighbourhood  Scholarship  Hipertension  \
        0  2016-04-29T00:00:00Z   62  JARDIM DA PENHA            0             1

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

To find the total number of records in noshowappointments.csv file

```
In [3]: df.shape
```

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

There are totally 110527 rows and 14 columns.
To find null values and duplicates.

```
In [4]: df.isnull().any()
```

```
Out[4]: PatientId         False
        AppointmentID     False
        Gender            False
        ScheduledDay      False
        AppointmentDay    False
        Age               False
        Neighbourhood     False
        Scholarship       False
        Hipertension      False
        Diabetes          False
        Alcoholism        False
        Handcap           False
        SMS_received      False
        No-show           False
        dtype: bool
```

```
In [5]: #df.duplicated()
        duplicate = df[df.duplicated()]
        print("Duplicate Rows :")
        duplicate
```

```
Duplicate Rows :


Out[5]: Empty DataFrame
        Columns: [PatientId, AppointmentID, Gender, ScheduledDay, AppointmentDay, Age, Neighbour
        Index: []
```

The above results shows that there are no null values and duplicates in the records.
Seems that the column names can be make better in uniform readable format.

```
In [6]: df.rename(columns={'PatientId':'patient_id','AppointmentID':'appointment_id','Gender':'g
```

```
In [7]: list(df.columns)
```

```
Out[7]: ['patient_id',
         'appointment_id',
         'gender',
         'scheduled_day',
         'appointment_day',
         'age',
         'neighbour_hood',
         'scholar_ship',
         'hyper_tension',
         'diabetes',
         'alcoholism',
         'handicap',
         'sms_received',
         'no_show']
```

```
In [8]: df.head()
```

```
Out[8]:      patient_id  appointment_id gender          scheduled_day  \
        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

                appointment_day  age     neighbour_hood  scholar_ship  hyper_tension  \
        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  handicap  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
```

```
In [9]: df['appointment_day'].unique()
```

```
Out[9]: array(['2016-04-29T00:00:00Z', '2016-05-03T00:00:00Z',
               '2016-05-10T00:00:00Z', '2016-05-17T00:00:00Z',
               '2016-05-24T00:00:00Z', '2016-05-31T00:00:00Z',
               '2016-05-02T00:00:00Z', '2016-05-30T00:00:00Z',
               '2016-05-16T00:00:00Z', '2016-05-04T00:00:00Z',
'2016-05-19T00:00:00Z', '2016-05-12T00:00:00Z',
'2016-05-06T00:00:00Z', '2016-05-20T00:00:00Z',
'2016-05-05T00:00:00Z', '2016-05-13T00:00:00Z',
'2016-05-09T00:00:00Z', '2016-05-25T00:00:00Z',
'2016-05-11T00:00:00Z', '2016-05-18T00:00:00Z',
'2016-05-14T00:00:00Z', '2016-06-02T00:00:00Z',
'2016-06-03T00:00:00Z', '2016-06-06T00:00:00Z',
'2016-06-07T00:00:00Z', '2016-06-01T00:00:00Z',
'2016-06-08T00:00:00Z'], dtype=object)
```

Since the time in appointment_day column is 0 in all the rows, its better to remove the time from the values.

```
In [10]: df['appointment_day'] = pd.to_datetime(df['appointment_day']).dt.date
```

```
In [11]: df.head()
```

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

            age     neighbour_hood  scholar_ship  hyper_tension  diabetes  alcoholism  \
         0   62    JARDIM DA PENHA             0              1         0           0
         1   56    JARDIM DA PENHA             0              0         0           0
         2   62      MATA DA PRAIA             0              0         0           0
         3    8  PONTAL DE CAMBURI             0              0         0           0
         4   56    JARDIM DA PENHA             0              1         1           0

            handicap  sms_received no_show
         0         0             0      No
         1         0             0      No
         2         0             0      No
         3         0             0      No
         4         0             0      No
```

appointment_day column looks clean with clear data.

Its better to split the time and date in scheduled_day column to explore few things only with date.

```
In [12]: df['scheduled_date'] = pd.to_datetime(df['scheduled_day']).dt.date
         df['scheduled_time'] = pd.to_datetime(df['scheduled_day']).dt.time
```

```
In [13]: df.head(2)
```

```
Out[13]:      patient_id  appointment_id gender         scheduled_day appointment_day  \
         0  2.987250e+13         5642903      F  2016-04-29T18:38:08Z      2016-04-29
```

```
1  5.589978e+14        5642503      M  2016-04-29T16:08:27Z      2016-04-29

   age   neighbour_hood  scholar_ship  hyper_tension  diabetes  alcoholism  \
0   62  JARDIM DA PENHA             0              1         0           0
1   56  JARDIM DA PENHA             0              0         0           0

   handicap  sms_received no_show scheduled_date scheduled_time
0         0             0      No     2016-04-29       18:38:08
1         0             0      No     2016-04-29       16:08:27
```

since scheduled_date and scheduled_time columns are newly populated, its better to delete the scheduled_day column

```
In [14]: del df['scheduled_day']

In [15]: df.head(2)

Out[15]:     patient_id  appointment_id gender appointment_day  age   neighbour_hood  \
0  2.987250e+13         5642903      F      2016-04-29   62  JARDIM DA PENHA
1  5.589978e+14         5642503      M      2016-04-29   56  JARDIM DA PENHA

   scholar_ship  hyper_tension  diabetes  alcoholism  handicap  sms_received  \
0             0              1         0           0         0             0
1             0              0         0           0         0             0

  no_show scheduled_date scheduled_time
0      No     2016-04-29       18:38:08
1      No     2016-04-29       16:08:27

In [16]: df.shape

Out[16]: (110527, 15)
```

After cleaning up the data, total number rows and columns are 110527 and 15 respectively in the dataframe.

Exploratory Data Analysis

To find the number of patients who show up and who not show up on their appointments.

```
In [17]: df.groupby(df['no_show']).count()['patient_id']

Out[17]: no_show
         No     88208
         Yes    22319
         Name: patient_id, dtype: int64
```

The number of patients who showed up on their appointments are 88208 and those who not show up are 22319 out of 110527 records.

```
In [18]: len(df['patient_id'].unique())
```

```
Out[18]: 62299
```

```
In [19]: len(df['appointment_id'].unique())
```

```
Out[19]: 110527
```

Since the unique number of patient_id is only 62299 out of 110527, it shows that each patient has more than one appointment record. And all the appointment records are unique.

To find the interval between scheduled_date and appointment_date: With the help of columns scheduled_date and appointment_day, the interval can be calculated.

```
In [20]: df['interval']=df['appointment_day']-df['scheduled_date']
```

```
In [21]: df['interval']=df['interval'].dt.days
```

```
In [22]: df.groupby(df['interval']).count()['patient_id'].reset_index()
```

```
Out[22]:      interval  patient_id
         0          -6           1
         1          -1           4
         2           0       38563
         3           1        5213
         4           2        6725
         5           3        2737
         6           4        5290
         7           5        3277
         8           6        4037
         9           7        4906
         10          8        2332
         11          9        1605
         12         10        1391
         13         11         987
         14         12        1115
         15         13        1682
         16         14        2913
         17         15        1503
         18         16        1151
         19         17        1107
         20         18        1021
         21         19        1044
         22         20        1187
         23         21        1861
         24         22        1173
         25         23         822
         26         24         622
         27         25         637
         28         26         731
         29         27        1013
         ..        ...         ...
```

```
101       101          1
102       102          4
103       103          5
104       104          8
105       105          4
106       107          2
107       108          5
108       109          5
109       110          2
110       111          5
111       112          5
112       115          2
113       117          1
114       119          4
115       122          3
116       123          1
117       125          1
118       126          1
119       127          1
120       132          1
121       133         11
122       139          1
123       142          8
124       146          1
125       151          1
126       155         10
127       162         11
128       169          8
129       176         16
130       179         10

[131 rows x 2 columns]
```

```
In [23]: df['interval'].count()

Out[23]: 110527

In [24]: (df[df['interval']>=0]).count()['patient_id']

Out[24]: 110522
```

The values of interval include -6 and -1 which indicates the interval could not be in negative values.since the total number of records are only 5 out of 110527, no need to disturb those records.

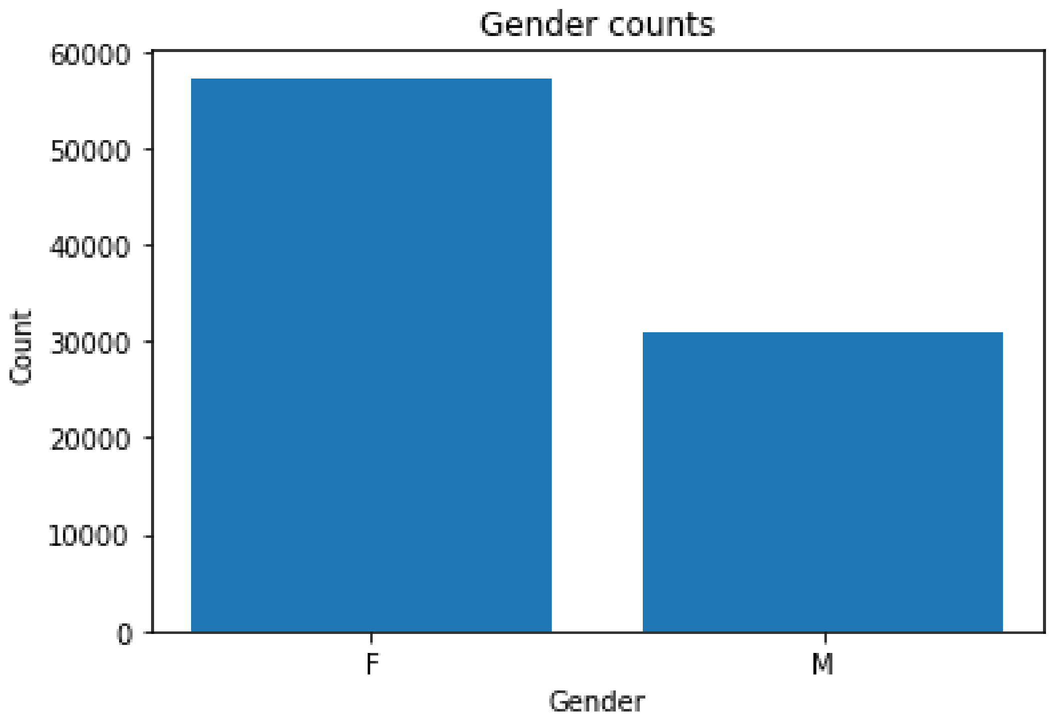
To find the characteristics of patients show up to their appointments, we need the records of those patients seperately. Lets make one more dataframe which contains only the records of patients who show up.

```
In [25]: df.shape

Out[25]: (110527, 16)
```

```
In [26]: df_no=df[df['no_show']=='No']

In [27]: df_no.shape

Out[27]: (88208, 16)

In [28]: df_no.head()

Out[28]:      patient_id  appointment_id gender appointment_day  age  \
         0  2.987250e+13         5642903      F      2016-04-29   62
         1  5.589978e+14         5642503      M      2016-04-29   56
         2  4.262962e+12         5642549      F      2016-04-29   62
         3  8.679512e+11         5642828      F      2016-04-29    8
         4  8.841186e+12         5642494      F      2016-04-29   56

              neighbour_hood  scholar_ship  hyper_tension  diabetes  alcoholism  \
         0    JARDIM DA PENHA             0              1         0           0
         1    JARDIM DA PENHA             0              0         0           0
         2      MATA DA PRAIA             0              0         0           0
         3  PONTAL DE CAMBURI             0              0         0           0
         4    JARDIM DA PENHA             0              1         1           0

            handicap  sms_received no_show scheduled_date scheduled_time  interval
         0         0             0      No     2016-04-29       18:38:08         0
         1         0             0      No     2016-04-29       16:08:27         0
         2         0             0      No     2016-04-29       16:19:04         0
         3         0             0      No     2016-04-29       17:29:31         0
         4         0             0      No     2016-04-29       16:07:23         0
```

To find the male female counts

```
In [29]: df_gender=df_no.groupby('gender').count()[['patient_id']].reset_index()
         df_gender

Out[29]:   gender  patient_id
         0      F       57246
         1      M       30962

In [30]: plt.bar(df_gender['gender'],df_gender['patient_id'])
         plt.xlabel('Gender')
         plt.ylabel('Count')
         plt.title('Gender counts')
         plt.show()
```



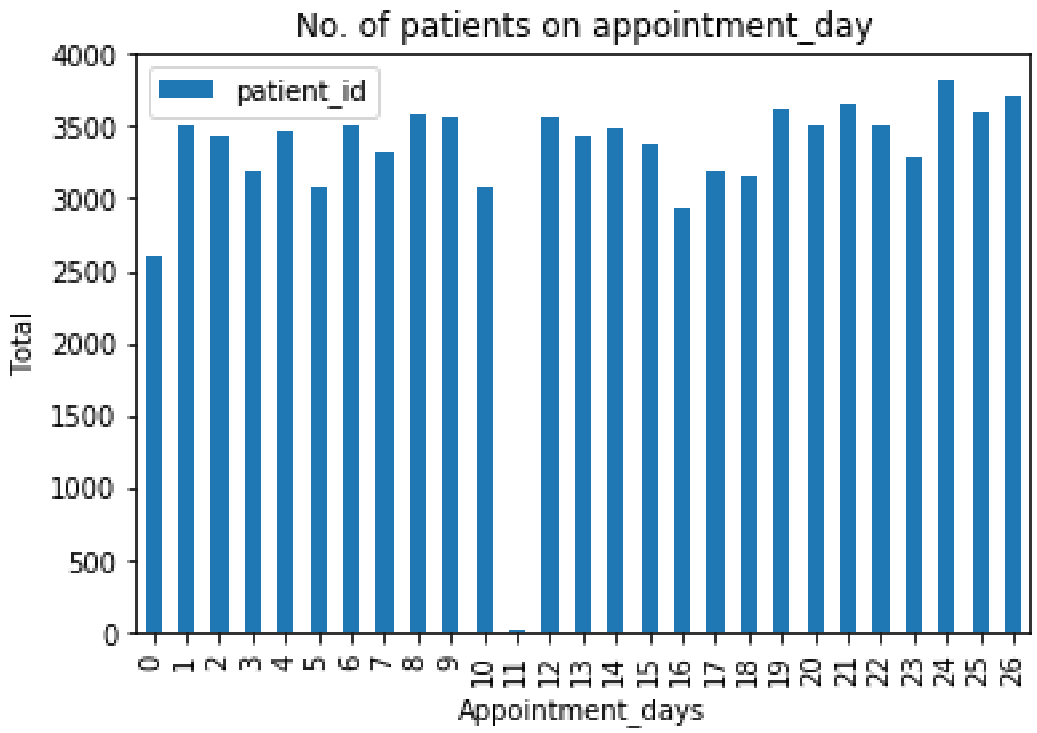
Female patients are showing up more compared to male.
To find records based on appointment_day

```
In [31]: df_appointment_day=df_no.groupby('appointment_day').count()[['patient_id']].reset_index
         df_appointment_day
```

```
Out[31]:    appointment_day  patient_id
         0       2016-04-29        2602
         1       2016-05-02        3515
         2       2016-05-03        3425
         3       2016-05-04        3195
         4       2016-05-05        3466
         5       2016-05-06        3084
         6       2016-05-09        3501
         7       2016-05-10        3316
         8       2016-05-11        3589
         9       2016-05-12        3557
         10      2016-05-13        3082
         11      2016-05-14          30
         12      2016-05-16        3564
         13      2016-05-17        3437
         14      2016-05-18        3483
         15      2016-05-19        3378
         16      2016-05-20        2929
         17      2016-05-24        3198
```

```
18        2016-05-25         3150
19        2016-05-30         3626
20        2016-05-31         3512
21        2016-06-01         3652
22        2016-06-02         3508
23        2016-06-03         3285
24        2016-06-06         3819
25        2016-06-07         3600
26        2016-06-08         3705
```

```
In [32]: df_appointment_day.plot.bar(stacked=True)
         plt.xlabel('Appointment_days')
         plt.ylabel('Total')
         plt.title('No. of patients on appointment_day')
         plt.show()
```



couldnt predict anything with is data excluding that 11th record dated 2016-05-14 has very minimum count of 30.

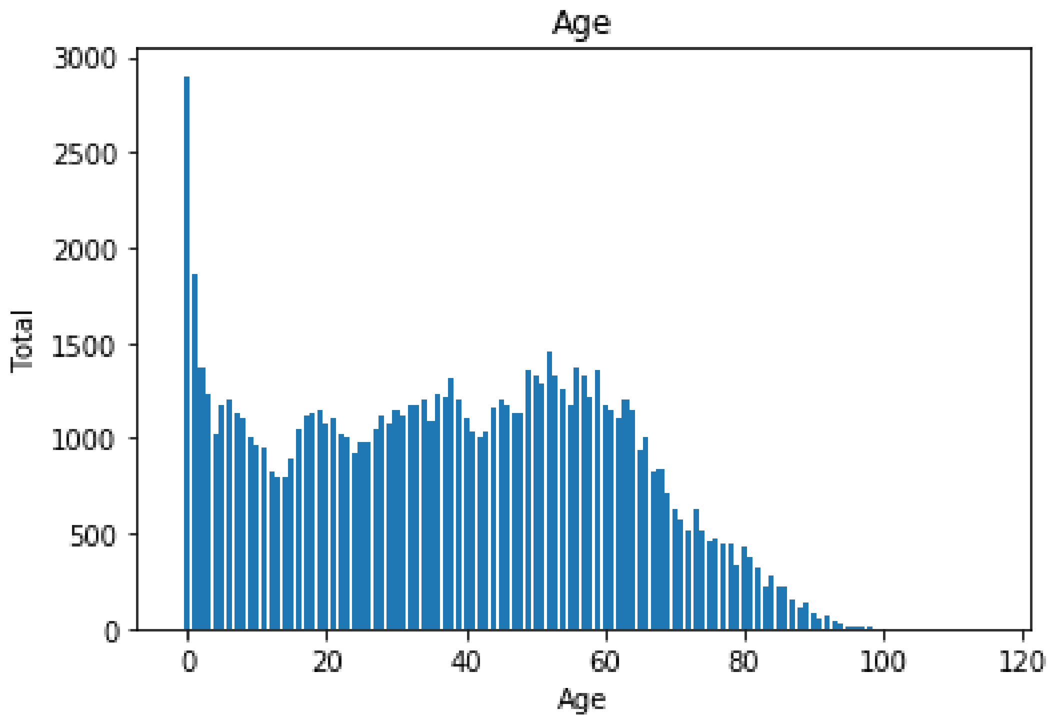
Will check the records based on age.

```
In [33]: df_age=df_no.groupby('age').count()['patient_id'].reset_index()
         df_age

Out[33]:      age  patient_id
         0     -1           1
```

```
1     0     2900
2     1     1858
3     2     1366
4     3     1236
5     4     1017
6     5     1169
7     6     1205
8     7     1126
9     8     1106
10    9     1008
11   10      970
12   11      948
13   12      820
14   13      800
15   14      802
16   15      889
17   16     1049
18   17     1113
19   18     1137
20   19     1151
21   20     1082
22   21     1097
23   22     1025
24   23     1006
25   24      921
26   25      980
27   26      971
28   27     1048
29   28     1116
..  ...      ...
74   73      629
75   74      513
76   75      463
77   76      480
78   77      448
79   78      452
80   79      329
81   80      430
82   81      371
83   82      326
84   83      219
85   84      276
86   85      226
87   86      218
88   87      157
89   88      114
90   89      144
91   90       86
```

```
92    91           53
93    92           66
94    93           43
95    94           27
96    95           18
97    96           16
98    97            9
99    98            5
100   99            1
101  100            4
102  102            2
103  115            2

[104 rows x 2 columns]
```

```
In [34]: plt.bar(df_age['age'],df_age['patient_id'])
         plt.xlabel('Age')
         plt.ylabel('Total')
         plt.title('Age')
         plt.show()
```



```
In [35]: df_age['age'].mean()

Out[35]: 50.634615384615387
```

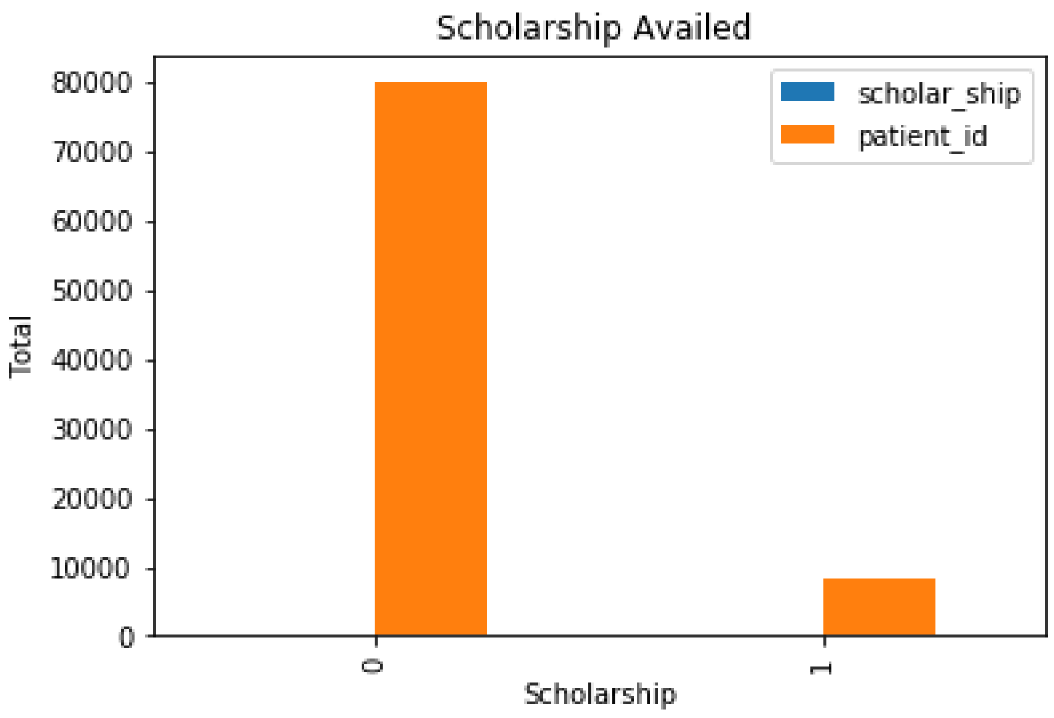
The age 0 contains 2900 records. This may be records of either children below 1 year or the age value might not be recorded so default may be of 0. So couldnt predict anything with this age variable.

Will evaluate the scholarship variable:

```
In [36]: df_scholar_ship=df_no.groupby('scholar_ship').count()['patient_id'].reset_index()
         df_scholar_ship
```

```
Out[36]:    scholar_ship  patient_id
         0             0       79925
         1             1        8283
```

```
In [37]: df_scholar_ship.plot.bar()
         plt.xlabel('Scholarship')
         plt.ylabel('Total')
         plt.title('Scholarship Availed ')
         plt.show()
```



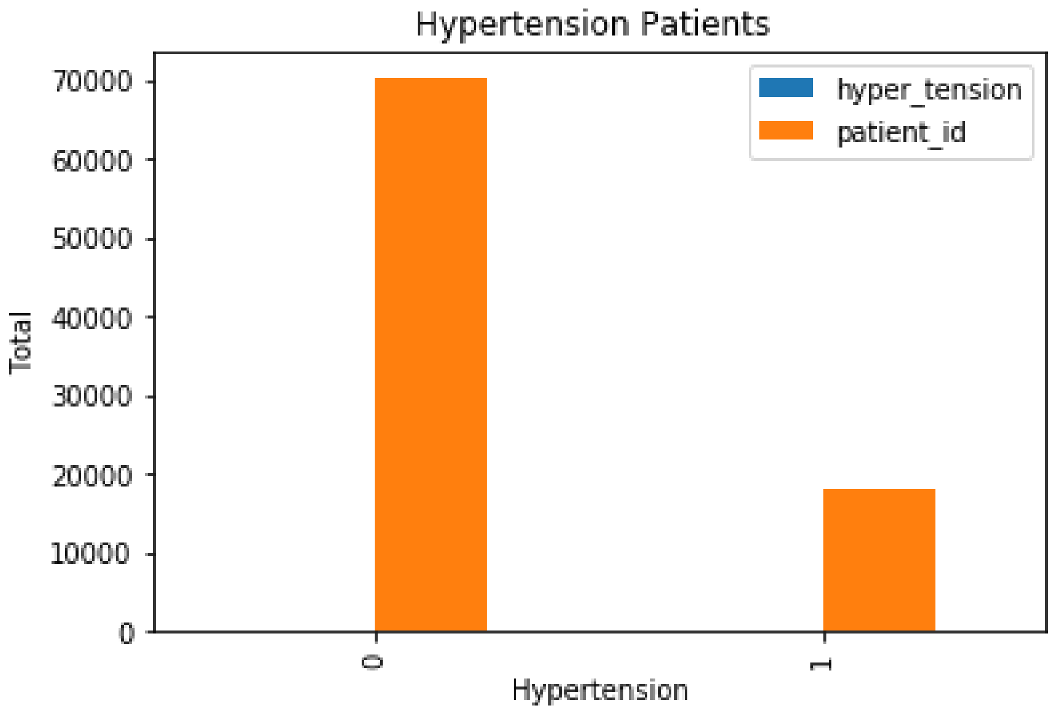
The majority of the patients who show up on their appointments were not enrolled in the scholarship of Brazil.

Lets get into hypertension variable

```
In [38]: df_hyper_tension=df_no.groupby('hyper_tension').count()['patient_id'].reset_index()
         df_hyper_tension
```

```
Out[38]:    hyper_tension  patient_id
         0              0       70179
         1              1       18029
```

```
In [39]: df_hyper_tension.plot.bar()
         plt.xlabel('Hypertension')
         plt.ylabel('Total')
         plt.title('Hypertension Patients ')
         plt.show()
```

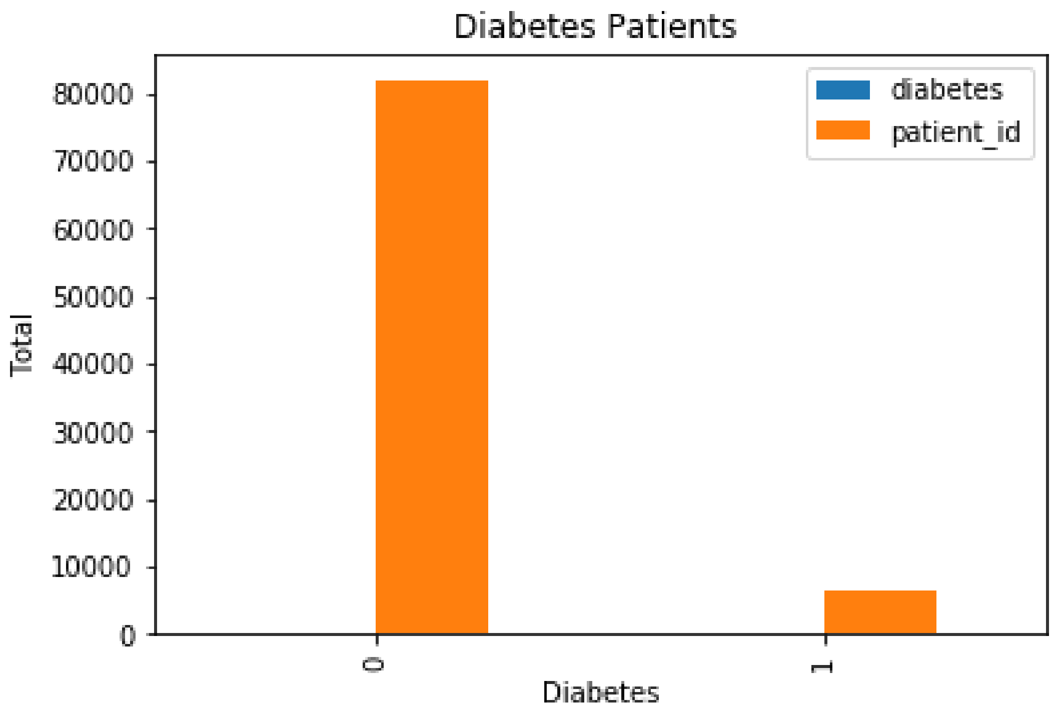


The majority of the patients who show up on their appointments does not have hypertension. Will check the records of diabetes patients.

```
In [40]: df_diabetes=df_no.groupby('diabetes').count()['patient_id'].reset_index()
         df_diabetes
```

```
Out[40]:    diabetes  patient_id
         0         0       81695
         1         1        6513
```

```
In [41]: df_diabetes.plot.bar()
         plt.xlabel('Diabetes')
         plt.ylabel('Total')
         plt.title('Diabetes Patients ')
         plt.show()
```

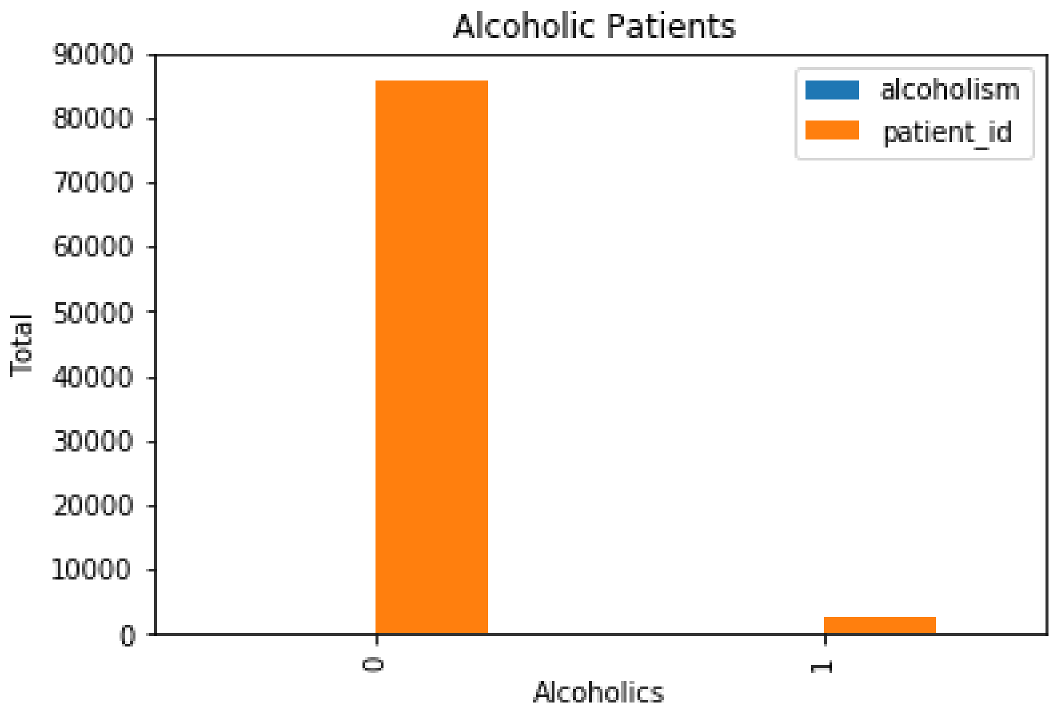


The patients showed up on their appointments are almost non diabetics.
Lets get into the recods of alcoholic patients.

```
In [42]: df_alcohol=df_no.groupby('alcoholism').count()['patient_id'].reset_index()
         df_alcohol
```

```
Out[42]:    alcoholism  patient_id
         0           0       85525
         1           1        2683
```

```
In [43]: df_alcohol.plot.bar()
         plt.xlabel('Alcoholics')
         plt.ylabel('Total')
         plt.title('Alcoholic Patients ')
         plt.show()
```

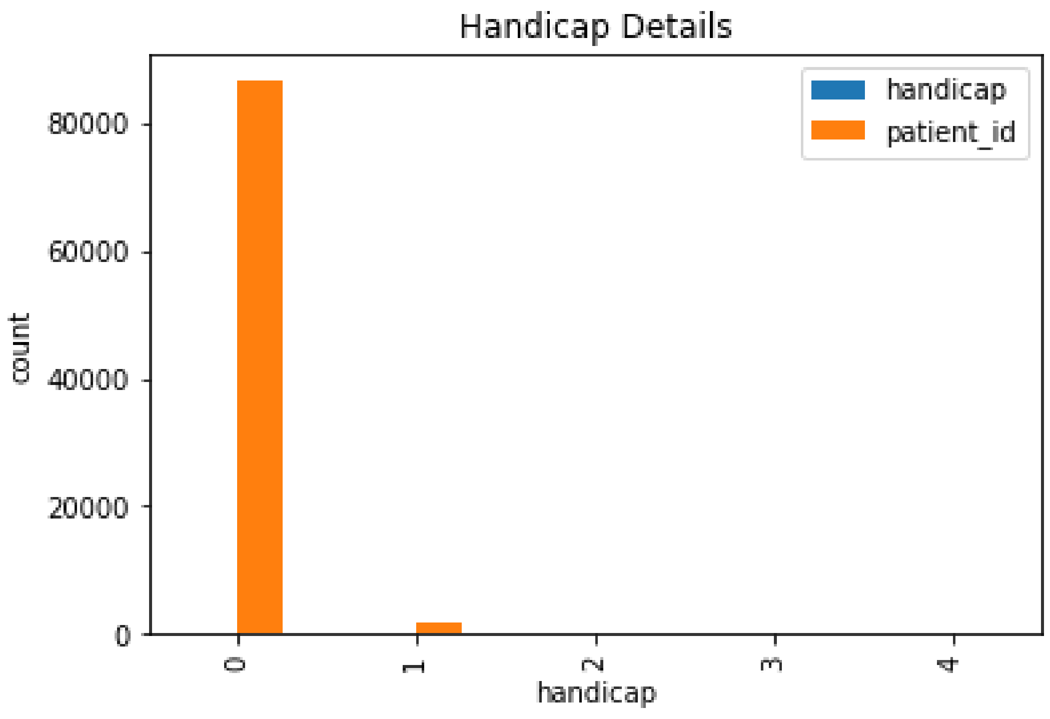


Alcoholic patients who show up are very minimum and most of the patients are non-alcoholic.
To analyse from the handicap patients records.

```
In [44]: df_handicap=df_no.groupby('handicap').count()['patient_id'].reset_index()
         df_handicap
```

```
Out[44]:    handicap  patient_id
         0         0       86374
         1         1        1676
         2         2         146
         3         3          10
         4         4           2
```

```
In [45]: df_handicap.plot.bar()
         plt.xlabel('handicap')
         plt.ylabel('count')
         plt.title('Handicap Details')
         plt.show()
```

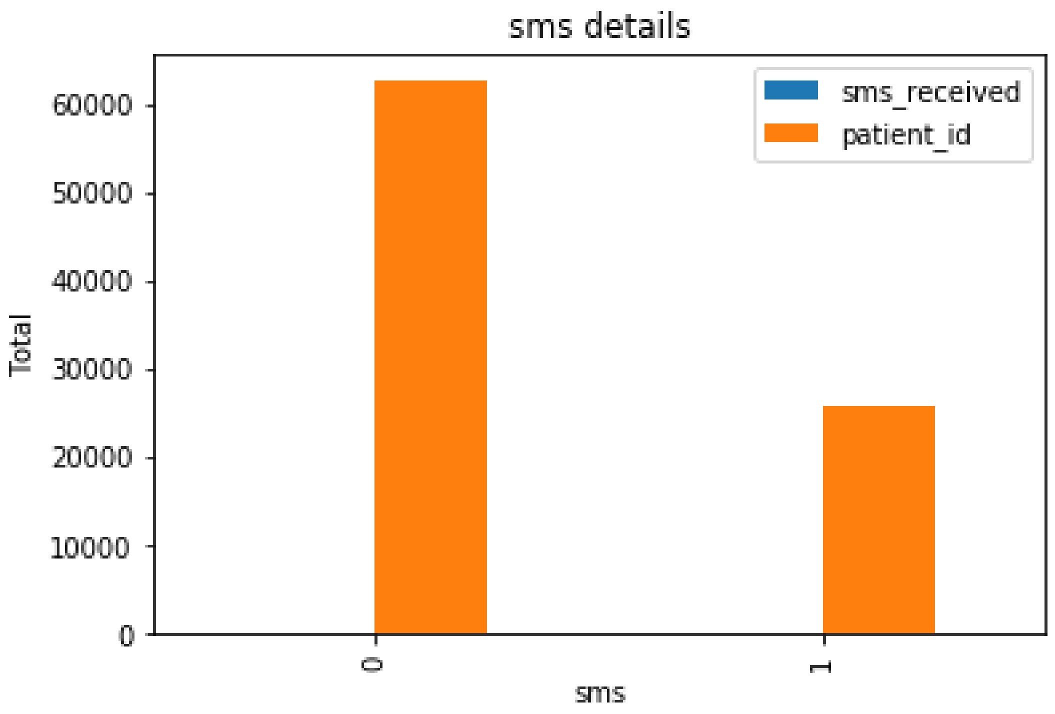


Among 88k plus patients 86374 patients are healthy without handicaps.
Will compute something based on the details of sms received by the patients.

```
In [46]: df_sms_received=df_no.groupby('sms_received').count()['patient_id'].reset_index()
         df_sms_received
```

```
Out[46]:    sms_received  patient_id
         0             0       62510
         1             1       25698
```

```
In [47]: df_sms_received.plot.bar()
         plt.xlabel('sms')
         plt.ylabel('Total')
         plt.title('sms details')
         plt.show()
```



Most of the patients who show up did not receive sms for their appointments. so this sms does not play any role here.

Lets look into the interval of days between scheduled and appointment days.

```
In [48]: df_interval=df_no.groupby('interval').count()['patient_id'].reset_index()
         df_interval
```

```
Out[48]:      interval  patient_id
         0           0       36771
         1           1        4100
         2           2        5123
         3           3        2093
         4           4        4059
         5           5        2405
         6           6        3036
         7           7        3597
         8           8        1662
         9           9        1165
         10         10         951
         11         11         675
         12         12         762
         13         13        1146
         14         14        2000
         15         15        1001
         16         16         800
```

```
17          17          757
18          18          709
19          19          681
20          20          779
21          21         1286
22          22          769
23          23          546
24          24          387
25          25          381
26          26          468
27          27          693
28          28         1203
29          29          733
..         ...          ...
94          94            2
95          95            4
96          96            3
97          97            2
98          98            4
99         101            1
100        102            3
101        103            2
102        104            2
103        105            4
104        107            2
105        108            5
106        109            5
107        110            1
108        111            4
109        112            5
110        115            2
111        117            1
112        119            4
113        122            3
114        123            1
115        125            1
116        127            1
117        133            7
118        142            5
119        155            4
120        162            9
121        169            7
122        176           10
123        179            8

[124 rows x 2 columns]
```

```
In [49]: df_interval_lt08=df_interval[df_interval['interval']<=8]
```

```
        df_interval_lt08

Out[49]:    interval  patient_id
        0          0       36771
        1          1        4100
        2          2        5123
        3          3        2093
        4          4        4059
        5          5        2405
        6          6        3036
        7          7        3597
        8          8        1662
```

```
In [50]: df_interval_lt08['patient_id'].sum()

Out[50]: 62846

In [51]: df_interval_lt15=df_interval[df_interval['interval']<=15]
         df_interval_lt15

Out[51]:     interval  patient_id
         0          0       36771
         1          1        4100
         2          2        5123
         3          3        2093
         4          4        4059
         5          5        2405
         6          6        3036
         7          7        3597
         8          8        1662
         9          9        1165
         10        10         951
         11        11         675
         12        12         762
         13        13        1146
         14        14        2000
         15        15        1001

In [52]: df_interval_lt15['patient_id'].sum()

Out[52]: 70546
```

Among 88k patients, around 62k were showed up with the interval of 8 days, which shows that the patients who has scheduled their appointments within a week have more chances to show up for the appointments.

Lets do some exploration with neighbourhood datas.

```
In [53]: df_neighbourhood=df_no.groupby('neighbour_hood').count()['patient_id'].sort_values(asce
         df_neighbourhood
```

```
Out[53]:          neighbour_hood  patient_id
         0        JARDIM CAMBURI        6252
         1           MARIA ORTIZ        4586
         2           RESISTÊNCIA        3525
         3        JARDIM DA PENHA        3246
         4          SANTA MARTHA        2635
         5                CENTRO        2631
         6               ITARARÉ        2591
         7            TABUAZEIRO        2559
         8         SANTO ANTÔNIO        2262
         9                BONFIM        2223
         10     JESUS DE NAZARETH        2157
         11          SANTO ANDRÉ        2063
         12               JABOUR        2058
         13            CARATOÍRA        1974
         14            SÃO PEDRO        1933
         15        NOVA PALESTINA        1862
         16             DA PENHA        1788
         17           ANDORINHAS        1741
         18                ROMÃO        1741
         19      ILHA DO PRÍNCIPE        1734
         20             GURIGICA        1562
         21             SÃO JOSÉ        1549
         22       FORTE SÃO JOÃO        1543
         23  ILHA DE SANTA MARIA        1524
         24           BELA VISTA        1523
         25              MARUÍPE        1478
         26         SÃO CRISTÓVÃO        1473
         27             REDENÇÃO        1278
         28          JOANA DťARC        1169
         29         SÃO BENEDITO        1152
         ..                  ...         ...
         50            DO CABRAL         472
         51          SANTOS REIS         435
         52           ESTRELINHA         432
         53         SOLON BORGES         400
         54          SANTA CLARA         372
         55              PIEDADE         364
         56          SANTA LÚCIA         352
         57          SANTA LUÍZA         351
         58       BARRO VERMELHO         332
         59         SANTA CECÍLIA         325
         60           DO MOSCOSO         321
         61        MÁRIO CYPRESTE         317
         62           DE LOURDES         258
         63            BOA VISTA         254
         64              COMDUSA         254
         65      ANTÔNIO HONÓRIO         221
```

```
66  ARIOVALDO FAVALESSA         220
67            FRADINHOS         210
68       ENSEADA DO SUÁ         183
69         SANTA HELENA         141
70                HORTO         133
71       UNIVERSITÁRIO          120
72     SEGURANÇA DO LAR         117
73             NAZARETH         106
74     MORADA DE CAMBURI         80
75     PONTAL DE CAMBURI         57
76           ILHA DO BOI         32
77         ILHA DO FRADE          8
78            AEROPORTO           7
79    PARQUE INDUSTRIAL           1

[80 rows x 2 columns]
```

```
In [54]: df_top10=df_neighbourhood[:10]
         df_top10
```

```
Out[54]:     neighbour_hood  patient_id
         0   JARDIM CAMBURI        6252
         1      MARIA ORTIZ        4586
         2      RESISTÊNCIA        3525
         3  JARDIM DA PENHA        3246
         4     SANTA MARTHA        2635
         5           CENTRO        2631
         6          ITARARÉ        2591
         7       TABUAZEIRO        2559
         8    SANTO ANTÔNIO        2262
         9           BONFIM        2223
```

Among 80 places listed in neighbourhood, i have shortlisted top 10 places depends on the count of patients.Those ten places have a total count of more than 2k and the most number of patients showed up were from JARDIM CAMBURI(count as 6252).

While comparing top 4 cities which has count more than 3k, (JARDIM CAMBURI,MARIA ORTIZ,RESISTÊNCIA,JARDIM DA PENHA) we came to know through Brazil map, JARDIM CAMBURI,MARIA ORTIZ and JARDIM DA PENHA belongs to State of Espírito Santo, Brazil and the third place city of RESISTÊNCIA is in Argentina, it is twinned with São Vicente, Brazil. From these places the patients were showed up to their appointments are higher when compared to other places.

To find out the days of the appointments for the patients.

```
In [55]: df_no['appointment_day']=pd.to_datetime(df_no['appointment_day'])
         df_no['appointment_day_week']=df_no['appointment_day'].dt.day_name()
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

```
See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#
  """Entry point for launching an IPython kernel.
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#
```

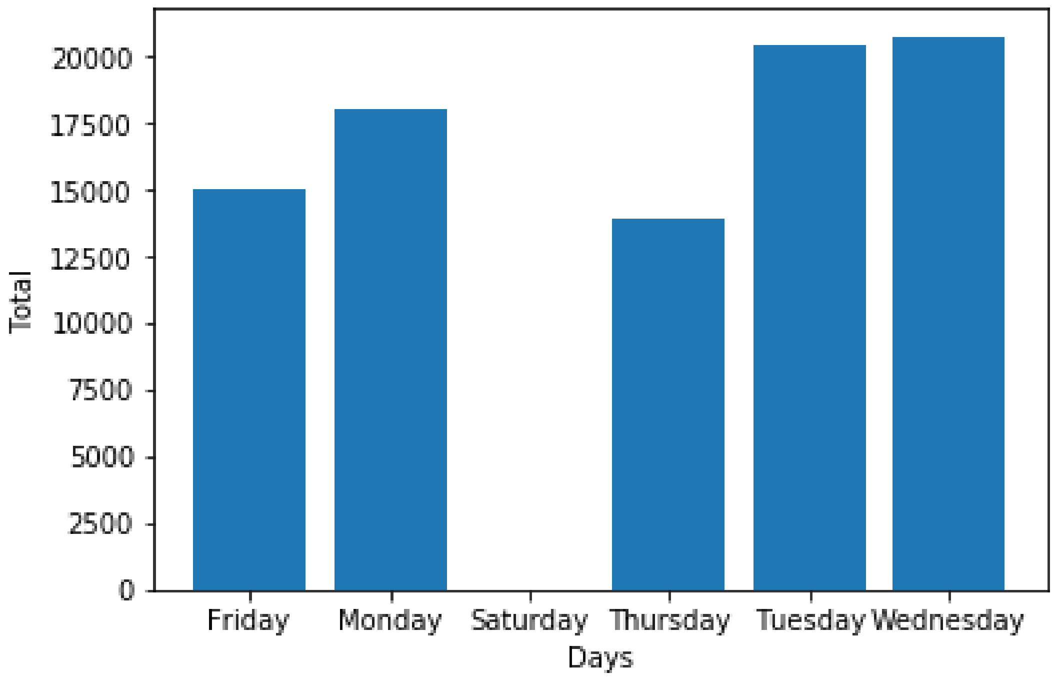
```
In [56]: df_no.head(2)
```

```
Out[56]:      patient_id  appointment_id gender appointment_day  age   neighbour_hood  \
         0  2.987250e+13         5642903      F      2016-04-29   62  JARDIM DA PENHA
         1  5.589978e+14         5642503      M      2016-04-29   56  JARDIM DA PENHA

            scholar_ship  hyper_tension  diabetes  alcoholism  handicap  sms_received  \
         0             0              1         0           0         0             0
         1             0              0         0           0         0             0

           no_show scheduled_date scheduled_time  interval appointment_day_week
         0      No     2016-04-29       18:38:08         0               Friday
         1      No     2016-04-29       16:08:27         0               Friday
```

```
In [57]: df_days=df_no.groupby('appointment_day_week').count()['patient_id'].reset_index()
         df_days
```

```
Out[57]:   appointment_day_week  patient_id
         0               Friday       14982
         1               Monday       18025
         2             Saturday          30
         3             Thursday       13909
         4              Tuesday       20488
         5            Wednesday       20774
```

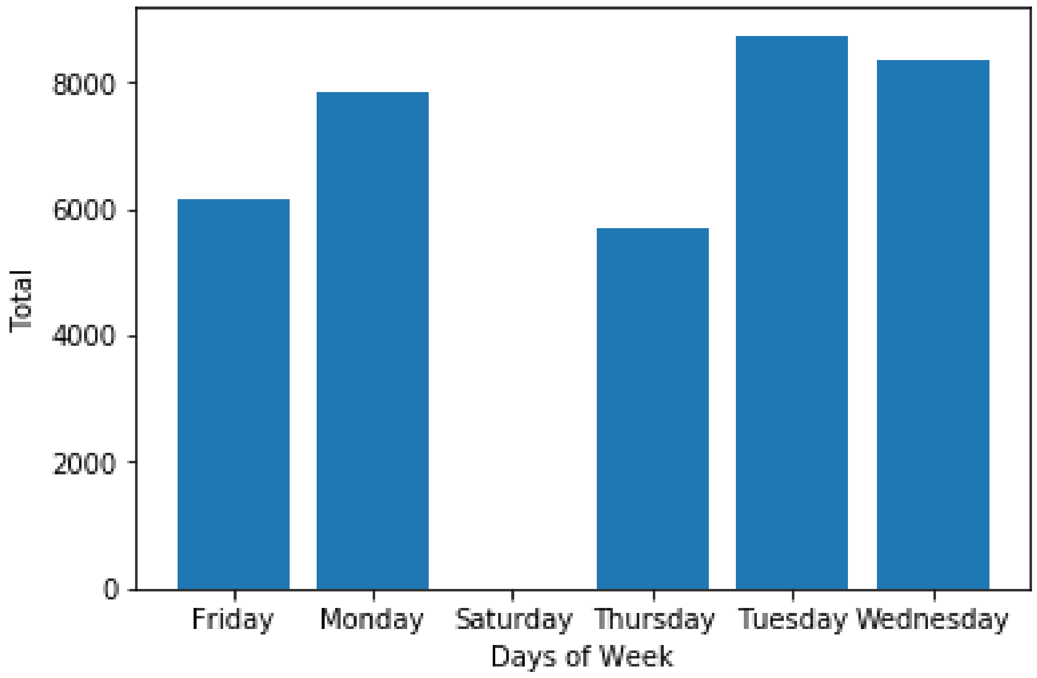
```
In [58]: plt.bar(df_days['appointment_day_week'],df_days['patient_id'])
         plt.xlabel('Days')
         plt.ylabel('Total')
         plt.title='count per days'
         plt.show()
```



As pe the above figure, the number of patients are high on Tuesday and Wednesday. Also on Monday. No records were given for Sunday, and Saturday has the minimum count of 30.

```
In [59]: df_days_interval = df_no.groupby(["appointment_day_week","interval"]).count()['patient_

In [60]: df_days_interval.head()

Out[60]:   appointment_day_week  interval  patient_id
         0               Friday         0        6140
         1               Friday         1         925
         2               Friday         2        1525
         3               Friday         3         584
         4               Friday         4         450

In [61]: df_days_interval = df_days_interval[df_days_interval['interval']<=8]

In [62]: df_days_interval.groupby('appointment_day_week').agg({'patient_id':'sum'}).reset_index(

Out[62]:   appointment_day_week  patient_id
         0               Friday       10300
         1               Monday       12818
         2             Saturday          25
         3             Thursday        9869
         4              Tuesday       14897
         5            Wednesday       14937
```

```
In [63]: #plt.bar(df_days_interval['appointment_day_week'],df_days_interval['patient_id'])
         #plt.xlabel("Days of Week")
         #plt.ylabel('Total')
         #plt.title('No. of patients per week')
         #plt.show()

         plt.bar(df_days_interval['appointment_day_week'],df_days_interval['patient_id'])
         plt.xlabel('Days of Week')
         plt.ylabel('Total')
         plt.title='No. of patients per week'
         plt.show()
```



```
In [64]: df_days_interval.sum()['patient_id']

Out[64]: 62846
```

So, out of 88k patients, 62846 were showed up within a week time of scheduled appointment and mostly on Tuesday,Wednesday and Monday.

Conclusions

With the above analysis, so far we knew that, 1) patients who has scheduled appointments within a week are showed up higher 2) Patients whose appointments on Tuesday, Wednesday are higher, even on Mondays too. 3) Patients from the places of JARDIM CAMBURI,MARIA ORTIZ,RESISTÊNCIA,JARDIM DA PENHA were showing up more than compared to others.

In order to predict if a patient will show up for the scheduled appointment, the important factors to be considered are Interval between scheduled day and appointment day, Day of the week and neighbourhood.

Limitations:

I have analysed this dataset only with the patients who showed up for their appointments and not focused on data of who was not showed up. Also if the appointment time and sms received time were provided along with the appointment date, the time duration between scheduled time and appointment time can be calculated, so that to know the number of patients who comes through walkins.

```
In [67]: from subprocess import call
         call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])

Out[67]: 0

In [ ]:
```