investigate_no_show_project

June 2, 2022

1 Project: Investigate a Dataset - [noshowappointments.csv]

1.1 Table of Contents

Introduction

Data Wrangling

Exploratory Data Analysis

Conclusions

Introduction

This analysis was carried out using a dataset from the health sector. The data collected showing No Show appointment and its factors.

1.1.1 Dataset Description

Tip: This dataset collects information from 100k medical appointments in Brazil and is focused on questions relating to patients rate of show up for their appointment. A number of characteristics about the patient are included in each row. Below is the column description of the data set in its raw for (prior to cleaning)

#	Column	Dtype
0	PatientId	float64

1 AppointmentID int64

2 Gender object

3 ScheduledDay object

4 AppointmentDay object

5 Age int64

6 Neighbourhood object

7 Scholarship int64

8 Hipertension int64

9 Diabetes int64

10 Alcoholism int64

11 Handcap int64

12 SMS_received int64

13 No-show object

1.1.2 Question(s) for Analysis

Question 1 What factors are important to know in order to predict if a patient will show up for their scheduled appointment? Using Age with No_show and Handicap with No_show

Question 2 Does gender of a patient impact on the number of no-shows?

[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
```

Data Wrangling

****: In this section of the report, the data set was loaded and was investigated to know the nature of the dataset.

[2]:
```
#data set loads here
df=pd.read_csv('noshowmedical.csv')
```

[3]:
```
df.head(20)
```

[3]:

	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	
5	9.598513e+13	5626772	F	2016-04-27T08:36:51Z	
6	7.336882e+14	5630279	F	2016-04-27T15:05:12Z	
7	3.449833e+12	5630575	F	2016-04-27T15:39:58Z	
8	5.639473e+13	5638447	F	2016-04-29T08:02:16Z	
9	7.812456e+13	5629123	F	2016-04-27T12:48:25Z	
10	7.345362e+14	5630213	F	2016-04-27T14:58:11Z	
11	7.542951e+12	5620163	M	2016-04-26T08:44:12Z	
12	5.666548e+14	5634718	F	2016-04-28T11:33:51Z	
13	9.113946e+14	5636249	M	2016-04-28T14:52:07Z	
14	9.988472e+13	5633951	F	2016-04-28T10:06:24Z	

15	9.994839e+10	5620206	F	2016-04-26T08:47:27Z
16	8.457439e+13	5633121	M	2016-04-28T08:51:47Z
17	1.479497e+13	5633460	F	2016-04-28T09:28:57Z
18	1.713538e+13	5621836	F	2016-04-26T10:54:18Z
19	7.223289e+12	5640433	F	2016-04-29T10:43:14Z

	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	
5	2016-04-29T00:00:00Z	76	REPÚBLICA	0	1	
6	2016-04-29T00:00:00Z	23	GOIABEIRAS	0	0	
7	2016-04-29T00:00:00Z	39	GOIABEIRAS	0	0	
8	2016-04-29T00:00:00Z	21	ANDORINHAS	0	0	
9	2016-04-29T00:00:00Z	19	CONQUISTA	0	0	
10	2016-04-29T00:00:00Z	30	NOVA PALESTINA	0	0	
11	2016-04-29T00:00:00Z	29	NOVA PALESTINA	0	0	
12	2016-04-29T00:00:00Z	22	NOVA PALESTINA	1	0	
13	2016-04-29T00:00:00Z	28	NOVA PALESTINA	0	0	
14	2016-04-29T00:00:00Z	54	NOVA PALESTINA	0	0	
15	2016-04-29T00:00:00Z	15	NOVA PALESTINA	0	0	
16	2016-04-29T00:00:00Z	50	NOVA PALESTINA	0	0	
17	2016-04-29T00:00:00Z	40	CONQUISTA	1	0	
18	2016-04-29T00:00:00Z	30	NOVA PALESTINA	1	0	
19	2016-04-29T00:00:00Z	46	DA PENHA	0	0	

	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
5	0	0	0	0	No
6	0	0	0	0	Yes
7	0	0	0	0	Yes
8	0	0	0	0	No
9	0	0	0	0	No
10	0	0	0	0	No
11	0	0	0	1	Yes
12	0	0	0	0	No
13	0	0	0	0	No
14	0	0	0	0	No
15	0	0	0	1	No
16	0	0	0	0	No
17	0	0	0	0	Yes

```
18          0            0         0              1       No
19          0            0         0              0       No
```

[4]:
```
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
```

[5]:
```
df.describe()
```

[5]:

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

	Hipertension	Diabetes	Alcoholism	Handcap	\
count	110527.000000	110527.000000	110527.000000	110527.000000	
mean	0.197246	0.071865	0.030400	0.022248	
std	0.397921	0.258265	0.171686	0.161543	
min	0.000000	0.000000	0.000000	0.000000	
25%	0.000000	0.000000	0.000000	0.000000	
50%	0.000000	0.000000	0.000000	0.000000	
75%	0.000000	0.000000	0.000000	0.000000	

```
max         1.000000       1.000000       1.000000       4.000000

        SMS_received
count  110527.000000
mean        0.321026
std         0.466873
min         0.000000
25%         0.000000
50%         0.000000
75%         1.000000
max         1.000000
```

[6]:
```
df.shape
```

[6]:
```
(110527, 14)
```

[7]:
```
df.corr()
```

[7]:
```
                PatientId  AppointmentID       Age  Scholarship  Hipertension  \
PatientId        1.000000       0.004039 -0.004139    -0.002880     -0.006441
AppointmentID    0.004039       1.000000 -0.019126     0.022615      0.012752
Age             -0.004139      -0.019126  1.000000    -0.092457      0.504586
Scholarship     -0.002880       0.022615 -0.092457     1.000000     -0.019729
Hipertension    -0.006441       0.012752  0.504586    -0.019729      1.000000
Diabetes         0.001605       0.022628  0.292391    -0.024894      0.433086
Alcoholism       0.011011       0.032944  0.095811     0.035022      0.087971
Handcap         -0.007916       0.014106  0.078033    -0.008586      0.080083
SMS_received    -0.009749      -0.256618  0.012643     0.001194     -0.006267

                Diabetes  Alcoholism   Handcap  SMS_received
PatientId       0.001605    0.011011 -0.007916     -0.009749
AppointmentID   0.022628    0.032944  0.014106     -0.256618
Age             0.292391    0.095811  0.078033      0.012643
Scholarship    -0.024894    0.035022 -0.008586      0.001194
Hipertension    0.433086    0.087971  0.080083     -0.006267
Diabetes        1.000000    0.018474  0.057530     -0.014550
Alcoholism      0.018474    1.000000  0.004648     -0.026147
Handcap         0.057530    0.004648  1.000000     -0.024161
SMS_received   -0.014550   -0.026147 -0.024161      1.000000
```

[8]:
```
df.isna().sum()
```

[8]:
```
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
```

[9]:
```
df.dtypes
```

[9]:
```
PatientId         float64
AppointmentID       int64
Gender             object
ScheduledDay       object
AppointmentDay     object
Age                 int64
Neighbourhood      object
Scholarship         int64
Hipertension        int64
Diabetes            int64
Alcoholism          int64
Handcap             int64
SMS_received        int64
No-show            object
dtype: object
```

1.1.3 Data Cleaning Section

**: I made changes to column names for more clarity,column datatypes for consistency and some values of some columns as seen below.

[10]:
```
#no-show having a dash could affect the code running.
#Therefore, it is of best preactice to replace dash(-) or space with an␣
 ↪underscore(_)

df.rename(columns={'No-show':'No_show'},inplace=True)
```

The 'No-show' column was succesfully renamed to 'No_show' and saved

[11]:
```
#confirm that the change has been made
df.head()
```

[11]:
```
      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
```

**Investigated Columns and their corresponding datatypes to make sure that everything column has an appropriate datatype

[12]:
```
#search for duplicates(none found)
df.duplicated().sum()
```

[12]:
```
0
```

There are no duplicate entries

[13]:
```
df.isna().sum()
```

[13]:
```
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
```

no null/NaN value is present

[14]:
```
#investigate column
df['PatientId'].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 110527 entries, 0 to 110526
Series name: PatientId
Non-Null Count   Dtype
--------------   -----
110527 non-null  float64
dtypes: float64(1)
memory usage: 863.6 KB
```

[15]:
```
#investigate column
df['PatientId'].head()
```

[15]:
```
0    2.987250e+13
1    5.589978e+14
2    4.262962e+12
3    8.679512e+11
4    8.841186e+12
Name: PatientId, dtype: float64
```

[16]:
```
df['PatientId']=df['PatientId'].astype(int)
```

"PatientId" columnn data type has now been converted to an Int data type

[17]:
```
df['PatientId'].head(15)
```

[17]:
```
0      29872499824296
1     558997776694438
2       4262962299951
3        867951213174
4       8841186448183
5      95985133231274
6     733688164476661
7       3449833394123
8      56394729949972
9      78124564369297
10    734536231958495
11      7542951368435
12    566654781423437
13    911394617215919
14     99884723334928
Name: PatientId, dtype: int64
```

[18]:
```
df.dtypes
```

[18]:
```
PatientId          int64
AppointmentID      int64
Gender            object
ScheduledDay      object
AppointmentDay    object
Age                int64
Neighbourhood     object
Scholarship        int64
Hipertension       int64
Diabetes           int64
Alcoholism         int64
Handcap            int64
SMS_received       int64
No_show           object
dtype: object
```

[19]:
```
#Further cleaning of columns ScheduledDay and AppointmentDay to a DateTime␣
↪format
df[['ScheduledDay','AppointmentDay']]
```

[19]:
```
                ScheduledDay        AppointmentDay
0       2016-04-29T18:38:08Z  2016-04-29T00:00:00Z
1       2016-04-29T16:08:27Z  2016-04-29T00:00:00Z
2       2016-04-29T16:19:04Z  2016-04-29T00:00:00Z
3       2016-04-29T17:29:31Z  2016-04-29T00:00:00Z
4       2016-04-29T16:07:23Z  2016-04-29T00:00:00Z
…                        …                   …
110522  2016-05-03T09:15:35Z  2016-06-07T00:00:00Z
110523  2016-05-03T07:27:33Z  2016-06-07T00:00:00Z
110524  2016-04-27T16:03:52Z  2016-06-07T00:00:00Z
110525  2016-04-27T15:09:23Z  2016-06-07T00:00:00Z
110526  2016-04-27T13:30:56Z  2016-06-07T00:00:00Z

[110527 rows x 2 columns]
```

[20]:
```
df['ScheduledDay'] = pd.to_datetime(df.ScheduledDay)
df['AppointmentDay'] = pd.to_datetime(df.AppointmentDay)
df.head()
```

[20]:
```
          PatientId  AppointmentID Gender              ScheduledDay  \
0   29872499824296        5642903      F 2016-04-29 18:38:08+00:00
1  558997776694438        5642503      M 2016-04-29 16:08:27+00:00
2    4262962299951        5642549      F 2016-04-29 16:19:04+00:00
3     867951213174        5642828      F 2016-04-29 17:29:31+00:00
4    8841186448183        5642494      F 2016-04-29 16:07:23+00:00

             AppointmentDay  Age      Neighbourhood  Scholarship  \
```

```
0 2016-04-29 00:00:00+00:00   62    JARDIM DA PENHA            0
1 2016-04-29 00:00:00+00:00   56    JARDIM DA PENHA            0
2 2016-04-29 00:00:00+00:00   62      MATA DA PRAIA            0
3 2016-04-29 00:00:00+00:00    8  PONTAL DE CAMBURI            0
4 2016-04-29 00:00:00+00:00   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
```

ScheduledDay and AppointmentDay have been converted to DateTime datatypes

[21]:
```
df.dtypes
```

[21]:
```
PatientId                       int64
AppointmentID                   int64
Gender                         object
ScheduledDay      datetime64[ns, UTC]
AppointmentDay    datetime64[ns, UTC]
Age                             int64
Neighbourhood                  object
Scholarship                     int64
Hipertension                    int64
Diabetes                        int64
Alcoholism                      int64
Handcap                         int64
SMS_received                    int64
No_show                        object
dtype: object
```

[22]:
```
df.head()
```

[22]:
```
         PatientId  AppointmentID Gender              ScheduledDay  \
0   29872499824296        5642903      F 2016-04-29 18:38:08+00:00
1  558997776694438        5642503      M 2016-04-29 16:08:27+00:00
2    4262962299951        5642549      F 2016-04-29 16:19:04+00:00
3     867951213174        5642828      F 2016-04-29 17:29:31+00:00
4    8841186448183        5642494      F 2016-04-29 16:07:23+00:00

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

```
4 2016-04-29 00:00:00+00:00   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
```

Having gone through the data clelaning process, one of my major goals is for the dataset to be consistent across board.

[23]:
```
df.No_show.replace({'Yes': 1, 'No': 0}, inplace=True)
```

No_show has been replaced with 1 and 0 so as to be consistent with Scholarship,Hipertension,Diabetes,Alcoholism,Handcap and SMS_received

[24]:
```
df.head()
```

[24]:
```
          PatientId  AppointmentID Gender              ScheduledDay  \
0   29872499824296        5642903      F 2016-04-29 18:38:08+00:00
1  558997776694438        5642503      M 2016-04-29 16:08:27+00:00
2    4262962299951        5642549      F 2016-04-29 16:19:04+00:00
3     867951213174        5642828      F 2016-04-29 17:29:31+00:00
4    8841186448183        5642494      F 2016-04-29 16:07:23+00:00

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

   Hipertension  Diabetes  Alcoholism  Handcap  SMS_received  No_show
0             1         0           0        0             0        0
1             0         0           0        0             0        0
2             0         0           0        0             0        0
3             0         0           0        0             0        0
4             1         1           0        0             0        0
```

[25]:
```
df.dtypes
```

[25]:
```
PatientId                      int64
AppointmentID                  int64
Gender                        object
ScheduledDay      datetime64[ns, UTC]
AppointmentDay    datetime64[ns, UTC]
Age                            int64
```

```
Neighbourhood                   object
Scholarship                      int64
Hipertension                     int64
Diabetes                         int64
Alcoholism                       int64
Handcap                          int64
SMS_received                     int64
No_show                          int64
dtype: object
```

[26]:
```
df.Gender.replace({'F':0,'M':1},inplace=True)
```

[27]:
```
df.Gender
```

[27]:
```
0         0
1         1
2         0
3         0
4         0
         ..
110522    0
110523    0
110524    0
110525    0
110526    0
Name: Gender, Length: 110527, dtype: int64
```

Gender column has been replaced with 0 for F and 1 for M. This was done for easy comparisons with other columns in future

[28]:
```
dropC = ['AppointmentID']
df.drop(dropC, axis=1, inplace=True)
```

[29]:
```
df.head(3)
```

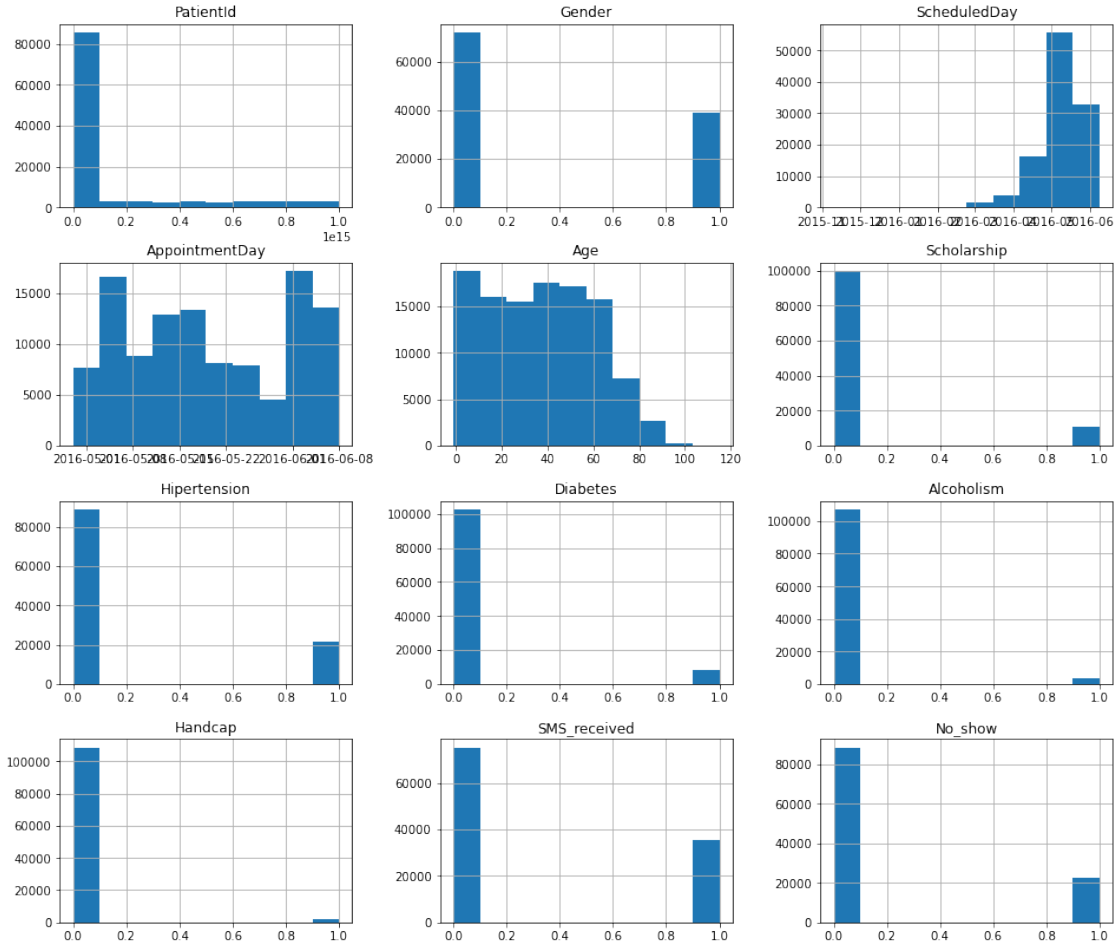
[29]:
```
          PatientId  Gender              ScheduledDay  \
0   29872499824296       0 2016-04-29 18:38:08+00:00
1  558997776694438       1 2016-04-29 16:08:27+00:00
2    4262962299951       0 2016-04-29 16:19:04+00:00

              AppointmentDay  Age    Neighbourhood  Scholarship  Hipertension  \
0 2016-04-29 00:00:00+00:00   62  JARDIM DA PENHA            0             1
1 2016-04-29 00:00:00+00:00   56  JARDIM DA PENHA            0             0
2 2016-04-29 00:00:00+00:00   62    MATA DA PRAIA            0             0

   Diabetes  Alcoholism  Handcap  SMS_received  No_show
0         0           0        0             0        0
```

1	0	0	0	0	0
2	0	0	0	0	0

Since every appointmentID is unique, it will be of less or no use to the data analysis hence the column was dropped.

[30]:
```
df.Handcap= df.Handcap.astype(bool)
df.Handcap.replace({ True: 1, False: 0}, inplace=True)
```

[31]:
```
df.hist(figsize=(16,14));
```



1.1.4 Data Cleaning Conclusion

1. **The dataset datatypes have be regularized to suit it's corresponding data.**
2. **There were no duplicates nor null values in the data.**
3. **No_show values were changed to a binary type values of 0's and 1's**

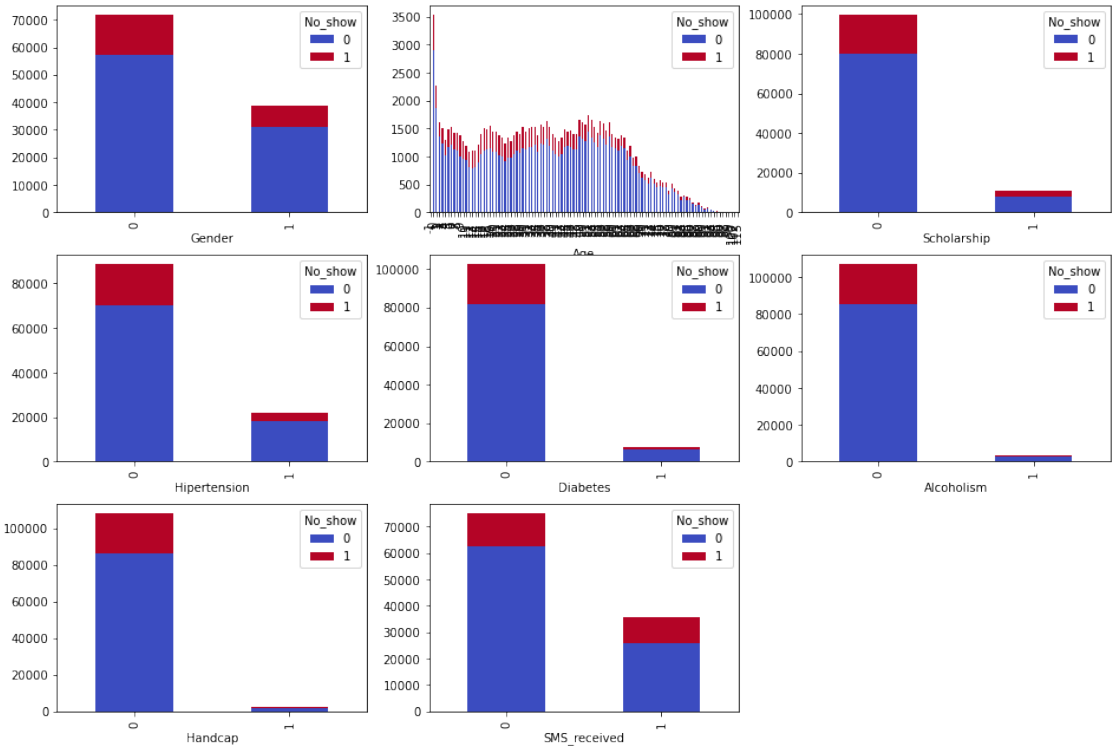
Exploratory Data Analysis

1.1.5 Research Question 1: What factors are important to know in order to predict if a patient will show up for their scheduled appointment?

Here , the question will be answered by drawing comparisons between 'Handicap' and 'No_show' to show that being handicapped is an important factor to predict no show.

The second comparison will be between 'Age' and 'no show'. Does Age play a significant role in no show appointments?

[32]:
```
factors=['Gender','Age', 'Scholarship', 'Hipertension', 'Diabetes',␣
↪'Alcoholism', 'Handcap', 'SMS_received']

fig = plt.figure(figsize=(16, 11))
for i, var in enumerate(factors):
    ax = fig.add_subplot(3, 3, i+1)
    df.groupby([var, 'No_show'])[var].count().unstack('No_show').plot(ax=ax,␣
↪kind='bar', stacked=True,cmap='coolwarm')
```



[33]:
```
def groupHandshow(normalize=True):
    return df.groupby(['Handcap'])['No_show'].value_counts(normalize)
```

1.2 custom function

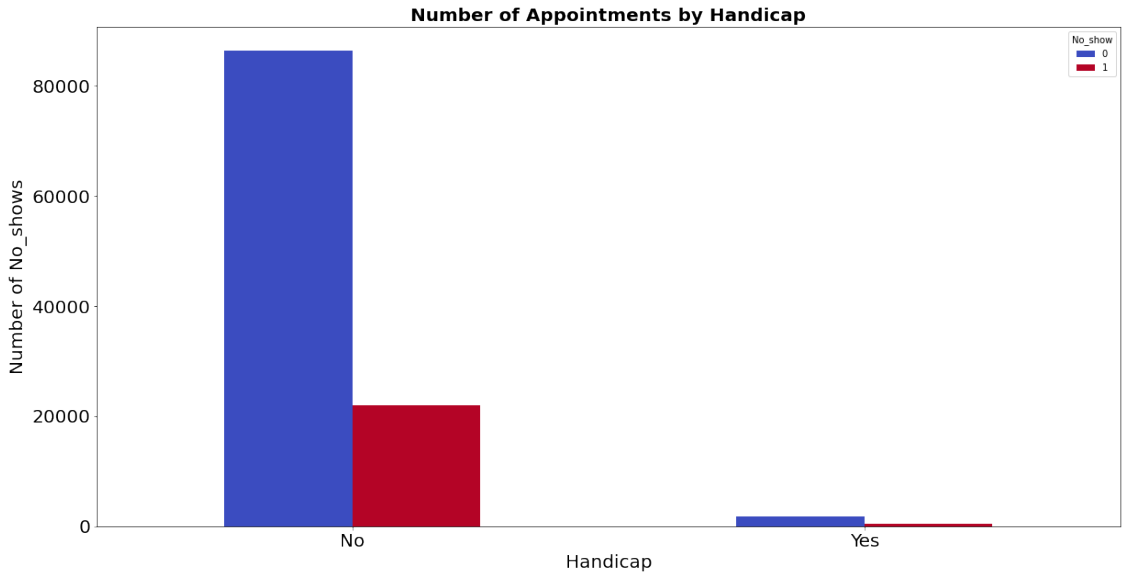
**To groupby Gender then do a value_count with respect to No_show column. This accepts a parameter value for normalization

[34]:
```
groupHandshow(False)
```

[34]:
```
Handcap  No_show
0        0          86374
         1          21912
1        0           1834
         1            407
Name: No_show, dtype: int64
```

[35]:
```
# Use this, and more code cells, to explore your data. Don't forget to add
#   Markdown cells to document your observations and findings.
tcks = groupHandshow(False).unstack().index

handshow=groupHandshow(False).unstack().
 ↪plot(kind='bar',cmap='coolwarm',figsize=(20,10),fontsize=20);

plt.xticks(tcks, ('No', 'Yes'), rotation ='horizontal');
handshow.set_xlabel('Handicap',fontsize=20);
plt.ylabel("Number of No_shows",fontsize=20);
plt.title('Number of Appointments by Handicap',fontsize=20,weight='bold')
```

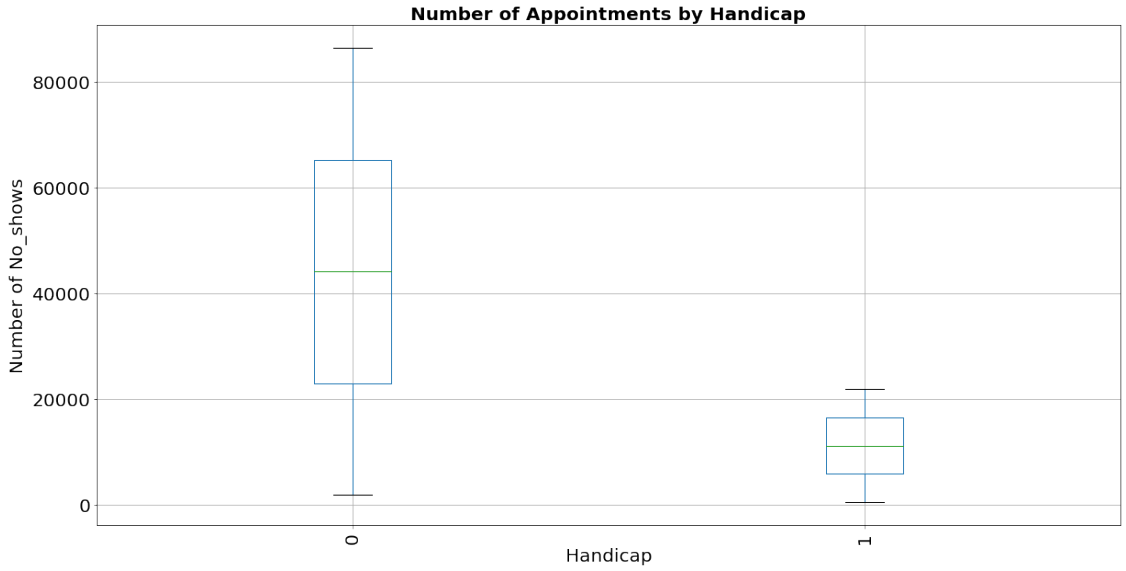
[35]:
```
Text(0.5, 1.0, 'Number of Appointments by Handicap')
```



This shows how being handicap is a factor for no show appointments. This might be as a result of public buildings(in this case hospital) not being wheel-chair accessible or handicap patients not having caregivers

[40]:
```
bxplt=groupHandshow(False).unstack().boxplot(rot=90,figsize=(20,10),fontsize=20)
bxplt.set_ylabel("Number of No_shows",fontsize=20)
bxplt.set_xlabel("Handicap",fontsize=20)
plt.title('Number of Appointments by Handicap',fontsize=20,weight='bold')
```

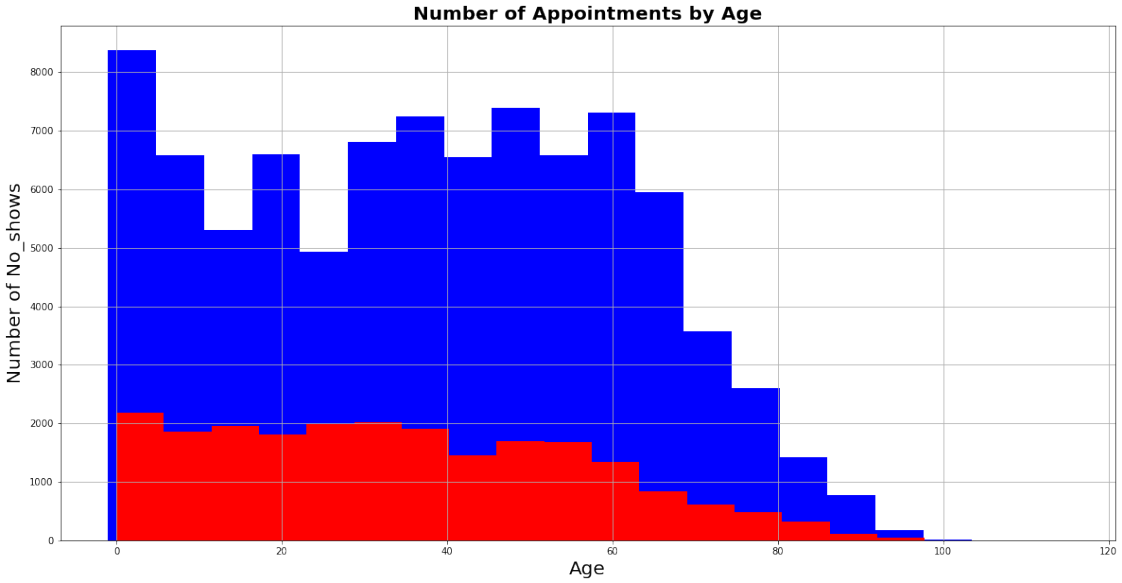
[40]:
```
Text(0.5, 1.0, 'Number of Appointments by Handicap')
```



[41]:
```
# Two useful masks to be used in further analysis
showed = df.No_show == 0
not_showed = df.No_show == 1
```

[42]:
```
histpl=df.Age[showed].hist(alpha=1, bins=20,color = "Blue",figsize=(20,10));
histpl=df.Age[not_showed].hist(alpha=1, bins=20, color = "Red",figsize=(20,10));
histpl.set_ylabel("Number of No_shows",fontsize=20)
histpl.set_xlabel("Age",fontsize=20)
histpl.set_title('Number of Appointments by Age',fontsize=20,weight='bold')
```

[42]:
```
Text(0.5, 1.0, 'Number of Appointments by Age')
```



The above plot shows that babies show up more than people of 55-80

[ ]:

1.2.1 Research Question 2 (Does gender of a patient impact on the number of no-shows?)

[43]:
```
df.groupby('Gender',axis=0).head()
```

[43]:

	PatientId	Gender	ScheduledDay	AppointmentDay	Age	Neighbourhood	Scholarship
0	29872499824296	0	2016-04-29 18:38:08+00:00	2016-04-29 00:00:00+00:00	62	JARDIM DA PENHA	0
1	558997776694438	1	2016-04-29 16:08:27+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	0
2	4262962299951	0	2016-04-29 16:19:04+00:00	2016-04-29 00:00:00+00:00	62	MATA DA PRAIA	0
3	867951213174	0	2016-04-29 17:29:31+00:00	2016-04-29 00:00:00+00:00	8	PONTAL DE CAMBURI	0
4	8841186448183	0	2016-04-29 16:07:23+00:00	2016-04-29 00:00:00+00:00	56	JARDIM DA PENHA	0
5	95985133231274	0	2016-04-27 08:36:51+00:00	2016-04-29 00:00:00+00:00	76	REPÚBLICA	0
11	7542951368435	1	2016-04-26 08:44:12+00:00	2016-04-29 00:00:00+00:00	23	GOIABEIRAS	0
13	911394617215919	1	2016-04-28 14:52:07+00:00	2016-04-29 00:00:00+00:00	39	GOIABEIRAS	0
16	84574392942817	1	2016-04-28 08:51:47+00:00	2016-04-29 00:00:00+00:00	21	GOIABEIRAS	0
22	863229818887631	1	2016-04-25 13:29:16+00:00	2016-04-29 00:00:00+00:00	19	GOIABEIRAS	0

```
11 2016-04-29 00:00:00+00:00   29     NOVA PALESTINA            0
13 2016-04-29 00:00:00+00:00   28     NOVA PALESTINA            0
16 2016-04-29 00:00:00+00:00   50     NOVA PALESTINA            0
22 2016-04-29 00:00:00+00:00   13          CONQUISTA            0

    Hipertension  Diabetes  Alcoholism  Handcap  SMS_received  No_show
0              1         0           0        0             0        0
1              0         0           0        0             0        0
2              0         0           0        0             0        0
3              0         0           0        0             0        0
4              1         1           0        0             0        0
5              1         0           0        0             0        0
11             0         0           0        0             1        1
13             0         0           0        0             0        0
16             0         0           0        0             0        0
22             0         0           0        0             1        1
```

[44]:
```
df.Gender.value_counts()
```

[44]:
```
0    71840
1    38687
Name: Gender, dtype: int64
```

There are more Females in the data set than Males . This can be as a result of population distribution or one gender having the tendecy of looking after their health

[45]:
```
def groupGenshow(normalize=True):
    return df.groupby(['Gender'])['No_show'].value_counts(normalize)
```

1.2.2 custom function

**To groupby Gender then do a value_count with respect to No_show column. This accepts a parameter value for normalization

[46]:
```
groupGenshow(True).unstack()
```

[46]:
```
No_show         0         1
Gender
0        0.796854  0.203146
1        0.800321  0.199679
```

The above returns the relative frequency by dividing all values by the sum of values. The difference in ratio .

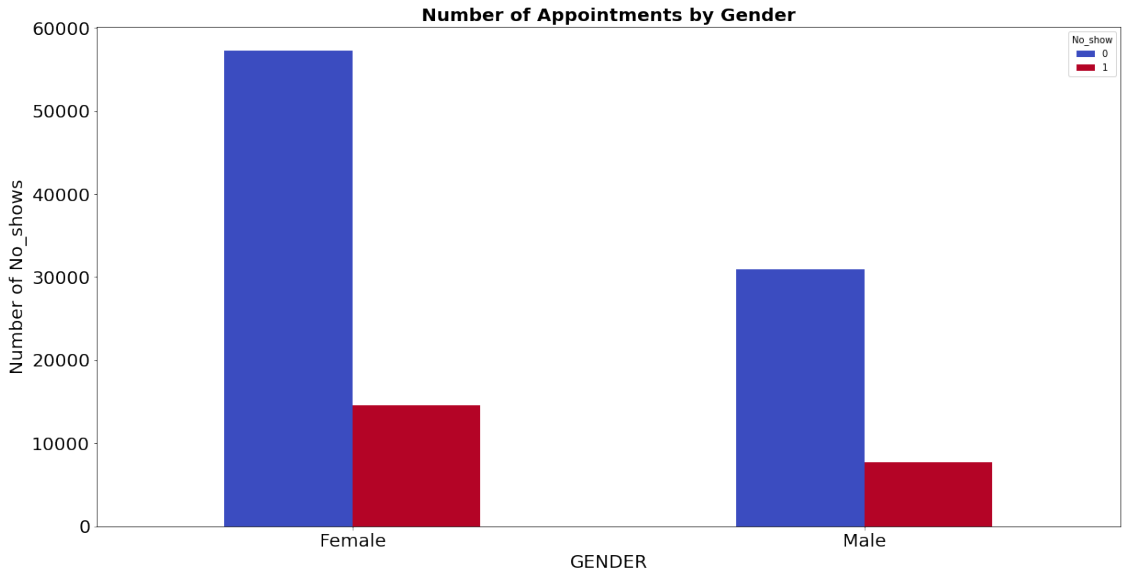
[47]:
```
groupGenshow(False)
```

[47]:
```
Gender  No_show
0       0          57246
```

```
         1          14594
1        0          30962
         1           7725
Name: No_show, dtype: int64
```

[48]:
```
# Use this, and more code cells, to explore your data. Don't forget to add
#   Markdown cells to document your observations and findings.
tcks = groupGenshow(False).unstack().index

gendshow=groupGenshow(False).unstack().
 ↪plot(kind='bar',cmap='coolwarm',figsize=(20,10),fontsize=20);

plt.xticks(tcks, ('Female', 'Male'), rotation ='horizontal');
gendshow.set_xlabel('GENDER',fontsize=20);
plt.ylabel("Number of No_shows",fontsize=20);
plt.title('Number of Appointments by Gender',weight='bold',fontsize=20)
```

[48]:
```
Text(0.5, 1.0, 'Number of Appointments by Gender')
```

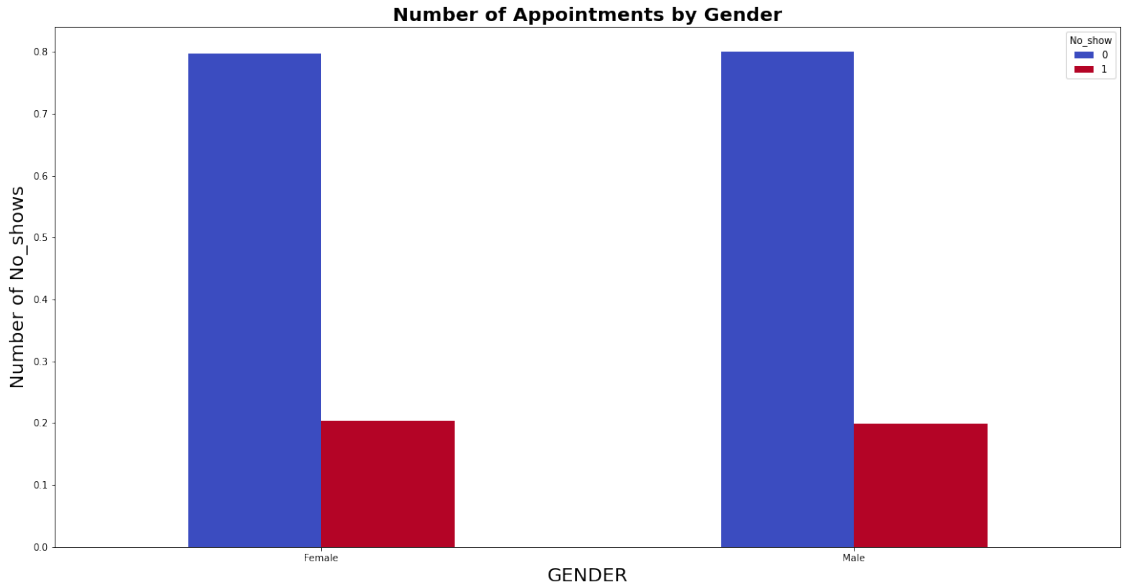


The above plot show the distribution of gender with respect to no show appointments

[49]:
```
# Use this, and more code cells, to explore your data. Don't forget to add
#   Markdown cells to document your observations and findings.
tcks = groupGenshow(True).unstack().index

gendshow=groupGenshow(True).unstack().
 ↪plot(kind='bar',cmap='coolwarm',figsize=(20,10));
```

```
plt.xticks(tcks, ('Female', 'Male'), rotation ='horizontal');
gendshow.set_xlabel('GENDER',fontsize=20);
plt.ylabel("Number of No_shows",fontsize=20);
plt.title('Number of Appointments by Gender',weight='bold',fontsize=20)
```

[49]: `Text(0.5, 1.0, 'Number of Appointments by Gender')`



The plot above shows that there is little or no difference in the ratio of no shows across genders

[ ]:

Conclusions

Tip: The dataset has been thoroghly looked at and analyzed. The No Show Appointment dataset had columns that needed to be tweaked in order to maintain consistency. To do this, I renamed some columns,analzied the datatypes and changed datatypes like that of PatientID to Int, ScheduledDay to Datetime(ns UTC) etc.

Limitation: The chosen dataset had lots of columns with values of zeroes and ones. This made it difficult to carry out further analysis

[91]:
```
from subprocess import call
call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])
```

```
This application is used to convert notebook files (*.ipynb)
        to various other formats.

        WARNING: THE COMMANDLINE INTERFACE MAY CHANGE IN FUTURE RELEASES.

Options
```

```
=======
The options below are convenience aliases to configurable class-options,
as listed in the "Equivalent to" description-line of the aliases.
To see all configurable class-options for some <cmd>, use:
    <cmd> --help-all

--debug
    set log level to logging.DEBUG (maximize logging output)
    Equivalent to: [--Application.log_level=10]
--show-config
    Show the application's configuration (human-readable format)
    Equivalent to: [--Application.show_config=True]
--show-config-json
    Show the application's configuration (json format)
    Equivalent to: [--Application.show_config_json=True]
--generate-config
    generate default config file
    Equivalent to: [--JupyterApp.generate_config=True]
-y
    Answer yes to any questions instead of prompting.
    Equivalent to: [--JupyterApp.answer_yes=True]
--execute
    Execute the notebook prior to export.
    Equivalent to: [--ExecutePreprocessor.enabled=True]
--allow-errors
    Continue notebook execution even if one of the cells throws an error and
include the error message in the cell output (the default behaviour is to abort
conversion). This flag is only relevant if '--execute' was specified, too.
    Equivalent to: [--ExecutePreprocessor.allow_errors=True]
--stdin
    read a single notebook file from stdin. Write the resulting notebook with
default basename 'notebook.*'
    Equivalent to: [--NbConvertApp.from_stdin=True]
--stdout
    Write notebook output to stdout instead of files.
    Equivalent to: [--NbConvertApp.writer_class=StdoutWriter]
--inplace
    Run nbconvert in place, overwriting the existing notebook (only
            relevant when converting to notebook format)
    Equivalent to: [--NbConvertApp.use_output_suffix=False
--NbConvertApp.export_format=notebook --FilesWriter.build_directory=]
--clear-output
    Clear output of current file and save in place,
            overwriting the existing notebook.
    Equivalent to: [--NbConvertApp.use_output_suffix=False
--NbConvertApp.export_format=notebook --FilesWriter.build_directory=
--ClearOutputPreprocessor.enabled=True]
--no-prompt
```

```
    Exclude input and output prompts from converted document.
    Equivalent to: [--TemplateExporter.exclude_input_prompt=True
--TemplateExporter.exclude_output_prompt=True]
--no-input
    Exclude input cells and output prompts from converted document.
            This mode is ideal for generating code-free reports.
    Equivalent to: [--TemplateExporter.exclude_output_prompt=True
--TemplateExporter.exclude_input=True
--TemplateExporter.exclude_input_prompt=True]
--allow-chromium-download
    Whether to allow downloading chromium if no suitable version is found on the
system.
    Equivalent to: [--WebPDFExporter.allow_chromium_download=True]
--log-level=<Enum>
    Set the log level by value or name.
    Choices: any of [0, 10, 20, 30, 40, 50, 'DEBUG', 'INFO', 'WARN', 'ERROR',
'CRITICAL']
    Default: 30
    Equivalent to: [--Application.log_level]
--config=<Unicode>
    Full path of a config file.
    Default: ''
    Equivalent to: [--JupyterApp.config_file]
--to=<Unicode>
    The export format to be used, either one of the built-in formats
            ['asciidoc', 'custom', 'html', 'latex', 'markdown', 'notebook',
'pdf', 'python', 'rst', 'script', 'slides', 'webpdf']
            or a dotted object name that represents the import path for an
            ``Exporter`` class
    Default: ''
    Equivalent to: [--NbConvertApp.export_format]
--template=<Unicode>
    Name of the template to use
    Default: ''
    Equivalent to: [--TemplateExporter.template_name]
--template-file=<Unicode>
    Name of the template file to use
    Default: None
    Equivalent to: [--TemplateExporter.template_file]
--writer=<DottedObjectName>
    Writer class used to write the
                                        results of the conversion
    Default: 'FilesWriter'
    Equivalent to: [--NbConvertApp.writer_class]
--post=<DottedOrNone>
    PostProcessor class used to write the
                                        results of the conversion
    Default: ''
```

```
    Equivalent to: [--NbConvertApp.postprocessor_class]
--output=<Unicode>
    overwrite base name use for output files.
                can only be used when converting one notebook at a time.
    Default: ''
    Equivalent to: [--NbConvertApp.output_base]
--output-dir=<Unicode>
    Directory to write output(s) to. Defaults
                                    to output to the directory of each notebook.
To recover
                                    previous default behaviour (outputting to the
current
                                    working directory) use . as the flag value.
    Default: ''
    Equivalent to: [--FilesWriter.build_directory]
--reveal-prefix=<Unicode>
    The URL prefix for reveal.js (version 3.x).
            This defaults to the reveal CDN, but can be any url pointing to a
copy
            of reveal.js.
            For speaker notes to work, this must be a relative path to a local
            copy of reveal.js: e.g., "reveal.js".
            If a relative path is given, it must be a subdirectory of the
            current directory (from which the server is run).
            See the usage documentation
            (https://nbconvert.readthedocs.io/en/latest/usage.html#reveal-js-
html-slideshow)
            for more details.
    Default: ''
    Equivalent to: [--SlidesExporter.reveal_url_prefix]
--nbformat=<Enum>
    The nbformat version to write.
            Use this to downgrade notebooks.
    Choices: any of [1, 2, 3, 4]
    Default: 4
    Equivalent to: [--NotebookExporter.nbformat_version]

Examples
--------

    The simplest way to use nbconvert is

            > jupyter nbconvert mynotebook.ipynb --to html

            Options include ['asciidoc', 'custom', 'html', 'latex', 'markdown',
'notebook', 'pdf', 'python', 'rst', 'script', 'slides', 'webpdf'].

            > jupyter nbconvert --to latex mynotebook.ipynb
```

```
            Both HTML and LaTeX support multiple output templates. LaTeX
includes
            'base', 'article' and 'report'.  HTML includes 'basic' and 'full'.
You
            can specify the flavor of the format used.

            > jupyter nbconvert --to html --template lab mynotebook.ipynb

            You can also pipe the output to stdout, rather than a file

            > jupyter nbconvert mynotebook.ipynb --stdout

            PDF is generated via latex

            > jupyter nbconvert mynotebook.ipynb --to pdf

            You can get (and serve) a Reveal.js-powered slideshow

            > jupyter nbconvert myslides.ipynb --to slides --post serve

            Multiple notebooks can be given at the command line in a couple of
            different ways:

            > jupyter nbconvert notebook*.ipynb
            > jupyter nbconvert notebook1.ipynb notebook2.ipynb

            or you can specify the notebooks list in a config file, containing::

                c.NbConvertApp.notebooks = ["my_notebook.ipynb"]

            > jupyter nbconvert --config mycfg.py

To see all available configurables, use `--help-all`.

[NbConvertApp] WARNING | pattern 'Investigate_a_Dataset.ipynb' matched no files
```

[91]: 255

[ ]:

[ ]:

[ ]: