EDA

Importing Libraries

In [1]:

```
#!pip install pivottablejs
#!pip install sweetviz
#!pip install dataprep
```

In [2]:

```
import pandas as pd
import numpy as np
import sweetviz as sv
import seaborn as sns
import matplotlib.pyplot as plt
```

Reading the dataframe

Reading csv

In [3]:

```
df=pd.read_csv('Files/'+'Covid Data.csv')
df.head()
```

Out[3]:

	USMER	MEDICAL_UNIT	SEX	PATIENT_TYPE	DATE_DIED	INTUBED	PNEUMONIA	AGE	PREGNANT
0	2	1	1	1	03/05/2020	97	1	65	2
1	2	1	2	1	03/06/2020	97	1	72	97
2	2	1	2	2	09/06/2020	1	2	55	97
3	2	1	1	1	12/06/2020	97	2	53	2
4	2	1	2	1	21/06/2020	97	2	68	97

5 rows × 21 columns

Exploration of the rows and columns

Counting nulls

```
In [4]: df.isna().sum()
```

```
Out[4]: USMER                   0
        MEDICAL_UNIT            0
        SEX                     0
        PATIENT_TYPE            0
        DATE_DIED               0
        INTUBED                 0
        PNEUMONIA               0
        AGE                     0
        PREGNANT                0
        DIABETES                0
        COPD                    0
        ASTHMA                  0
        INMSUPR                 0
        HIPERTENSION            0
        OTHER_DISEASE           0
        CARDIOVASCULAR          0
        OBESITY                 0
        RENAL_CHRONIC           0
        TOBACCO                 0
        CLASIFFICATION_FINAL    0
        ICU                     0
        dtype: int64
```

The dataframe appears to be free of null values; however, this is due to the replacement of nulls with numbers and tags for machine learning algorithm compatibility. To view the authentic data, we will substitute these numbers with their corresponding tags.

```
In [5]: df.columns
```

```
Out[5]: Index(['USMER', 'MEDICAL_UNIT', 'SEX', 'PATIENT_TYPE', 'DATE_DIED', 'INTUBED',
               'PNEUMONIA', 'AGE', 'PREGNANT', 'DIABETES', 'COPD', 'ASTHMA', 'INMSUPR',
               'HIPERTENSION', 'OTHER_DISEASE', 'CARDIOVASCULAR', 'OBESITY',
               'RENAL_CHRONIC', 'TOBACCO', 'CLASIFFICATION_FINAL', 'ICU'],
              dtype='object')
```

Columns amount

```
In [6]: len(df.columns)
```

```
Out[6]: 21
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1048575 entries, 0 to 1048574
Data columns (total 21 columns):
 #   Column                Non-Null Count    Dtype 
---  ------                --------------    ----- 
 0   USMER                 1048575 non-null  int64 
 1   MEDICAL_UNIT          1048575 non-null  int64 
 2   SEX                   1048575 non-null  int64 
 3   PATIENT_TYPE          1048575 non-null  int64 
 4   DATE_DIED             1048575 non-null  object
 5   INTUBED               1048575 non-null  int64 
 6   PNEUMONIA             1048575 non-null  int64 
 7   AGE                   1048575 non-null  int64 
 8   PREGNANT              1048575 non-null  int64 
 9   DIABETES              1048575 non-null  int64 
 10  COPD                  1048575 non-null  int64 
 11  ASTHMA                1048575 non-null  int64 
 12  INMSUPR               1048575 non-null  int64 
 13  HIPERTENSION          1048575 non-null  int64 
 14  OTHER_DISEASE         1048575 non-null  int64 
 15  CARDIOVASCULAR        1048575 non-null  int64 
 16  OBESITY               1048575 non-null  int64 
 17  RENAL_CHRONIC         1048575 non-null  int64 
 18  TOBACCO               1048575 non-null  int64 
 19  CLASIFFICATION_FINAL  1048575 non-null  int64 
 20  ICU                   1048575 non-null  int64 
dtypes: int64(20), object(1)
memory usage: 168.0+ MB
```

Most of the columns are integer, except date died which should be a datetime column, but is object (string). Let's make the required changes.

Data cleaning

Let's replace the values 97, 98 and 99 with NaN (null), as it was mentioned in the dataset description.

In [8]:
```
columns_to_exclude = ['USMER', 'MEDICAL_UNIT', 'AGE', 'CLASIFFICATION_FINAL']

df.loc[:, ~df.columns.isin(columns_to_exclude)] = df.loc[:, ~df.columns.isin(columns_
```

We need to replace the '9999-99-99' value by null

In [9]:
```
df['DIED'] = df['DATE_DIED'].apply(lambda x: 'no' if x == '9999-99-99' else ('yes' if
```

In [10]:
```
# Replace '9999-99-99' in the 'DATE_DIED' column with NaN (null)
df['DATE_DIED'] = df['DATE_DIED'].replace({'9999-99-99': np.nan})

# Convert 'DATE_DIED' column to datetime
df['DATE_DIED'] = pd.to_datetime(df['DATE_DIED'])
```

```
C:\Users\edwin\AppData\Local\Temp\ipykernel_34500\1449240428.py:5: UserWarning: Pars
ing dates in DD/MM/YYYY format when dayfirst=False (the default) was specified. This
may lead to inconsistently parsed dates! Specify a format to ensure consistent parsi
ng.
  df['DATE_DIED'] = pd.to_datetime(df['DATE_DIED'])
```

Then need to change tags for each column.

In [11]:

```
# Replace numerical values with tags
replacement_mapping = {
    'SEX': {1: 'Female', 2: 'Male'},
    'PATIENT_TYPE': {1: 'Returned Home', 2: 'Hospitalization'},
    'INTUBED': {1: 'Yes', 2: 'No'},
    'PNEUMONIA': {1: 'Yes', 2: 'No'},
    'PREGNANT': {1: 'Yes', 2: 'No'},
    'DIABETES': {1: 'Yes', 2: 'No'},
    'COPD': {1: 'Yes', 2: 'No'},
    'ASTHMA': {1: 'Yes', 2: 'No'},
    'INMSUPR': {1: 'Yes', 2: 'No'},
    'HIPERTENSION': {1: 'Yes', 2: 'No'},
    'OTHER_DISEASE': {1: 'Yes', 2: 'No'},
    'CARDIOVASCULAR': {1: 'Yes', 2: 'No'},
    'OBESITY': {1: 'Yes', 2: 'No'},
    'RENAL_CHRONIC': {1: 'Yes', 2: 'No'},
    'TOBACCO': {1: 'Yes', 2: 'No'},
    'CLASIFFICATION_FINAL': {1: 'COVID-1', 2: 'COVID-2', 3: 'COVID-3', 4: 'Not COVID
    'ICU': {1: 'Yes', 2: 'No'}
}

# Update the 'CLASIFFICATION_FINAL' column
df['CLASIFFICATION_FINAL'] = df['CLASIFFICATION_FINAL'].apply(lambda x: 'Not COVID or

df.replace(replacement_mapping, inplace=True)
df.head()
```

Out[11]:

	USMER	MEDICAL_UNIT	SEX	PATIENT_TYPE	DATE_DIED	INTUBED	PNEUMONIA	AGE	PREGNAI
0	2	1	Female	Returned Home	2020-03-05	NaN	Yes	65	I
1	2	1	Male	Returned Home	2020-03-06	NaN	Yes	72	Na
2	2	1	Male	Hospitalization	2020-09-06	Yes	No	55	Na
3	2	1	Female	Returned Home	2020-12-06	NaN	No	53	I
4	2	1	Male	Returned Home	2020-06-21	NaN	No	68	Na

5 rows × 22 columns

Let's review the final amount of nulls and the data type.

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1048575 entries, 0 to 1048574
Data columns (total 22 columns):
 #   Column                Non-Null Count    Dtype         
---  ------                --------------    -----         
 0   USMER                 1048575 non-null  int64         
 1   MEDICAL_UNIT          1048575 non-null  int64         
 2   SEX                   1048575 non-null  object        
 3   PATIENT_TYPE          1048575 non-null  object        
 4   DATE_DIED             76942 non-null    datetime64[ns]
 5   INTUBED               192706 non-null   object        
 6   PNEUMONIA             1032572 non-null  object        
 7   AGE                   1048575 non-null  int64         
 8   PREGNANT              521310 non-null   object        
 9   DIABETES              1045237 non-null  object        
 10  COPD                  1045572 non-null  object        
 11  ASTHMA                1045596 non-null  object        
 12  INMSUPR               1045171 non-null  object        
 13  HIPERTENSION          1045471 non-null  object        
 14  OTHER_DISEASE         1043530 non-null  object        
 15  CARDIOVASCULAR        1045499 non-null  object        
 16  OBESITY               1045543 non-null  object        
 17  RENAL_CHRONIC         1045569 non-null  object        
 18  TOBACCO               1045355 non-null  object        
 19  CLASIFFICATION_FINAL  1048575 non-null  object        
 20  ICU                   192543 non-null   object        
 21  DIED                  1048575 non-null  object        
dtypes: datetime64[ns](1), int64(3), object(18)
memory usage: 176.0+ MB
```

Let's change the column names

In [13]:
```
# Rename and tag the columns as before
column_mapping = {
    'USMER': 'USMER',
    'MEDICAL_UNIT': 'Medical Unit',
    'SEX': 'Sex',
    'PATIENT_TYPE': 'Patient Type',
    'DATE_DIED': 'Date Died',
    'INTUBED': 'Intubed',
    'PNEUMONIA': 'Pneumonia',
    'AGE': 'Age of Patient',
    'PREGNANT': 'Pregnant',
    'DIABETES': 'Diabetes',
    'COPD': 'COPD',
    'ASTHMA': 'Asthma',
    'INMSUPR': 'Immunosuppressed',
    'HIPERTENSION': 'Hypertension',
    'OTHER_DISEASE': 'Other Disease',
    'CARDIOVASCULAR': 'Cardiovascular',
    'OBESITY': 'Obesity',
    'RENAL_CHRONIC': 'Renal Chronic',
    'TOBACCO': 'Tobacco User',
    'CLASIFFICATION_FINAL': 'Classification',
    'ICU': 'ICU Admission',
    'DIED': 'Died'
}

df.rename(columns=column_mapping, inplace=True)
```

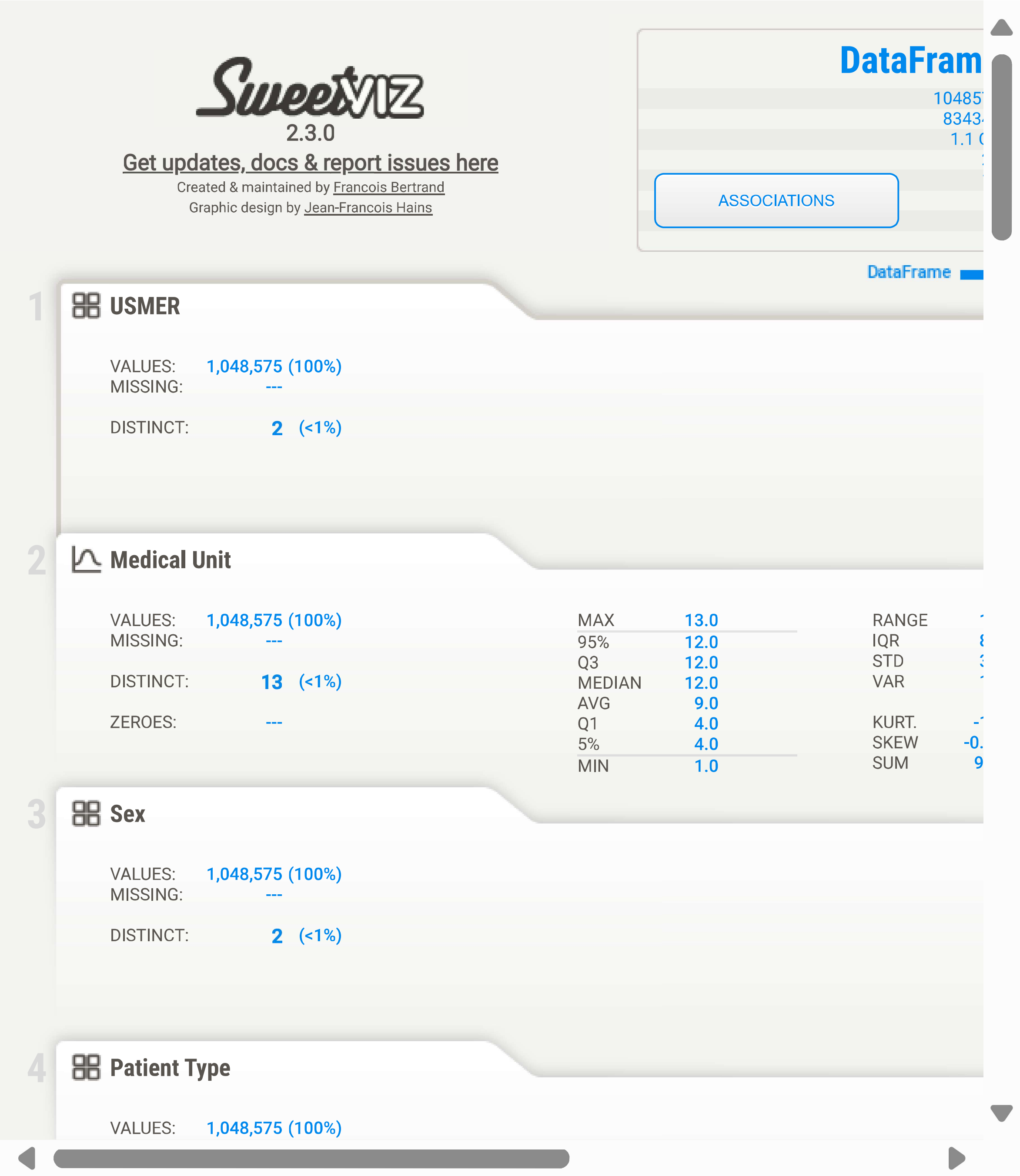
Type *Markdown* and LaTeX: α^2

Final data report

With the SweetViz library we can produce a data report to analyze each column separately.

In [14]:
```
sv_report = sv.analyze(df)
sv_report.show_notebook()
```

A Jupyter widget could not be displayed because the widget state could not be found. This could happen if the kernel storing the widget is no longer available, or if the widget state was not saved in the notebook. You may be able to create the widget by running the appropriate cells.



SweetVIZ 2.3.0

Get updates, docs & report issues here

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DataFram

10485

8343

1.1

ASSOCIATIONS

DataFrame

1 USMER

VALUES: 1,048,575 (100%)
MISSING: ---

DISTINCT: 2 (<1%)

2 Medical Unit

VALUES: 1,048,575 (100%)
MISSING: ---

DISTINCT: 13 (<1%)

ZEROES: ---

```
MAX      13.0      RANGE
95%      12.0      IQR
Q3       12.0      STD
MEDIAN   12.0      VAR
AVG       9.0
Q1        4.0      KURT.
5%        4.0      SKEW   -0.
MIN       1.0      SUM     9
```

3 Sex

VALUES: 1,048,575 (100%)
MISSING: ---

DISTINCT: 2 (<1%)

4 Patient Type

VALUES: 1,048,575 (100%)

In [15]:
```
sv_report.show_html('analyze.html',open_browser=False)
```

```
Report analyze.html was generated.
```

Exporting CSV

Finally, we export the clean dataset.

In [16]:

```
df.to_csv("Cleaned_DF.csv")
```