CARDIAC DISEASE ANALYSIS

In [ ]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

In [ ]:
```
## Copying so we don't make changes into original
df = pd.read_csv('medical_examination.csv').copy()
```

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

Out[ ]:
```
Index(['id', 'age', 'sex', 'height', 'weight', 'ap_hi', 'ap_lo', 'cholesterol',
       'gluc', 'smoke', 'alco', 'active', 'cardio'],
      dtype='object')
```

In [ ]:
```
df.size
```

Out[ ]:
```
910000
```

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

Out[ ]:
```
(70000, 13)
```

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

Out[ ]:

	id	age	sex	height	weight	ap_hi	
count	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.
mean	49972.419900	19468.865814	1.349843	164.359229	74.205690	128.817286	96.
std	28851.302323	2467.251667	0.477253	8.210126	14.395757	154.011419	188.
min	0.000000	10798.000000	1.000000	55.000000	10.000000	-150.000000	-70.
25%	25006.750000	17664.000000	1.000000	159.000000	65.000000	120.000000	80.
50%	50001.500000	19703.000000	1.000000	165.000000	72.000000	120.000000	80.
75%	74889.250000	21327.000000	2.000000	170.000000	82.000000	140.000000	90.
max	99999.000000	23713.000000	3.000000	250.000000	200.000000	16020.000000	11000.

In [ ]:
```
df
```

Out[ ]:

	id	age	sex	height	weight	ap_hi	ap_lo	cholesterol	gluc	smoke	alco	active	c
0	0	18393	2	168	62.0	110	80	1	1	0	0	1	
1	1	20228	1	156	85.0	140	90	3	1	0	0	1	
2	2	18857	1	165	64.0	130	70	3	1	0	0	0	
3	3	17623	2	169	82.0	150	100	1	1	0	0	1	
4	4	17474	1	156	56.0	100	60	1	1	0	0	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	
69995	99993	19240	2	168	76.0	120	80	1	1	1	0	1	
69996	99995	22601	1	158	126.0	140	90	2	2	0	0	1	
69997	99996	19066	2	183	105.0	180	90	3	1	0	1	0	
69998	99998	22431	1	163	72.0	135	80	1	2	0	0	0	
69999	99999	20540	1	170	72.0	120	80	2	1	0	0	1	

70000 rows × 13 columns

CLEANING DATA

In [ ]:

```
## Converting the age, which is in days to years
df['Age'] = round(df['age'] / 365, 0)
```

In [ ]:

```
## Droping age column
df = df.drop('age', axis='columns')
```

In [ ]:

```
df.columns
```

Out[ ]:

```
Index(['id', 'sex', 'height', 'weight', 'ap_hi', 'ap_lo', 'cholesterol',
       'gluc', 'smoke', 'alco', 'active', 'cardio', 'Age'],
      dtype='object')
```

In [ ]:

```
## Checkimg for Null Values
df.isnull().sum()
```

Out[ ]:

```
id             0
sex            0
height         0
weight         0
ap_hi          0
ap_lo          0
cholesterol    0
gluc           0
smoke          0
alco           0
active         0
cardio         0
Age            0
dtype: int64
```

In [ ]:

```
## Creating BMI Column for overweight
df['Overweight'] = round(df['weight'] / (df['height'] / 100) **2, 2).apply(lambda x
df
```

Out[ ]:

	id	sex	height	weight	ap_hi	ap_lo	cholesterol	gluc	smoke	alco	active	cardio
0	0	2	168	62.0	110	80	1	1	0	0	1	0
1	1	1	156	85.0	140	90	3	1	0	0	1	1
2	2	1	165	64.0	130	70	3	1	0	0	0	1
3	3	2	169	82.0	150	100	1	1	0	0	1	1
4	4	1	156	56.0	100	60	1	1	0	0	0	0
...	...	...	...	...	...	...	...	...	...	...	...	...
69995	99993	2	168	76.0	120	80	1	1	1	0	1	0
69996	99995	1	158	126.0	140	90	2	2	0	0	1	1
69997	99996	2	183	105.0	180	90	3	1	0	1	0	1
69998	99998	1	163	72.0	135	80	1	2	0	0	0	1
69999	99999	1	170	72.0	120	80	2	1	0	0	1	0

70000 rows × 14 columns

In [ ]:

```
# Fixing Glucose and Chelostrol values to Binary: 1 & 0
df['cholesterol'] = df.cholesterol.apply(lambda x:1 if x >1 else 0)
df['gluc'] = df.gluc.apply(lambda x:1 if x >1 else 0)
df
```

Out[ ]:

	id	sex	height	weight	ap_hi	ap_lo	cholesterol	gluc	smoke	alco	active	cardio
0	0	2	168	62.0	110	80	0	0	0	0	1	0
1	1	1	156	85.0	140	90	1	0	0	0	1	1
2	2	1	165	64.0	130	70	1	0	0	0	0	1
3	3	2	169	82.0	150	100	0	0	0	0	1	1
4	4	1	156	56.0	100	60	0	0	0	0	0	0
...	...	...	...	...	...	...	...	...	...	...	...	...
69995	99993	2	168	76.0	120	80	0	0	1	0	1	0
69996	99995	1	158	126.0	140	90	1	1	0	0	1	1
69997	99996	2	183	105.0	180	90	1	0	0	1	0	1
69998	99998	1	163	72.0	135	80	0	1	0	0	0	1
69999	99999	1	170	72.0	120	80	1	0	0	0	1	0

70000 rows × 14 columns

In [ ]:

```
df
```

Out[ ]:

	id	sex	height	weight	ap_hi	ap_lo	cholesterol	gluc	smoke	alco	active	cardio
0	0	2	168	62.0	110	80	0	0	0	0	1	0
1	1	1	156	85.0	140	90	1	0	0	0	1	1
2	2	1	165	64.0	130	70	1	0	0	0	0	1
3	3	2	169	82.0	150	100	0	0	0	0	1	1
4	4	1	156	56.0	100	60	0	0	0	0	0	0
...	...	...	...	...	...	...	...	...	...	...	...	...
69995	99993	2	168	76.0	120	80	0	0	1	0	1	0
69996	99995	1	158	126.0	140	90	1	1	0	0	1	1
69997	99996	2	183	105.0	180	90	1	0	0	1	0	1
69998	99998	1	163	72.0	135	80	0	1	0	0	0	1
69999	99999	1	170	72.0	120	80	1	0	0	0	1	0

70000 rows × 14 columns

In [ ]:

```
## REMOVE Blood Pressure Outliers
df.describe()
```

Out[ ]:

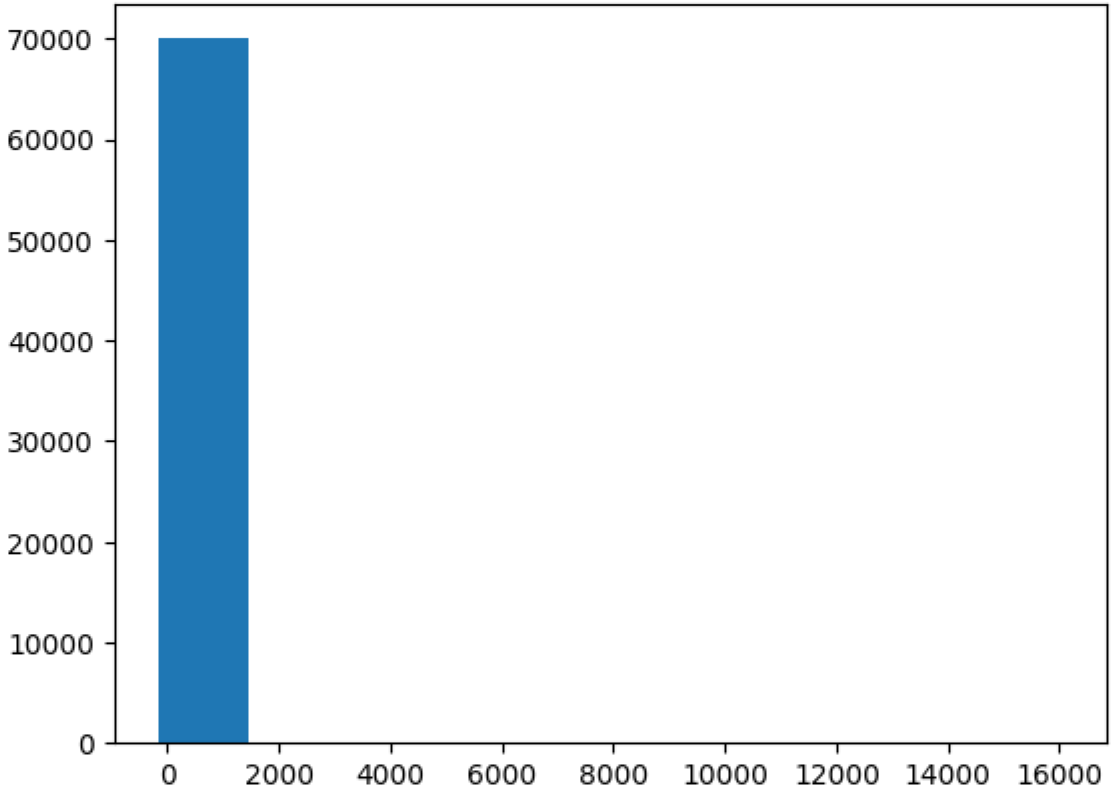
	id	sex	height	weight	ap_hi	ap_lo	chol
count	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.
mean	49972.419900	1.349843	164.359229	74.205690	128.817286	96.630414	0.
std	28851.302323	0.477253	8.210126	14.395757	154.011419	188.472530	0.
min	0.000000	1.000000	55.000000	10.000000	-150.000000	-70.000000	0.
25%	25006.750000	1.000000	159.000000	65.000000	120.000000	80.000000	0.
50%	50001.500000	1.000000	165.000000	72.000000	120.000000	80.000000	0.
75%	74889.250000	2.000000	170.000000	82.000000	140.000000	90.000000	1.
max	99999.000000	3.000000	250.000000	200.000000	16020.000000	11000.000000	1.

In [ ]:

```
# Not Normal Systolic Blood Pressure
plt.hist(df['ap_hi'])
```

Out[ ]:

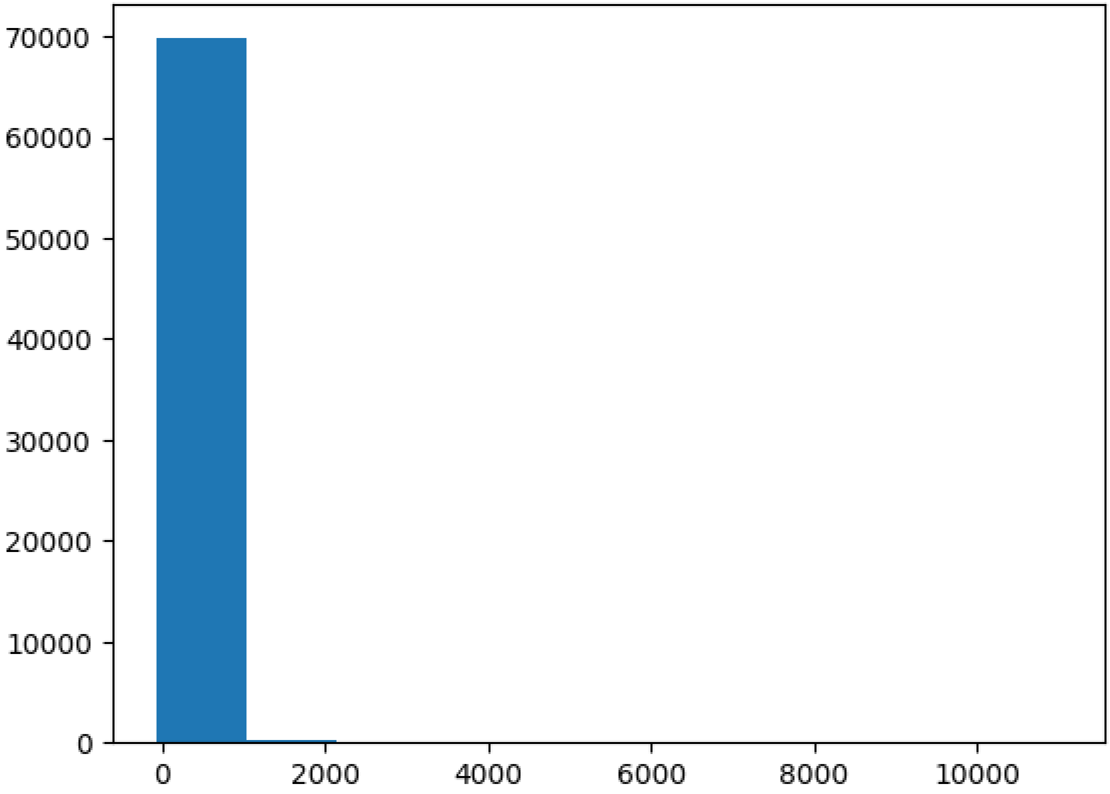
```
(array([6.9988e+04, 3.0000e+00, 0.0000e+00, 0.0000e+00, 0.0000e+00,
        0.0000e+00, 1.0000e+00, 1.0000e+00, 6.0000e+00, 1.0000e+00]),
 array([ -150.,  1467.,  3084.,  4701.,  6318.,  7935.,  9552., 11169.,
        12786., 14403., 16020.]),
 <BarContainer object of 10 artists>)
```



In [ ]:

```
# Not Normal Diastolic Blood Pressure
plt.hist(df['ap_lo'])
```

```
Out[ ]: (array([6.9766e+04, 2.1000e+02, 0.0000e+00, 0.0000e+00, 0.0000e+00,
                2.0000e+00, 3.0000e+00, 1.1000e+01, 4.0000e+00, 4.0000e+00]),
         array([  -70.,  1037.,  2144.,  3251.,  4358.,  5465.,  6572.,  7679.,
                 8786.,  9893., 11000.]),
         <BarContainer object of 10 artists>)
```



In [ ]:

```
df.describe()
```

Out[ ]:

	id	sex	height	weight	ap_hi	ap_lo	chol
count	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.
mean	49972.419900	1.349843	164.359229	74.205690	128.817286	96.630414	0.
std	28851.302323	0.477253	8.210126	14.395757	154.011419	188.472530	0.
min	0.000000	1.000000	55.000000	10.000000	-150.000000	-70.000000	0.
25%	25006.750000	1.000000	159.000000	65.000000	120.000000	80.000000	0.
50%	50001.500000	1.000000	165.000000	72.000000	120.000000	80.000000	0.
75%	74889.250000	2.000000	170.000000	82.000000	140.000000	90.000000	1.
max	99999.000000	3.000000	250.000000	200.000000	16020.000000	11000.000000	1.

In [ ]:

```
def blood_pressure_outlier(df, column):
    if df[df[column] < 0][column].min() < 0:
        df[column] = df[column].apply(lambda x:x if x >= 0 else x * - 1)
    if df[df[column] == 0][column].min() == 0:
        df[column] = df[column].apply(lambda x:x if x > 0 else x + 70)
    if df[df[column] < 30][column].min() < 30:
        df[column] = df[column].apply(lambda x:x if x >= 30 else x * 10)
    if df[df[column] > 250][column].max() > 250 :
        df[column] = df[column].apply(lambda x:x if x <= 250 else x / 10)
    if df[df[column] >= 1000][column].max() >= 1000:
        df[column] = df[column].apply(lambda x:x if x <= 999 else x / 10)

    return
blood_pressure_outlier(df,'ap_lo')
blood_pressure_outlier(df,'ap_hi')
```

In [ ]:

```
df.describe()
```

Out[ ]:

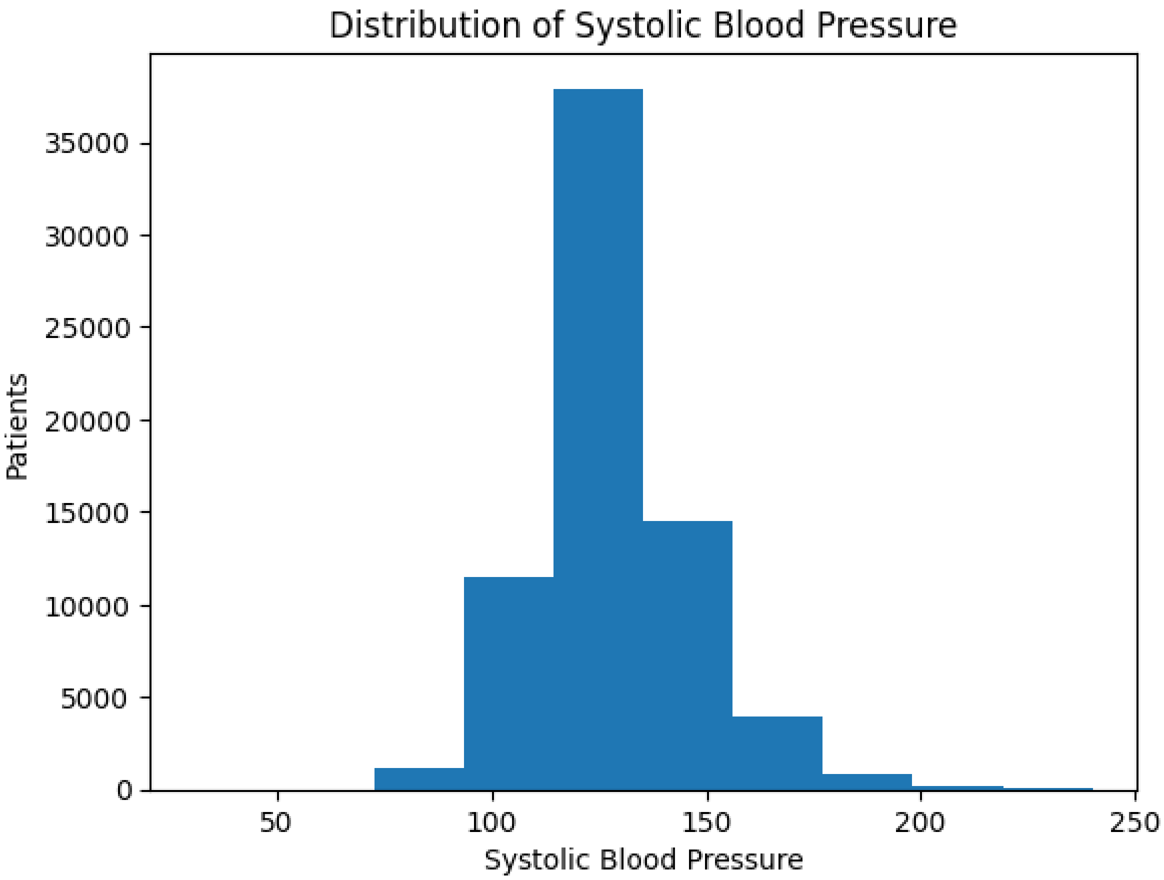
	id	sex	height	weight	ap_hi	ap_lo	chol
count	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.000000	70000.
mean	49972.419900	1.349843	164.359229	74.205690	126.994693	81.681043	0.
std	28851.302323	0.477253	8.210126	14.395757	17.121783	10.134571	0.
min	0.000000	1.000000	55.000000	10.000000	30.900000	30.000000	0.
25%	25006.750000	1.000000	159.000000	65.000000	120.000000	80.000000	0.
50%	50001.500000	1.000000	165.000000	72.000000	120.000000	80.000000	0.
75%	74889.250000	2.000000	170.000000	82.000000	140.000000	90.000000	1.
max	99999.000000	3.000000	250.000000	200.000000	240.000000	208.800000	1.

In [ ]:

```
# Systolic Blood Pressure
plt.title("Distribution of Systolic Blood Pressure")
plt.xlabel("Systolic Blood Pressure")
plt.ylabel("Patients")
plt.hist(df['ap_hi'])
```

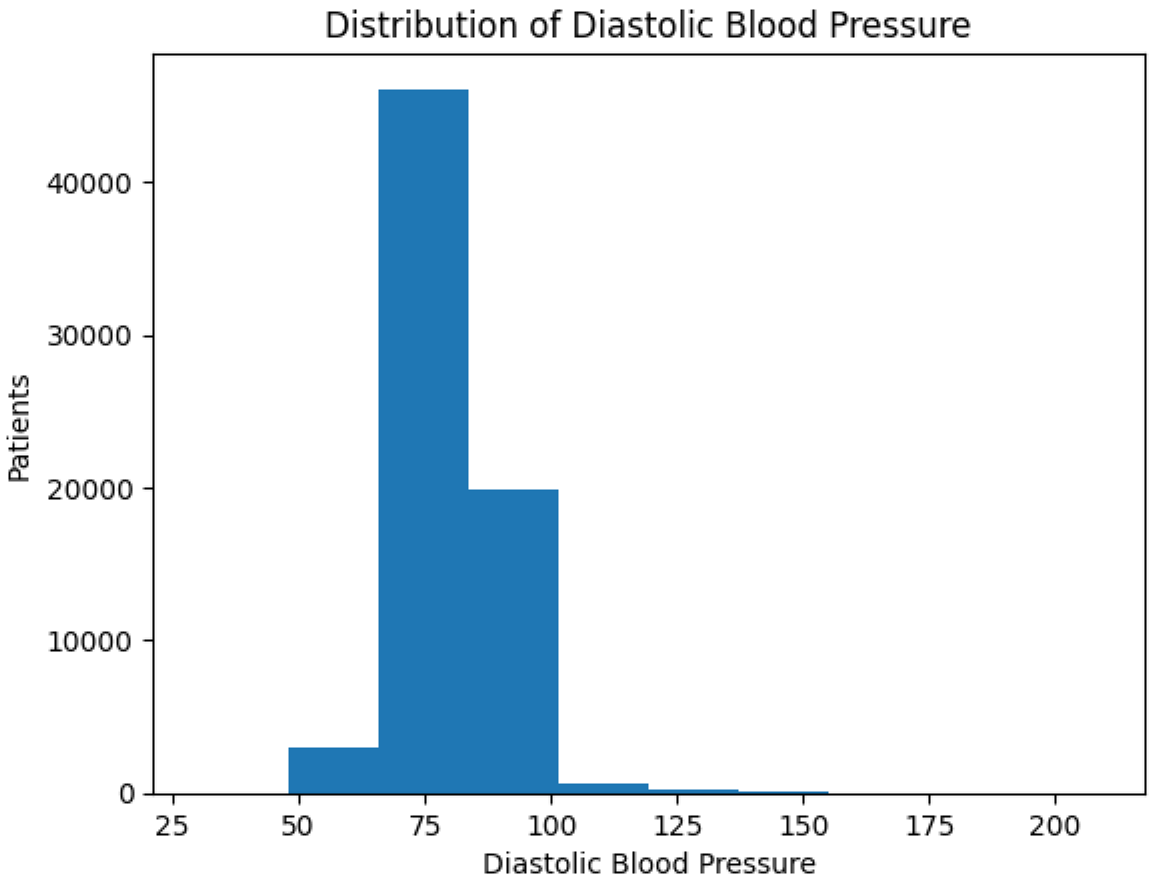
Out[ ]:

```
(array([2.0000e+00, 2.1000e+01, 1.1090e+03, 1.1500e+04, 3.7884e+04,
        1.4525e+04, 3.9220e+03, 8.5900e+02, 1.4500e+02, 3.3000e+01]),
 array([ 30.9 ,  51.81,  72.72,  93.63, 114.54, 135.45, 156.36, 177.27,
        198.18, 219.09, 240.  ]),
 <BarContainer object of 10 artists>)
```



```
In [ ]: plt.title("Distribution of Diastolic Blood Pressure")
        plt.xlabel("Diastolic Blood Pressure")
        plt.ylabel("Patients")
        plt.hist(df['ap_lo'])
```

```
Out[ ]: (array([2.5000e+01, 2.9380e+03, 4.6096e+04, 1.9929e+04, 6.5900e+02,
                2.7100e+02, 4.2000e+01, 1.5000e+01, 9.0000e+00, 1.6000e+01]),
         array([ 30.  ,  47.88,  65.76,  83.64, 101.52, 119.4 , 137.28, 155.16,
                173.04, 190.92, 208.8 ]),
         <BarContainer object of 10 artists>)
```



```
In [ ]: df.to_csv('medical_clean.csv')
```

CLEANED