APLMS PROJECT

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4. Project : Data Analysis on DoctorsVisit Dataset

IMPORTING THE LIBRARIES

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import sklearn
import sklearn.preprocessing
```

In [2]:
```
df = pd.read_excel('DoctorVisits (2).xlsx')
```

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

Out[3]:

	Unnamed: 0	visits	gender	age	income	illness	reduced	health	private	freepoor	freerepat
0	1	1	female	0.19	0.55	1	4	1	yes	no	no
1	2	1	female	0.19	0.45	1	2	1	yes	no	no
2	3	1	male	0.19	0.90	3	0	0	no	no	no
3	4	1	male	0.19	0.15	1	0	0	no	no	no
4	5	1	male	0.19	0.45	2	5	1	no	no	no

In [4]:
```
df.tail()
```

Out[4]:

	Unnamed: 0	visits	gender	age	income	illness	reduced	health	private	freepoor	freere
5185	5186	0	female	0.22	0.55	0	0	0	no	no	
5186	5187	0	male	0.27	1.30	0	0	1	no	no	
5187	5188	0	female	0.37	0.25	1	0	1	no	no	
5188	5189	0	female	0.52	0.65	0	0	0	no	no	
5189	5190	0	male	0.72	0.25	0	0	0	no	no	

NUMBER OF ROWS AND COLUMNS IN THE DATASET

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

Out[5]:
```
(5190, 13)
```

THE COLUMNS IN THE DATASET

In [6]:
```
df.columns
```

Out[6]:
```
Index(['Unnamed: 0', 'visits', 'gender', 'age', 'income', 'illness', 'reduce
d',
       'health', 'private', 'freepoor', 'freerepat', 'nchronic', 'lchronic'],
      dtype='object')
```

THE INFO() FUNCTION GIVES THE INFORMATION SUCH AS COLUMN NAME,COUNT,TYPE OF DATE AND OVERALL MEMORY USAGE

In [7]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5190 entries, 0 to 5189
Data columns (total 13 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Unnamed: 0  5190 non-null   int64  
 1   visits      5190 non-null   int64  
 2   gender      5190 non-null   object 
 3   age         5190 non-null   float64
 4   income      5190 non-null   float64
 5   illness     5190 non-null   int64  
 6   reduced     5190 non-null   int64  
 7   health      5190 non-null   int64  
 8   private     5190 non-null   object 
 9   freepoor    5190 non-null   object 
 10  freerepat   5190 non-null   object 
 11  nchronic    5190 non-null   object 
 12  lchronic    5190 non-null   object 
dtypes: float64(2), int64(5), object(6)
memory usage: 527.2+ KB
```

SUMMARIZATION

In [8]:

```
df.describe(include = 'number')
#summarization of Numerical columns only
```

Out[8]:

	Unnamed: 0	visits	age	income	illness	reduced	hea
count	5190.000000	5190.000000	5190.000000	5190.000000	5190.000000	5190.000000	5190.0000
mean	2595.500000	0.301734	0.406385	0.583160	1.431985	0.861850	1.2175
std	1498.368279	0.798134	0.204782	0.368907	1.384152	2.887628	2.1242
min	1.000000	0.000000	0.190000	0.000000	0.000000	0.000000	0.0000
25%	1298.250000	0.000000	0.220000	0.250000	0.000000	0.000000	0.0000
50%	2595.500000	0.000000	0.320000	0.550000	1.000000	0.000000	0.0000
75%	3892.750000	0.000000	0.620000	0.900000	2.000000	0.000000	2.0000
max	5190.000000	9.000000	0.720000	1.500000	5.000000	14.000000	12.0000

In [9]:

```
df.describe(include = 'object')
#summarization of Object columns only
```

Out[9]:

	gender	private	freepoor	freerepat	nchronic	lchronic
count	5190	5190	5190	5190	5190	5190
unique	2	2	2	2	2	2
top	female	no	no	no	no	no
freq	2702	2892	4968	4099	3098	4585

In [10]:

```
df.describe(include = 'all')
#summarization of both Numerical and Object columns
```

Out[10]:

	Unnamed: 0	visits	gender	age	income	illness	reduced
count	5190.000000	5190.000000	5190	5190.000000	5190.000000	5190.000000	5190.000000
unique	NaN	NaN	2	NaN	NaN	NaN	NaN
top	NaN	NaN	female	NaN	NaN	NaN	NaN
freq	NaN	NaN	2702	NaN	NaN	NaN	NaN
mean	2595.500000	0.301734	NaN	0.406385	0.583160	1.431985	0.861850
std	1498.368279	0.798134	NaN	0.204782	0.368907	1.384152	2.887628
min	1.000000	0.000000	NaN	0.190000	0.000000	0.000000	0.000000
25%	1298.250000	0.000000	NaN	0.220000	0.250000	0.000000	0.000000
50%	2595.500000	0.000000	NaN	0.320000	0.550000	1.000000	0.000000
75%	3892.750000	0.000000	NaN	0.620000	0.900000	2.000000	0.000000
max	5190.000000	9.000000	NaN	0.720000	1.500000	5.000000	14.000000

CLEANING DATA

1. Cleaning Data: Cleaning data involves the removal of unnecessary columns,duplicate values, handling the missing values and removal of outliers
2. The goal of the cleaning data is that the data is accurate,complete and consistent

REMOVAL OF UNNECESSARY COLUMNS

1. As the Unnamed: 0 column doesn't has any much preference in this dataset
2. so, we are going to drop it from the dataset

```
In [11]: df = df.drop(['Unnamed: 0'],axis = 1)
```

```
In [12]: df.columns
```

```
Out[12]: Index(['visits', 'gender', 'age', 'income', 'illness', 'reduced', 'health',
               'private', 'freepoor', 'freerepat', 'nchronic', 'lchronic'],
              dtype='object')
```

```
In [13]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5190 entries, 0 to 5189
Data columns (total 12 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   visits     5190 non-null   int64  
 1   gender     5190 non-null   object 
 2   age        5190 non-null   float64
 3   income     5190 non-null   float64
 4   illness    5190 non-null   int64  
 5   reduced    5190 non-null   int64  
 6   health     5190 non-null   int64  
 7   private    5190 non-null   object 
 8   freepoor   5190 non-null   object 
 9   freerepat  5190 non-null   object 
 10  nchronic   5190 non-null   object 
 11  lchronic   5190 non-null   object 
dtypes: float64(2), int64(4), object(6)
memory usage: 486.7+ KB
```

IDENTIFYING THE MISSING VALUES

```
In [14]: #lets check for the null values in each column using isnull() function
         #isnull() function is used to check whether the record is null or not
         #sum() function returns the sum of all the null values in each column
         df.isnull().sum()
```

```
Out[14]: visits       0
         gender       0
         age          0
         income       0
         illness      0
         reduced      0
         health       0
         private      0
         freepoor     0
         freerepat    0
         nchronic     0
         lchronic     0
         dtype: int64
```

In [15]:

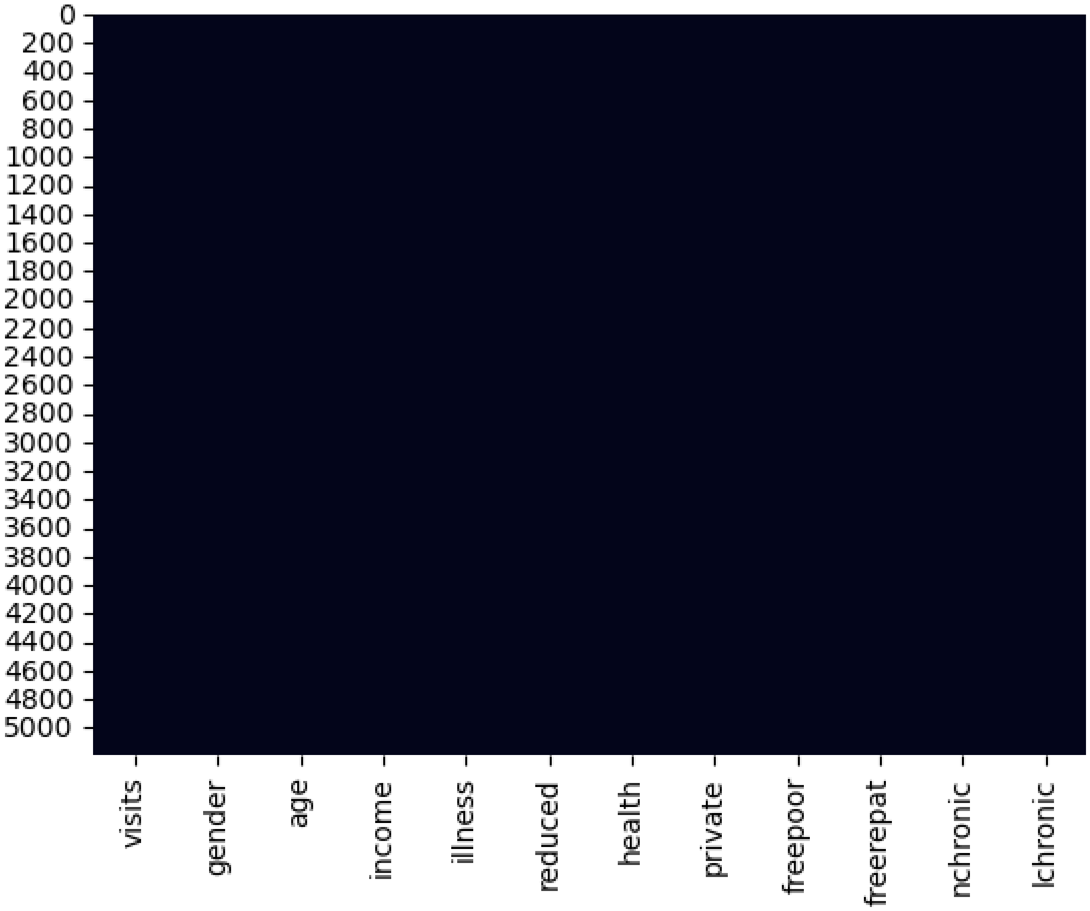
```
#lets see the null values in percentage form in each column respectively
missing_values = df.isnull().sum()
#check for the missing values and sort the values in descending order
total = df.isnull().sum().sort_values(ascending = False)
#percentage of total
percent = ((df.isnull().sum()/df.shape[0]*100))
#lets set the percent in descending order
percent = percent.sort_values(ascending = False)
missing_data = pd.concat([total,percent],axis = 1,
                        keys = ['Total Missing Values','Percentage of Missing
missing_data['Type of Data'] = df[missing_data.index].dtypes
#view the missing dta
missing_data
```

Out[15]:

	Total Missing Values	Percentage of Missing values	Type of Data
visits	0	0.0	int64
gender	0	0.0	object
age	0	0.0	float64
income	0	0.0	float64
illness	0	0.0	int64
reduced	0	0.0	int64
health	0	0.0	int64
private	0	0.0	object
freepoor	0	0.0	object
freerepat	0	0.0	object
nchronic	0	0.0	object
lchronic	0	0.0	object

In [16]:
```
#lets represent the null values in heatmap using seaborn
sns.heatmap(df.isnull(),cbar = False)
```

Out[16]:
```
<AxesSubplot:>
```



HENCE, THERE ARE NO NAN VALUES IN THE DATASET

ANALYSIS OF DATA

1. THE TOTAL NUMBER OF PEOPLE BASED ON ILLNESS

In [17]:
```
df['illness'].value_counts()
```

Out[17]:
```
1    1638
0    1554
2     946
3     542
4     274
5     236
Name: illness, dtype: int64
```

2. THE NUMBER OF PEOPLE BASED ON THEIR GENDER

```
In [18]: df['gender'].value_counts()
```

```
Out[18]: female    2702
         male      2488
         Name: gender, dtype: int64
```

3. THE AGE OF PEOPLE IN YEARS DIVIDED BY 100

```
In [19]: df['age'].value_counts()
```

```
Out[19]: 0.22    1213
         0.72     822
         0.19     752
         0.27     523
         0.62     316
         0.67     315
         0.32     301
         0.57     273
         0.52     222
         0.47     181
         0.37     146
         0.42     126
         Name: age, dtype: int64
```

4. THE DAYS TAKEN FOR EACH PERSON TO REDUCE FROM THE ILLNESS

```
In [20]: df['reduced'].value_counts()
```

```
Out[20]: 0     4454
         14     188
         1      177
         2      108
         3       74
         4       45
         5       40
         7       38
         6       17
         8       17
         10      12
         9        7
         12       6
         13       5
         11       2
         Name: reduced, dtype: int64
```

5. THE NUMBER OF DAYS TO GET REDUCE FROM ILLNESS BASED

ON THE MEAN OF PEOPLE ON GENDER

In [23]:

```
df.groupby(['reduced','gender']).mean()
```

Out[23]:

```
                  visits       age    income   illness    health
reduced gender
      0 female  0.229322  0.465755  0.482735  1.462144  1.115098
          male  0.136007  0.344703  0.694398  1.099585  0.924850
      1 female  0.400000  0.325684  0.542105  2.242105  1.610526
          male  0.304878  0.286220  0.676341  1.743902  1.256098
      2 female  0.672727  0.391455  0.560182  2.236364  1.781818
          male  0.471698  0.343585  0.653019  2.358491  1.547170
      3 female  1.333333  0.403111  0.516000  2.733333  1.733333
          male  0.724138  0.334138  0.741379  2.137931  1.689655
      4 female  0.851852  0.458889  0.466667  2.222222  2.074074
          male  0.722222  0.309444  0.869444  2.055556  2.000000
      5 female  1.444444  0.401667  0.614444  2.222222  2.500000
          male  1.136364  0.331818  0.570455  2.272727  2.818182
      6 female  1.363636  0.426364  0.622727  2.363636  1.363636
          male  0.833333  0.340000  0.591667  2.500000  2.000000
      7 female  1.384615  0.436154  0.473462  2.653846  2.230769
          male  0.750000  0.314167  0.655000  2.583333  4.333333
      8 female  1.090909  0.471818  0.404545  2.181818  4.000000
          male  1.333333  0.365000  0.833333  2.666667  2.000000
      9 female  0.500000  0.570000  0.825000  3.000000  1.000000
          male  2.200000  0.310000  0.392000  2.400000  2.000000
     10 female  2.142857  0.512857  0.421429  2.571429  2.000000
          male  1.800000  0.480000  0.590000  2.600000  4.600000
     11   male  5.000000  0.320000  1.000000  1.500000  0.500000
     12 female  2.000000  0.720000  0.250000  3.500000  5.500000
          male  2.000000  0.370000  0.515000  1.500000  1.000000
     13 female  4.000000  0.720000  0.300000  4.500000  3.500000
          male  4.000000  0.510000  0.350000  3.333333  2.333333
     14 female  1.543103  0.551724  0.427586  2.534483  4.112069
          male  1.555556  0.476806  0.598611  2.375000  3.527778
```

6.THE NUMBER OF INDIVIDUAL HAVE PRIVATE HEALTH INSURANCE

In [24]:

```
df['private'].value_counts()
```

Out[24]:

```
no     2892
yes    2298
Name: private, dtype: int64
```

7. THE NUMBER OF INDIVIDUAL HAVE SUPPORT OF GOVERNMENT

In [25]:

```
df['freepoor'].value_counts()
```

Out[25]:

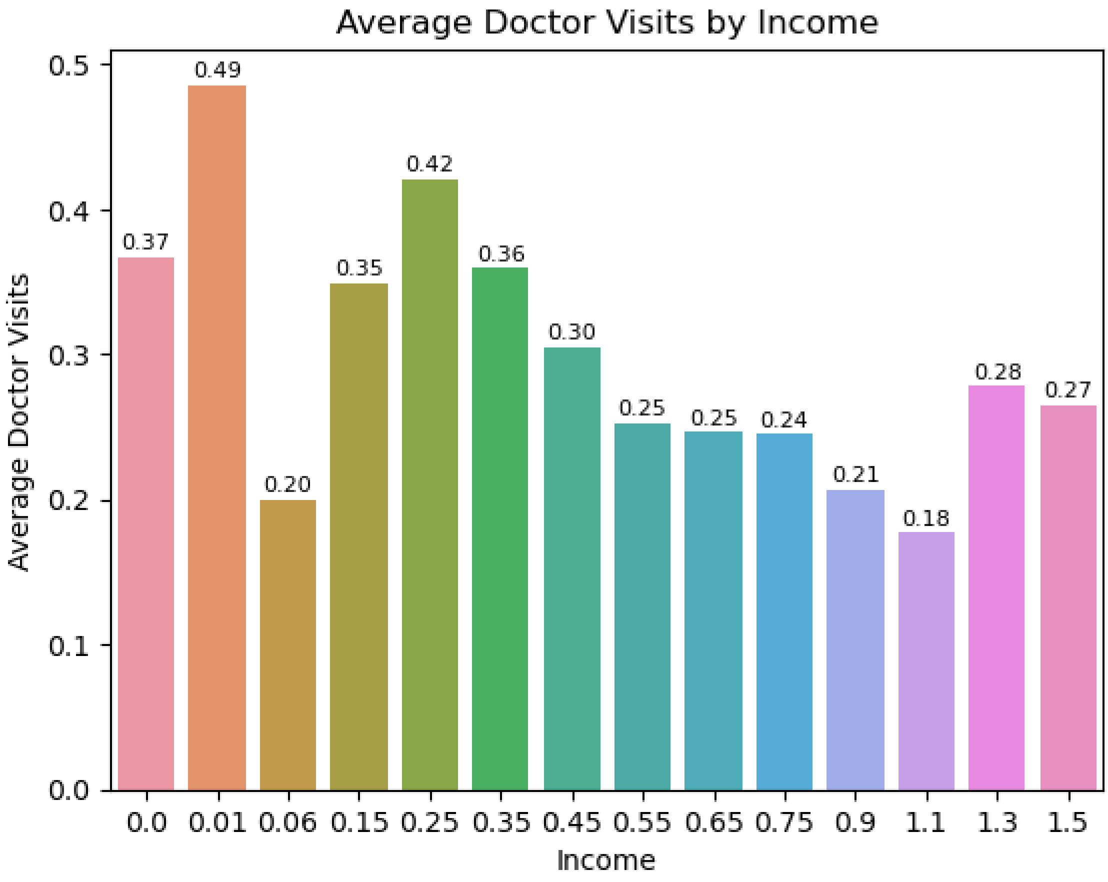
```
no     4968
yes     222
Name: freepoor, dtype: int64
```

ANALYSIS OF DATA USING DATA VISUALIZATION

1. THE AVERAGE DOCTOR VISITS BASED ON THE INCOME

In [27]:

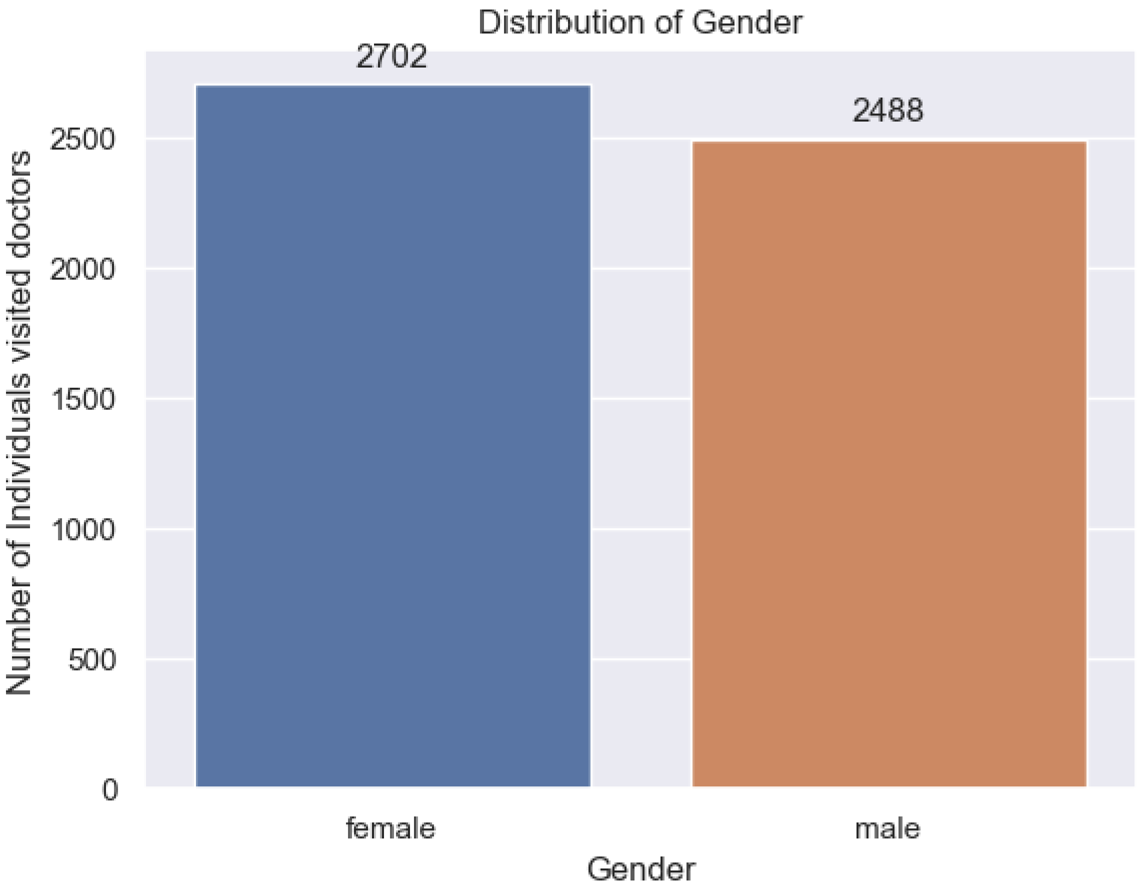
```
# Generate the bar plot
ax = sns.barplot(x='income', y='visits', data=df,ci=None)

# Add value annotations on top of each bar
for p in ax.patches:
    ax.annotate(format(p.get_height(), '.2f'),
                (p.get_x() + p.get_width() / 2., p.get_height()),
                ha='center', va='center',
                xytext=(0, 5), textcoords='offset points', fontsize=8)

# Set labels and title
plt.xlabel('Income')
plt.ylabel('Average Doctor Visits')
plt.title('Average Doctor Visits by Income')

# Show the plot
plt.show()
```



2. THE NUMBER OF INDIVIDUALS DOCTOR VISITED BASED ON GENDER OF PATIENTS

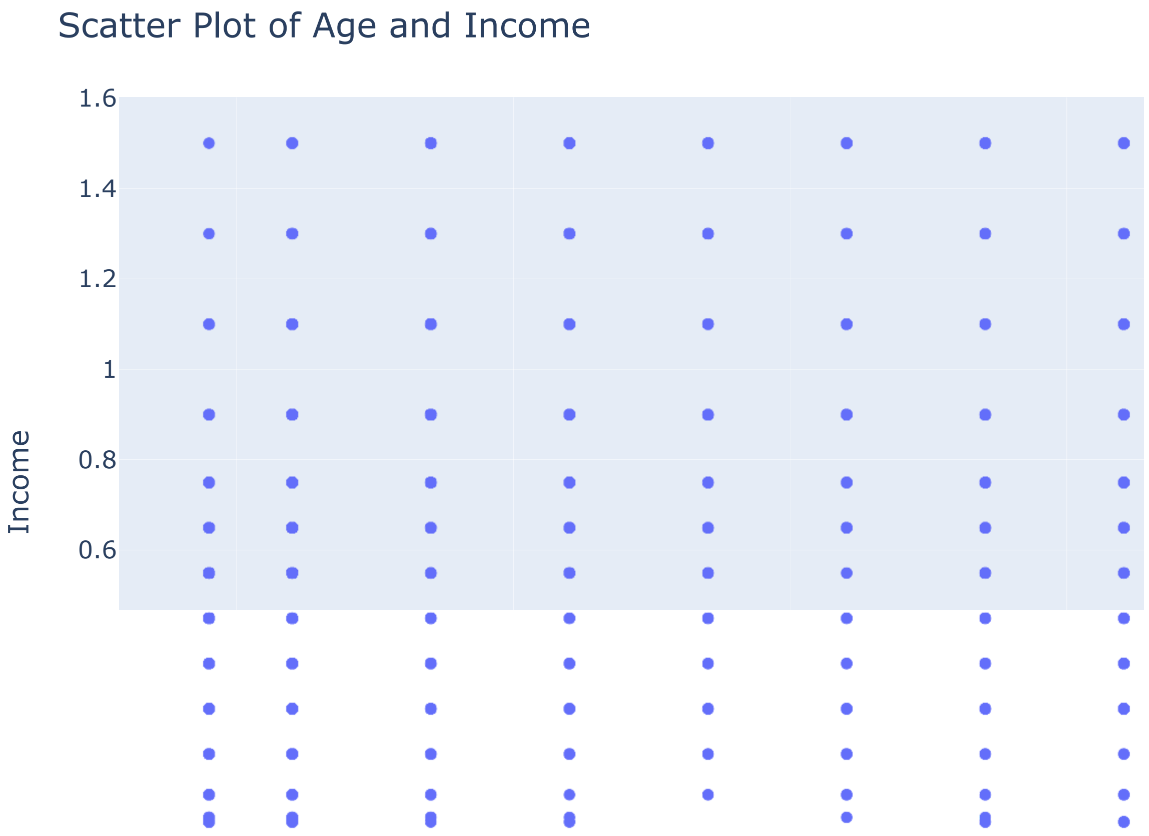
In [28]:

```python
sns.set(style="darkgrid")

ax = sns.countplot(x='gender', data=df)

for p in ax.patches:
    ax.annotate(format(p.get_height(), '.0f'),
                (p.get_x() + p.get_width() / 2., p.get_height()),
                ha = 'center', va = 'center',
                xytext = (0, 10), textcoords = 'offset points', fontsize=12)

plt.xlabel('Gender')
plt.ylabel("Number of Individuals visited doctors")
plt.title('Distribution of Gender')

plt.show()
```



3.THE RELATION BETWEEN AGE AND INCOME

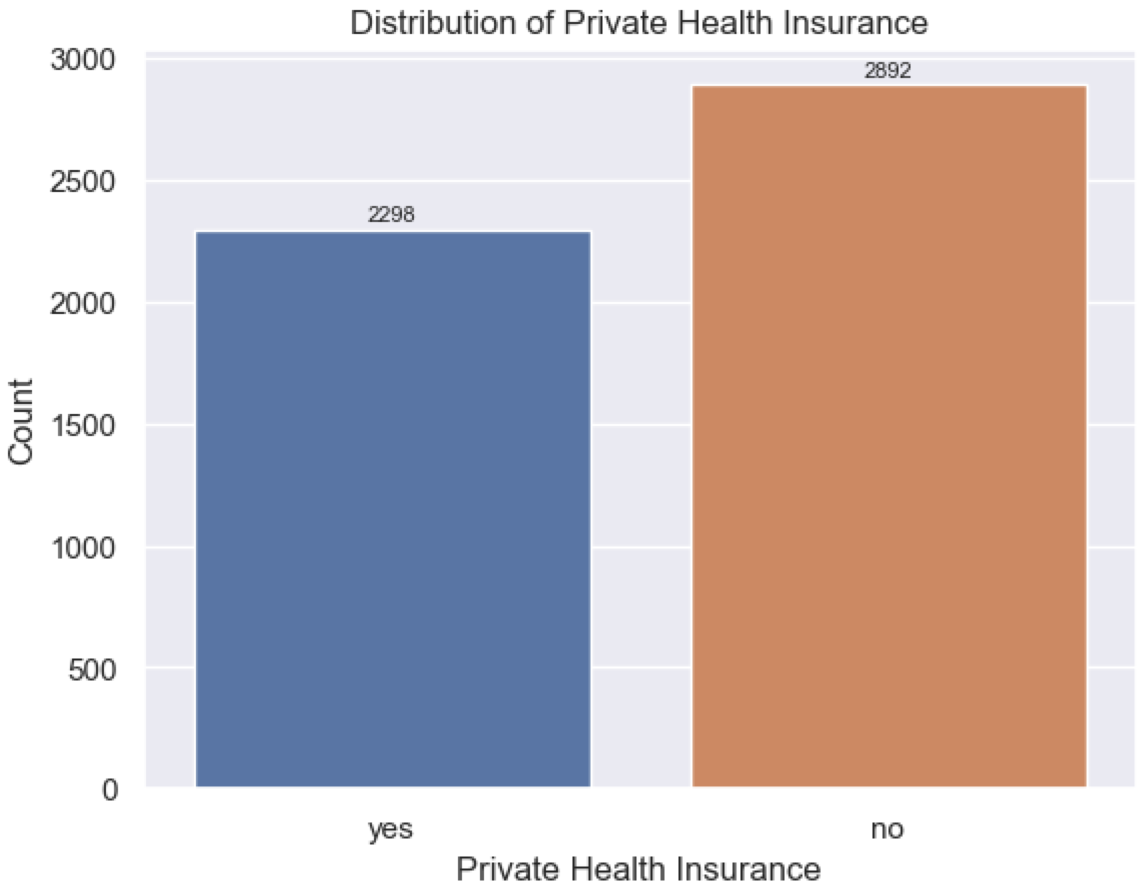
In [29]:
```
import plotly.express as px

fig = px.scatter(df, x='age', y='income', hover_data=['visits'], labels={'age'

fig.update_layout(
    title='Scatter Plot of Age and Income',
    xaxis_title='Age',
    yaxis_title='Income'
)

fig.show()
```



4.THE COUNT OF PRIVATE HEALTH INSURANCE BASEDON GENDER

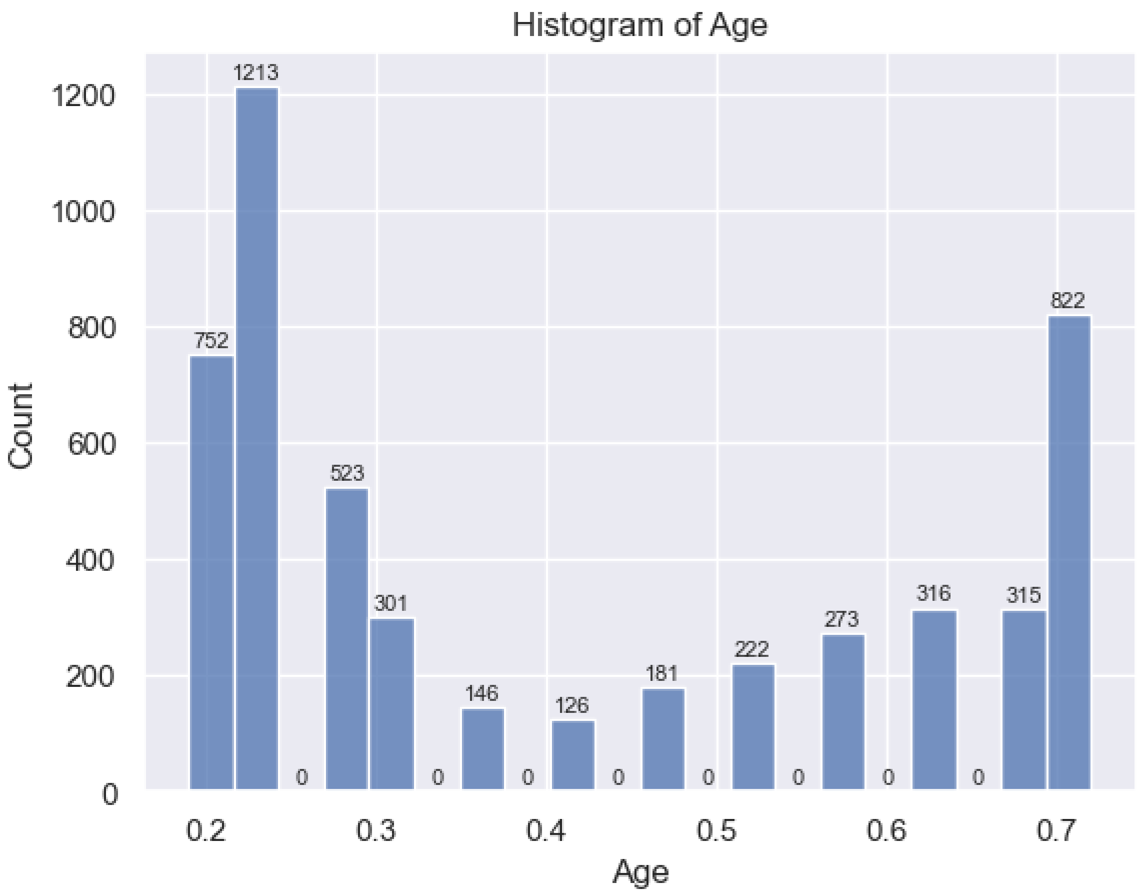
In [30]:

```
# Generate the bar plot
ax = sns.countplot(x='private', data=df)

# Add value annotations on top of each bar
for p in ax.patches:
    ax.annotate(format(p.get_height(), '.0f'),
                (p.get_x() + p.get_width() / 2., p.get_height()),
                ha='center', va='center',
                xytext=(0, 5), textcoords='offset points', fontsize=8)

# Set labels and title
plt.xlabel('Private Health Insurance')
plt.ylabel('Count')
plt.title('Distribution of Private Health Insurance')

# Show the plot
plt.show()
```



5.THE COUNT OF AGE ON HISTORGRAM PLOT

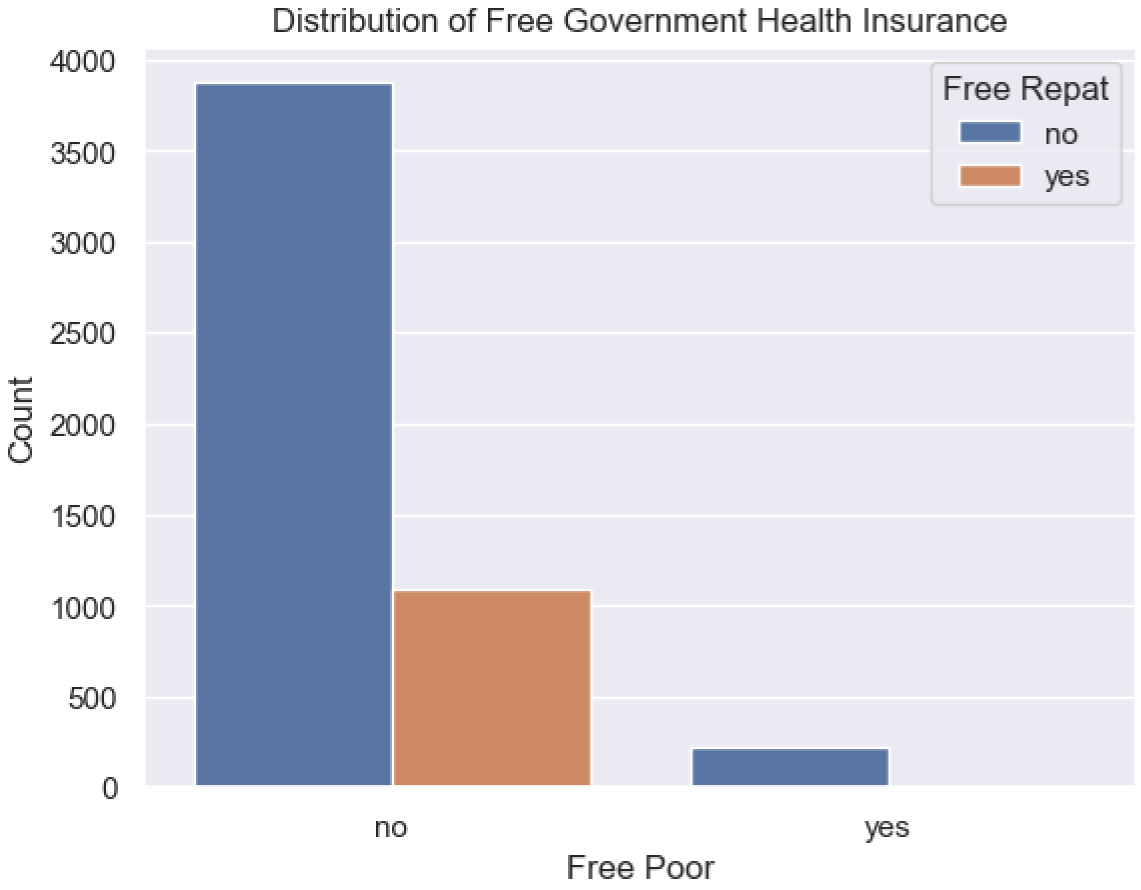
In [31]:
```
ax = sns.histplot(data=df, x='age', bins=20)

for p in ax.patches:
    ax.annotate(format(p.get_height(), '.0f'),
                (p.get_x() + p.get_width() / 2., p.get_height()),
                ha='center', va='center',
                xytext=(0, 5), textcoords='offset points', fontsize=8)

plt.xlabel('Age')
plt.ylabel('Count')
plt.title('Histogram of Age')

plt.show()
```



6. THE DISTRIBUTION OF FREE GOVERNMENT HEALTH INSURANCE

In [33]:

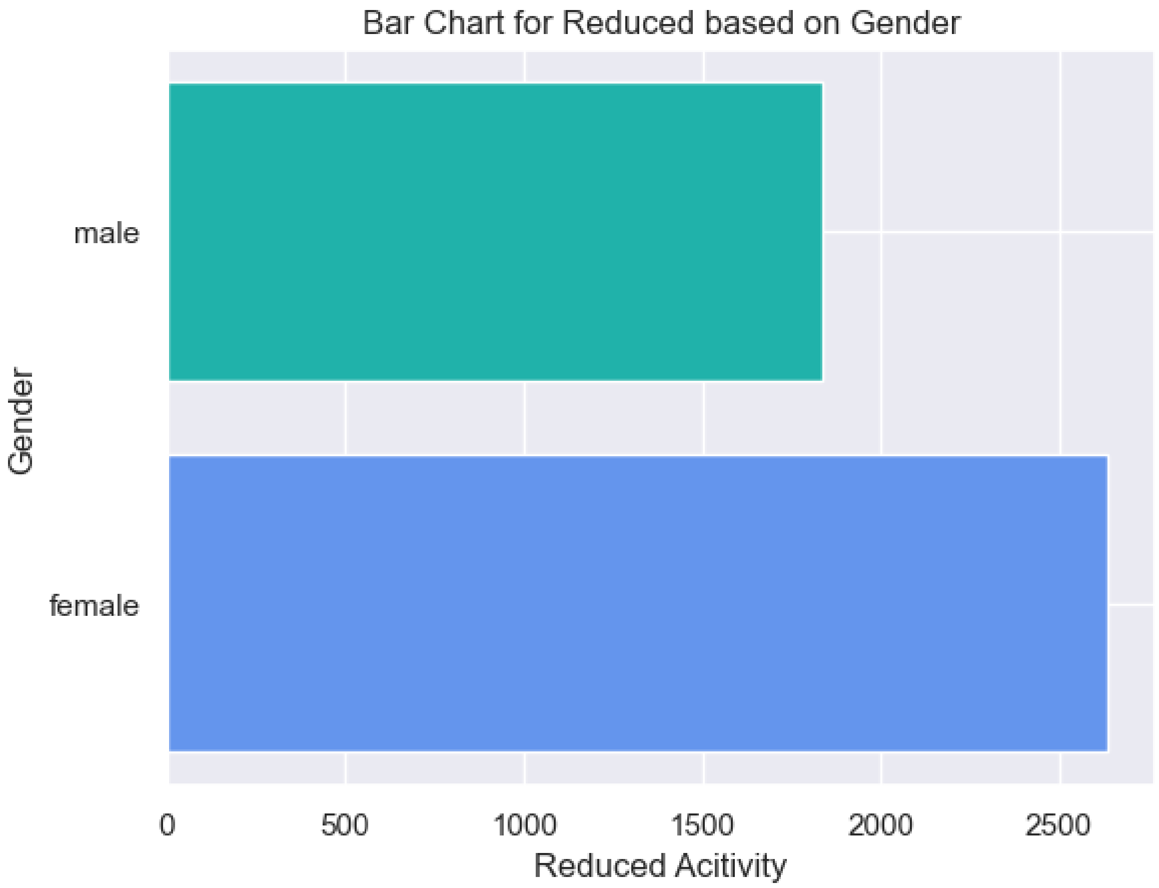
```python
sns.countplot(x='freepoor', hue='freerepat', data=df)
plt.xlabel('Free Poor')
plt.ylabel('Count')
plt.title('Distribution of Free Government Health Insurance')
plt.legend(title='Free Repat', loc='upper right')
plt.show()
```



7. THE REDUCED DAYS OF ACTIVITY DUE TO ILLNESS BASEDON GENDER

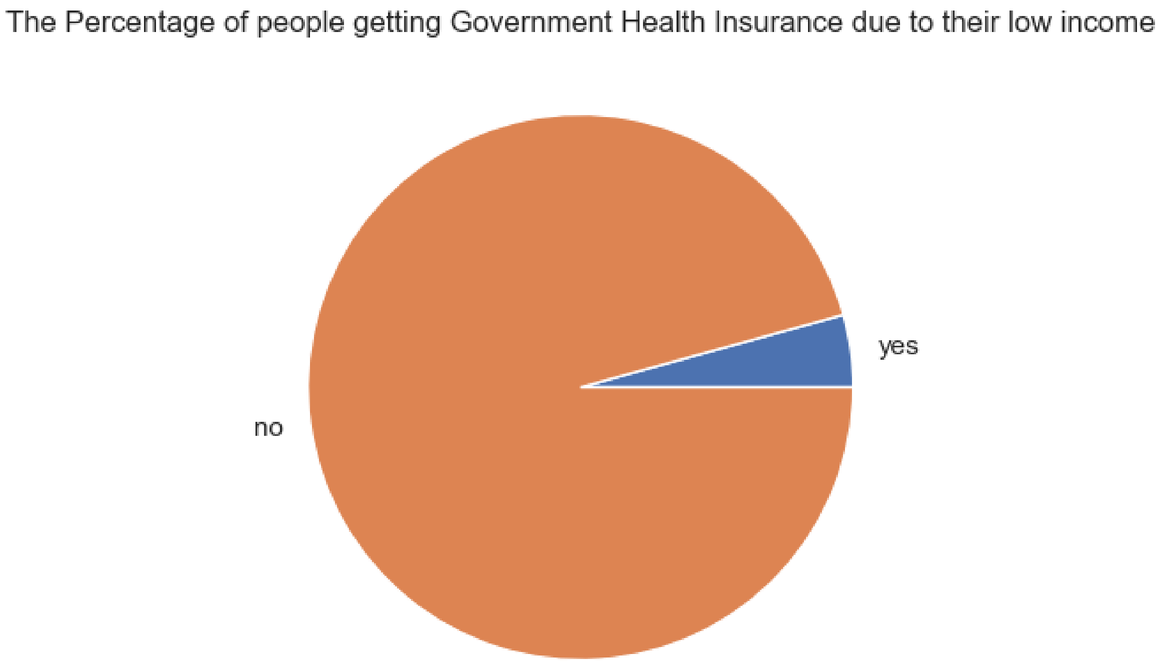
In [34]:

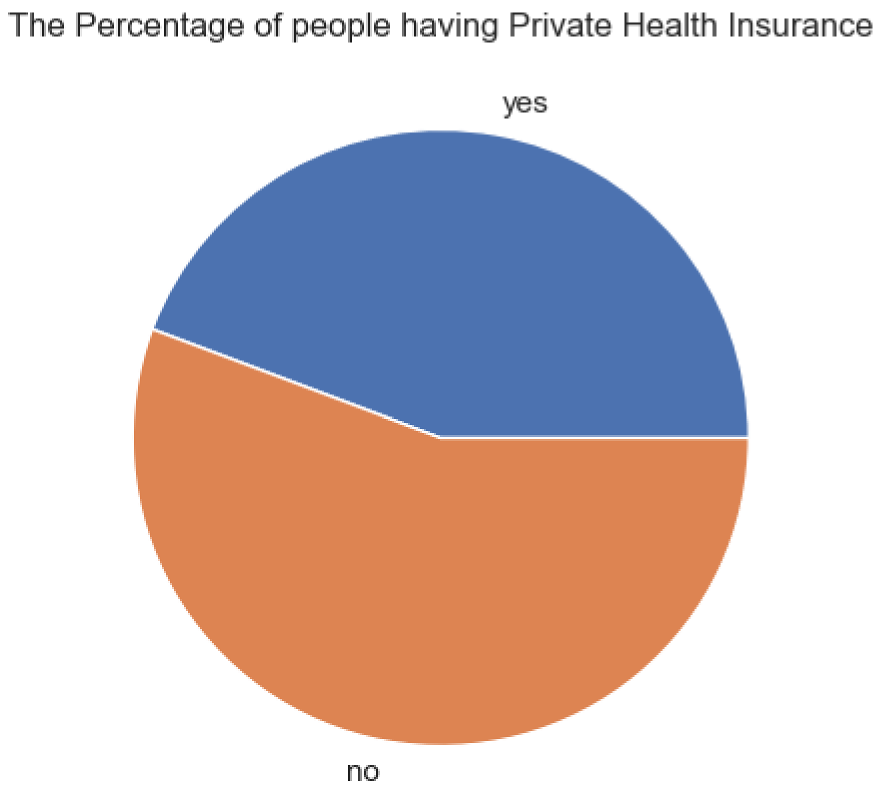
```
db = df.groupby('gender')['reduced'].sum().to_frame().reset_index()
plt.barh(db['gender'],db['reduced'],color = ['cornflowerblue','lightseagreen']
plt.title('Bar Chart for Reduced based on Gender')
plt.xlabel("Reduced Acitivity")
plt.ylabel("Gender")
plt.show()
```



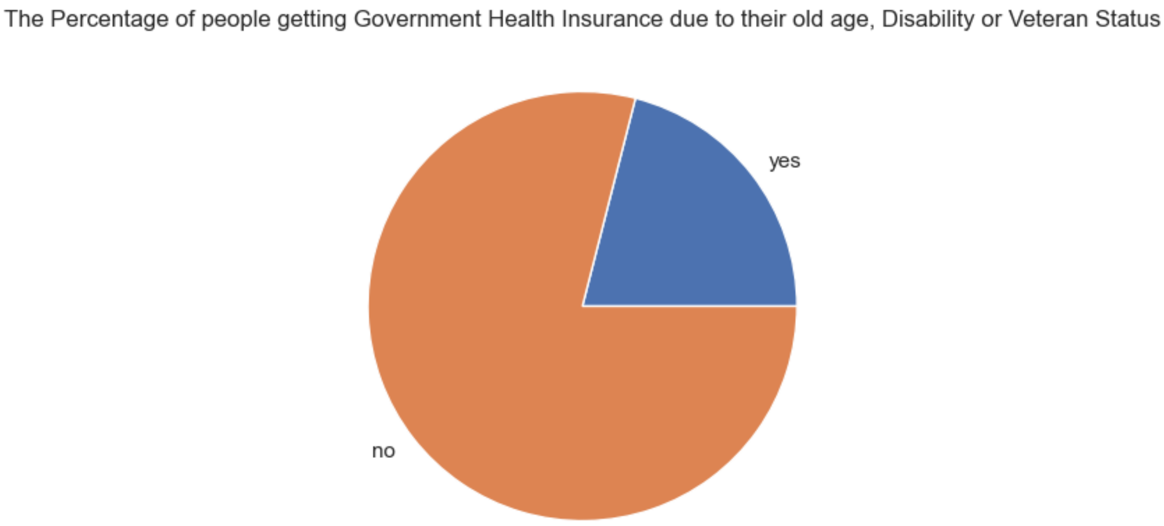
8.THE PERCENTAGE OF PEOPLE WHO ARE GETTING GOVT HEALTH INSURANCE, AND WHO HAVE PRIVAT HEALTH INSURANCE

In [39]:
```
label = ['yes','no']
Y = df[df['freepoor']=='yes']
N = df[df['freepoor']=='no']
x = [Y.shape[0],N.shape[0]]
plt.figure(figsize = (5,5))
plt.pie(x,labels=label)
plt.title('The Percentage of people getting Government Health Insurance due to
plt.show()
label = ['yes','no']
Y = df[df['private']=='yes']
N = df[df['private']=='no']
x = [Y.shape[0],N.shape[0]]
plt.figure(figsize = (5,5))
plt.pie(x,labels = label)
plt.title('The Percentage of people having Private Health Insurance')
plt.show()
label = ['yes','no']
Y = df[df['freerepat']=='yes']
N = df[df['freerepat']=='no']
x = [Y.shape[0],N.shape[0]]
plt.figure(figsize = (5,5))
plt.pie(x,labels = label)
plt.title('The Percentage of people getting Government Health Insurance due to
plt.show()
```





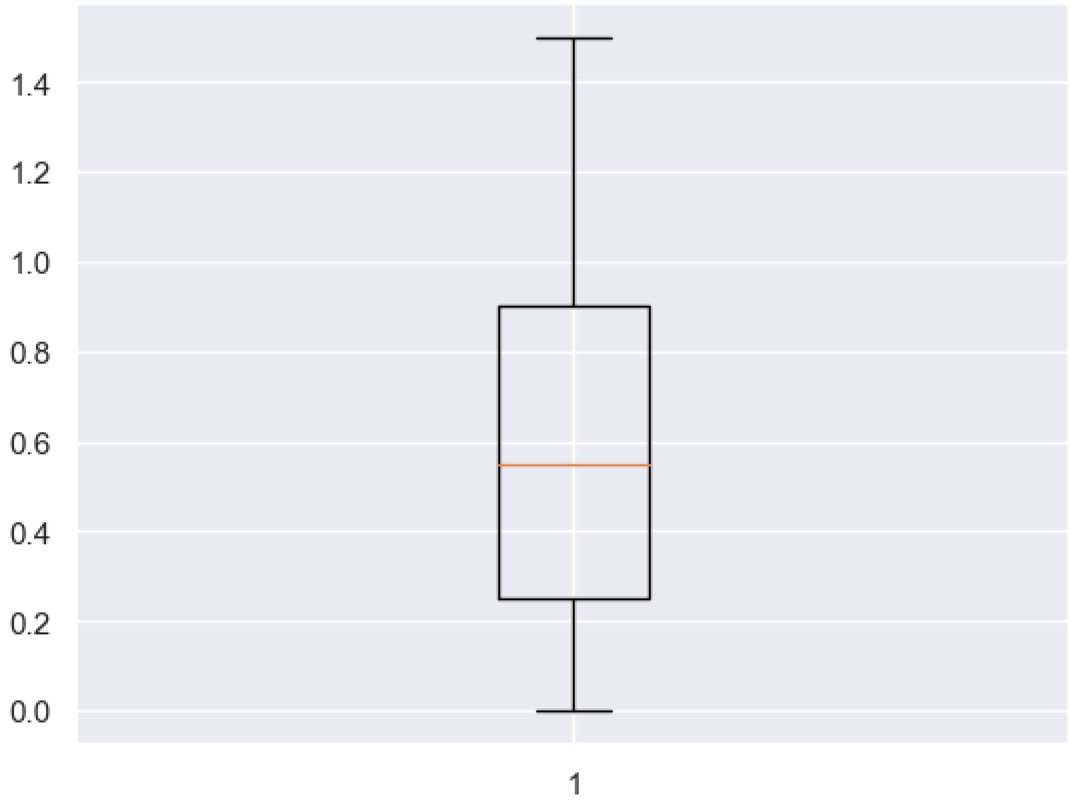
The Percentage of people having Private Health Insurance



The Percentage of people getting Government Health Insurance due to their old age, Disability or Veteran Status

9.THE INCOME FOR THE HOSPITAL

In [40]:
```
y = list(df.income)
plt.boxplot(y)
plt.show()
```



CORRELATION MATRIX

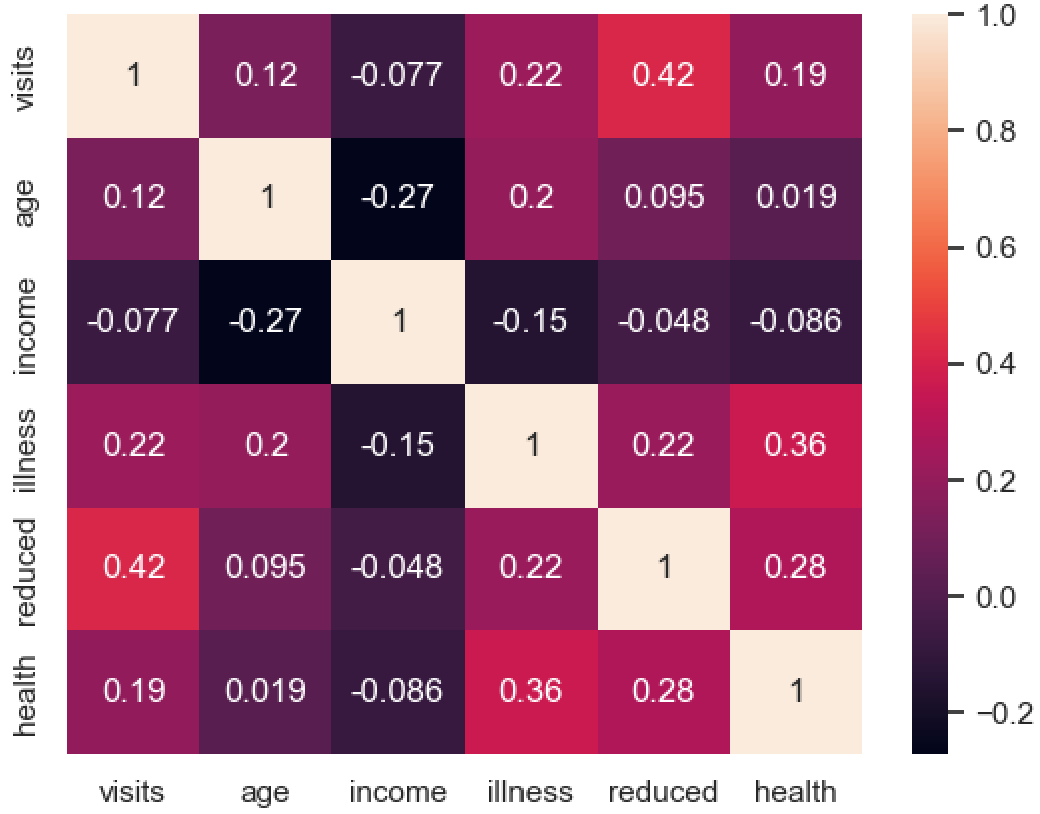
In [41]:
```
df.corr()
```

Out[41]:

	visits	age	income	illness	reduced	health
visits	1.000000	0.124537	-0.076840	0.223552	0.418954	0.193272
age	0.124537	1.000000	-0.271073	0.204984	0.094745	0.018616
income	-0.076840	-0.271073	1.000000	-0.148812	-0.047545	-0.085790
illness	0.223552	0.204984	-0.148812	1.000000	0.218116	0.360110
reduced	0.418954	0.094745	-0.047545	0.218116	1.000000	0.280208
health	0.193272	0.018616	-0.085790	0.360110	0.280208	1.000000

```
In [44]: sns.heatmap(df.corr(),annot = True)
```

```
Out[44]: <AxesSubplot:>
```



THE FINAL INSIGHTS FROM THE DATASET

1. There Are 2702 Females Who Are Suffering With Their Own Illness When Compared To 2488 Males Which Means That Females Are Suffering More Than Males
2. The 22 Aged People Are The Highest Count With 1213 Who Visited The Hospital
3. There Are Only 222 Number Of People Who Have Govt Health Insurance
4. Females Got Reduced From The Illness Fastly Than The Males
5. The Percentage Of People Who Get Govt Health Insurance Due To Their Old Age,Disability Or Veteran Status Are Less Than 25% From The Overall People
6. The Hospital Gets Minimum Income Of 0.2, Median Of 0.5 And Maximum Of 1.4 In Dollars

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