DATA VISUALISATION

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- Descriptive statistics
- Univariate graphing
- Bivariate graphing
- Lab4

DATA VISUALISATION

- To visualise the variables we use graphs. Starting with graphing one variable at a time.
- Bar charts are the most commonly used graph to examine the distribution of individual variables.
- The x axis is where we plot the variable we are visualising. In this first case it is a categorical variable. The Y axis is therefore the count of the number of occurrences for each possible value in the categorical variable.

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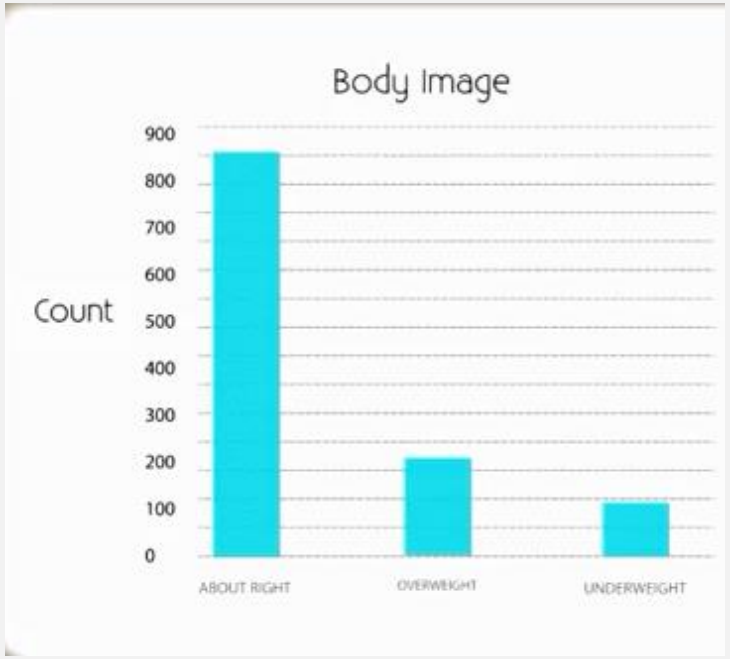

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- To visualise in Python we must import additional libraries into our program.
- First the seaborn package and secondly the matplotlib.pyplot library.
- To ensure a variable is ordered properly on the X axis (horizontal), you should always convert your categorical variables, which are often formatted as numeric variables. We convert them into a category variable so that Python recognises them.

```
#change format of variable from numerical to
Categorical

subset2['TAB12MDX'] =
subset2['TAB12MDX'].astype('category')
```

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```
bc1 = seaborn.countplot(x='TAB12MDX',data=subset2)

plt.xlabel('Nicotine Dependence past 12 months')

plt.title('Nicotine Dependence in the past 12 months
among young adult smokers in the Nesarc study')
```

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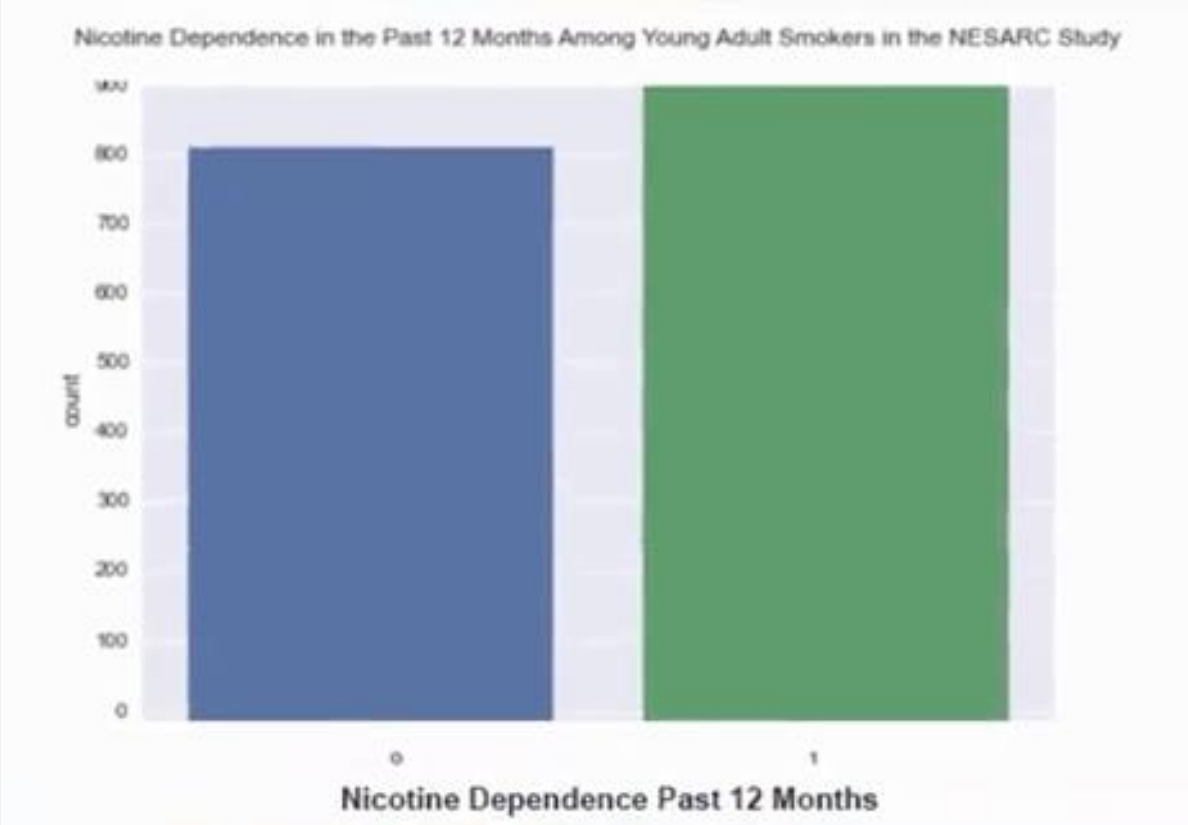

DATA VISUALISATION

- Some numerical variables are best described and visualised by creating groups for the variable and thus converting it into a categorical variable.
- For exam student grades could be naturally grouped into grand bands and the distribution of the grade bands visualised.
- The X axis would be the grade bands (categorical) and the Y axis would be the number of observations for each grade band.
- Once visualised you can interpret the histogram based on your knowledge from last term.

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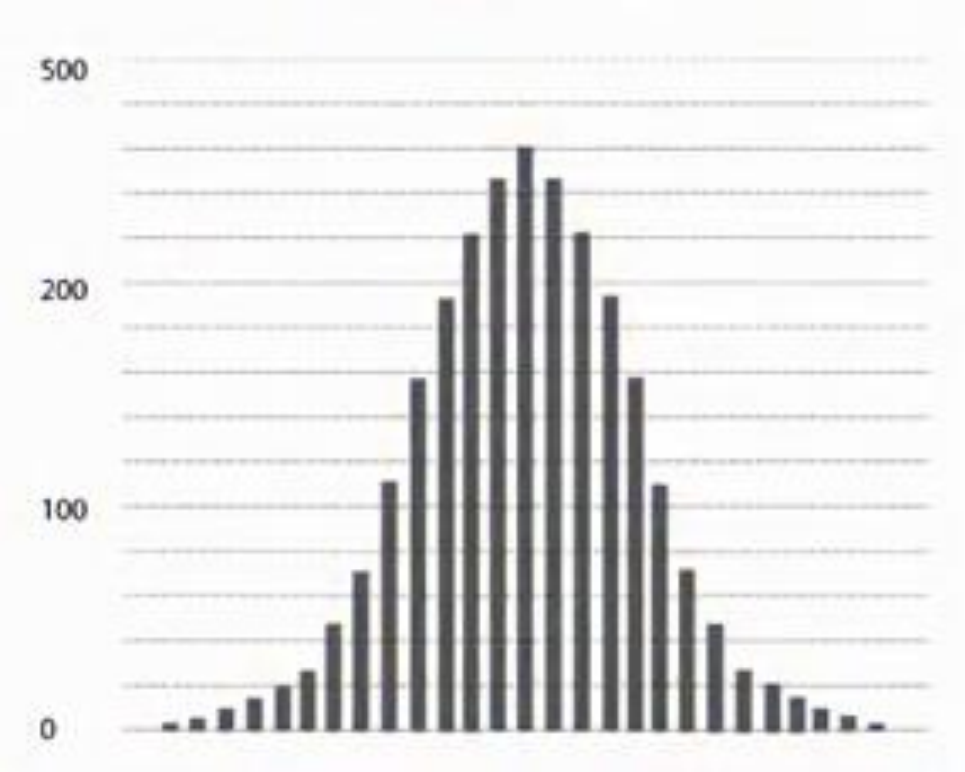

What can you say about this histogram?

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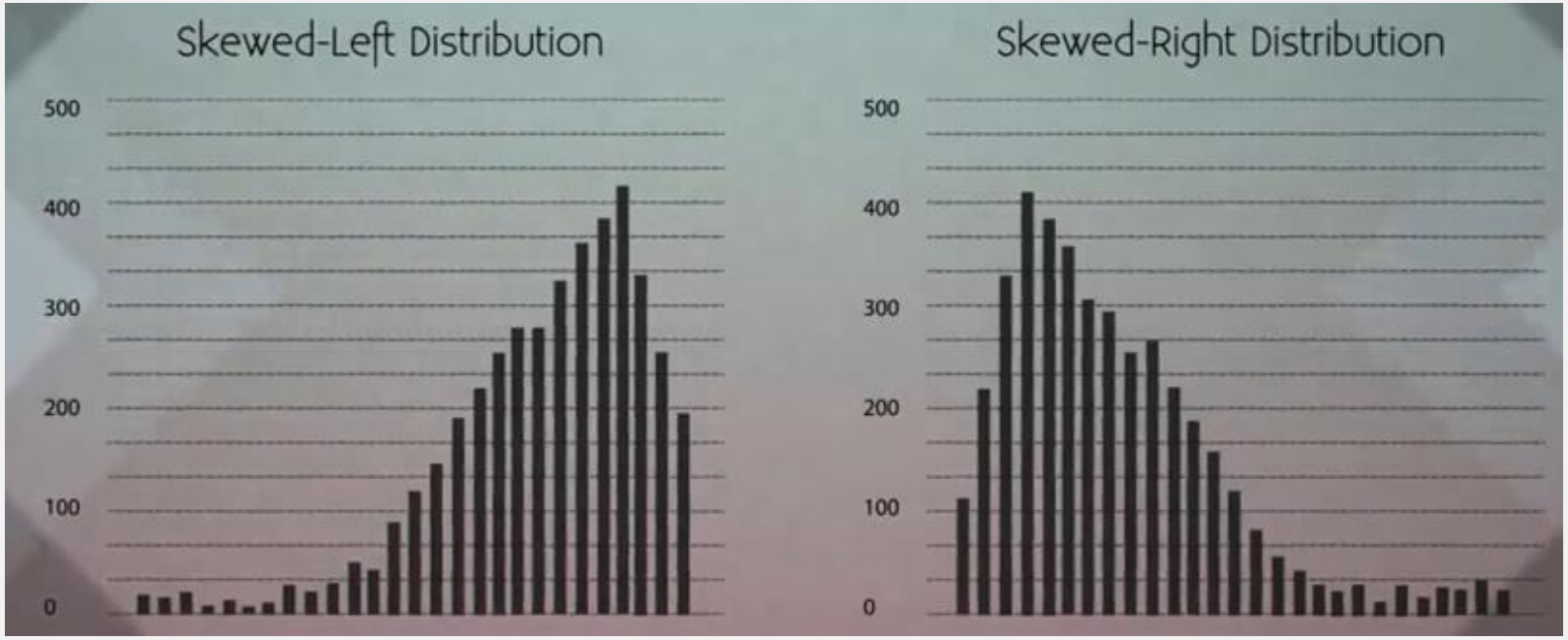

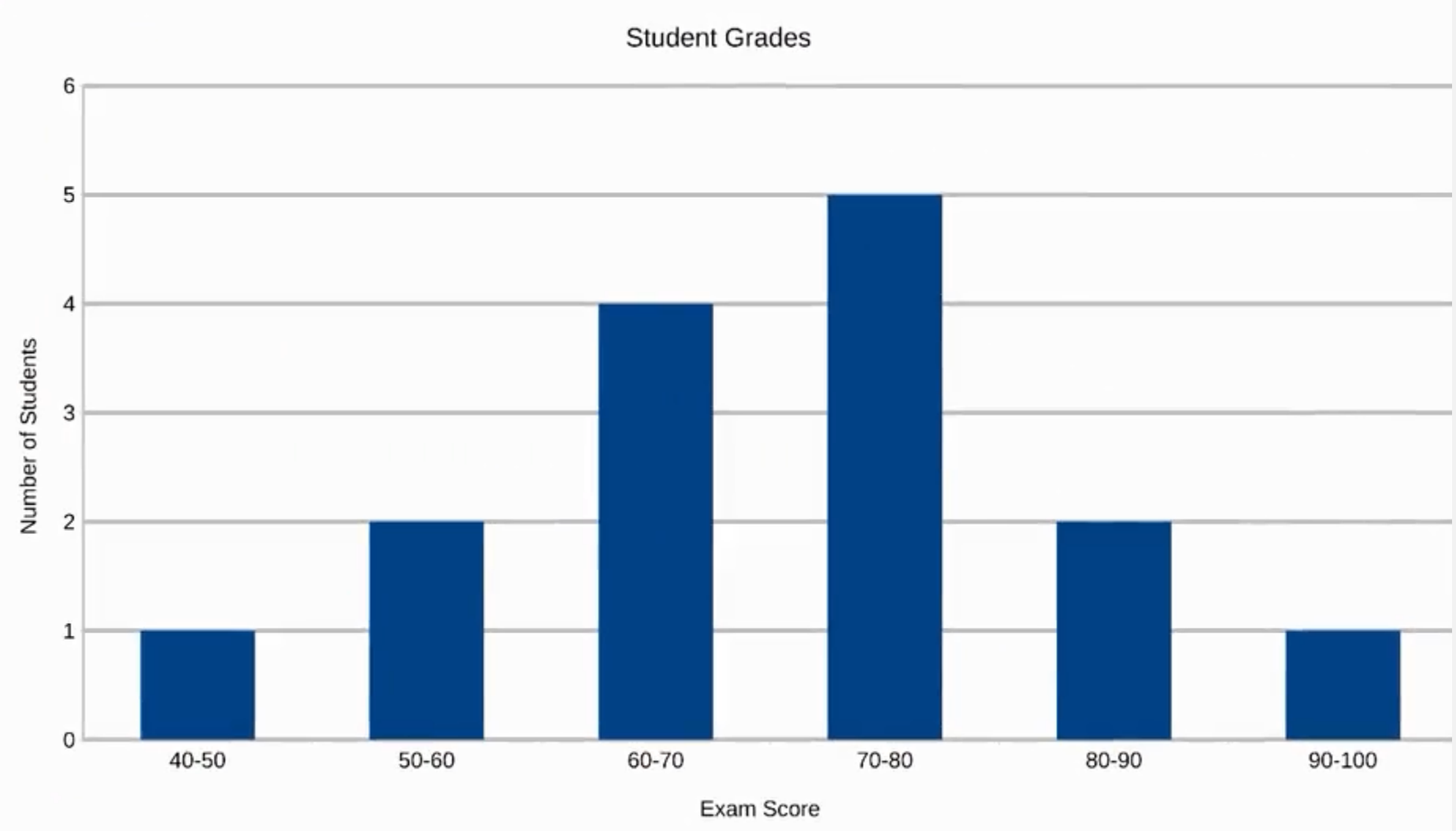
Student Grades
Number of Students
0
1
2
3
4
5
6
40-50
50-60
60-70
70-80
80-90
90-100
Exam Score

DATA VISUALISATION

- It is important to supplement a graphical display with some measures of spread, shape, and variability.

DATA VISUALISATION

```
print('describe number of cigarettes smoked per month')

desc1 = subset2['NUMCIGMO_EST'].describe()

print(desc1)


print('mean')

mean1 = subset2['NUMCIGMO_EST'].mean()

print(mean1)


print('std deviation')

std1 = subset2['NUMCIGMO_EST'].std()

print(std1)
```

```
print('min')
min1 = subset2['NUMCIGMO_EST'].min()
print(min1)

print('max')
max1 = subset2['NUMCIGMO_EST'].max()
print(max1)

print('median')
median1 = subset2['NUMCIGMO_EST'].median()
print(median1)

print('mode')
mode1 = subset2['NUMCIGMO_EST'].mode()
print(mode1)
```

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- The describe function works well on a numerical variable, calculating the mean, mode etc.
- What about using the describe function on a categorical variable?
- It will calculate a count, the number of unique values, the top or highest value and the frequency of that top value.
- You must remember to use the appropriate descriptive statistics for both quantitative and categorical variables.
- For quantitative it is best to examine histograms, and then supplement with measures of shape, centre and spread.
- Categorical variables often described well with frequency distributions or with a bar chart.

DATA VISUALISATION

- Visualising the relationship between two variables:
- Each variable has a role to play.
- A variable may either be a response variable, also known as the dependent variable or outcome variable, or it could be the explanatory variable, also known as the independent variable or predictor variable.
- The following classification helps in selecting statistical tools that can be used to explore the relationship of variables and selecting the appropriate graphs.

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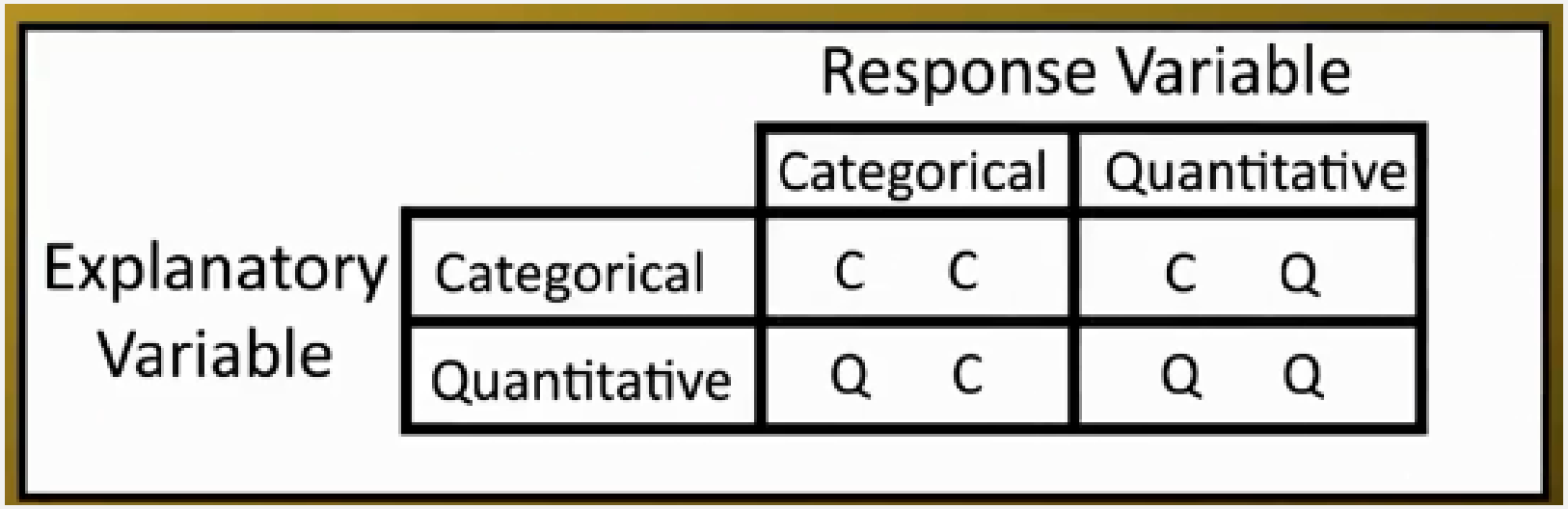


DATA VISUALISATION

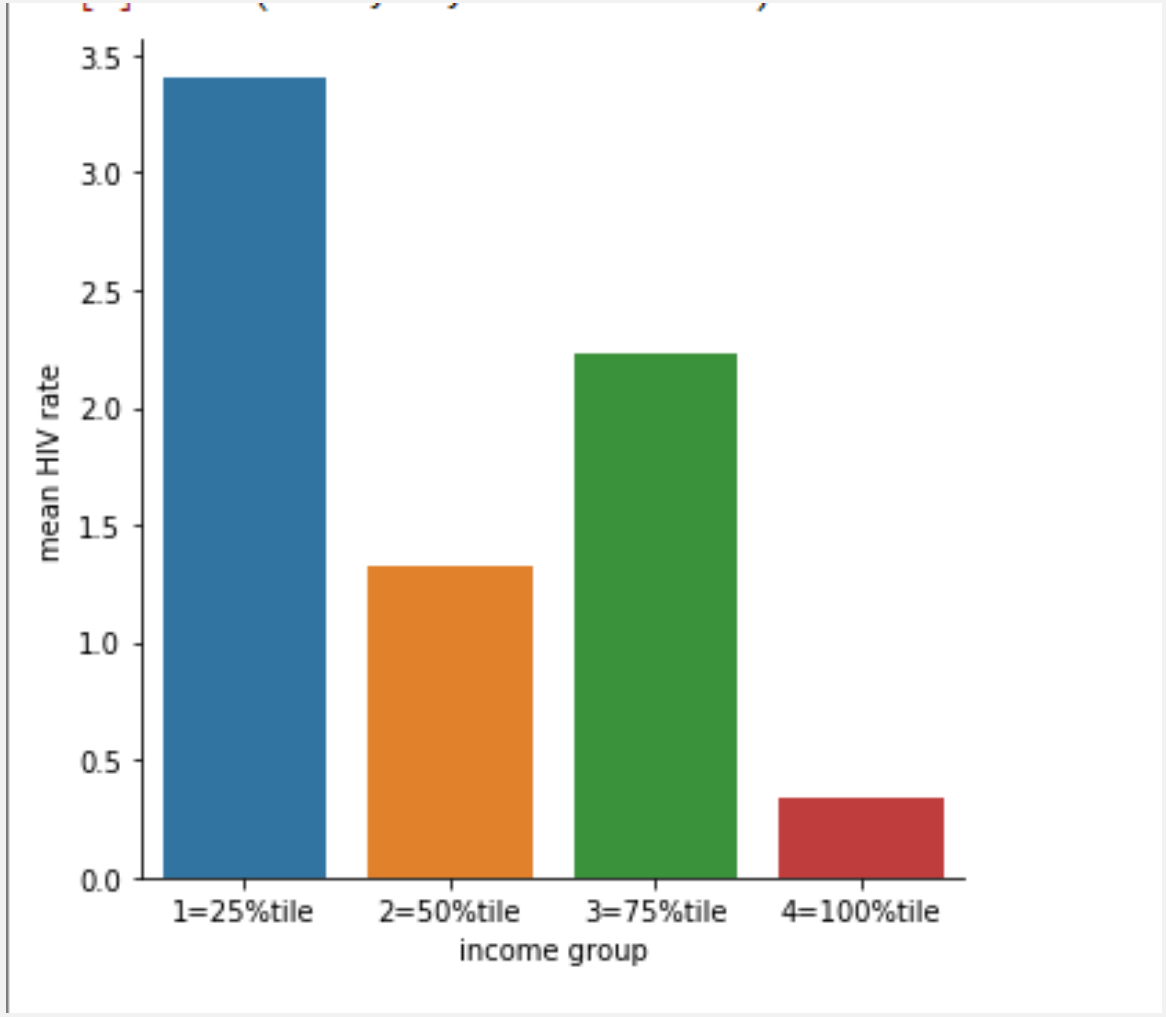
- Explanatory variable goes on the X axis and the response variable goes on the Y axis (usually count/average for each explanatory variable)
- For our example smoking will be the explanatory variable and nicotine dependence the response variable.
- To graph correctly we must first answer a couple of questions.
- What type is the response variable? In our case it is categorical
- How many categories are in the response variable? 1 and 0 (yes and no)
- What type is the explanatory variable? Number of cigarettes smoked per month, so it is a quantitative variable.

DATA VISUALISATION

- When you have a response variable that is a categorical and an explanatory variable that is quantitative then we need to convert the quantitative variable into categorical.
- In our case that means grouping the number of cigarettes smoked per month.
- This would mean we could then graph a categorical by categorical chart.
- The factorplot() is used to graph two categorical variables.

DATA VISUALISATION

- For a bivariate graph where the response variable (HIV rate) is categorical with two values 0 and 1 we convert it to numerical so that the Y Axis shows the mean for each observation that falls into the explanatory variable categories. Otherwise Python won't calculate the mean if it is a categorical variable.
- For example, the number of 1's (HIV rate) are added together for all observations that fall into the income bins value of 25% tile and divided by the total number of observations, thus giving the HIV rate for each incomeperperson bin.


3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
mean HIV rate
1=25%tile
2=50%tile
3=75%tile
4=100%tile
income group