

## Types of Variables

A variable represents any aspect of the individual on which measurement is done. To distinguish between different types of variables, it is useful to classify them according to their *scale of measurement* i.e. how they are measured. Variables can either be qualitative or quantitative.

### A) *Qualitative Variables*

A qualitative variable characterizes a certain quality of a subject which could not be expressed in a number i.e. it is not result of a count. Qualitative data is also known as **categorical** data because they could be expressed in categories. Categorical variables are divided in to 3 types according to the number and type of the categories.

- 1) Binary (dichotomous) variables: This is the simplest type of a a categorical variable as it takes only two categories. Binary variables are very common in epidemiological studies. A lot of questions we ask could be answered in only two categories and a lot of characteristics we study take only two categories. Expanses include questions answered in “Yes” or “No”, sex, vaccination status, presence of disease, literacy etc. These variables take two answers.

Sex

Male

Female

Vaccination status

Vaccinated

Not vaccinated

Literacy

Literate

Illiterate

- 2) Ordinal variables: Ordinal variables (also called ordered categorical variables) are those categorical variables which take more that two categories in their values and the categories have a natural ordering i.e. the categories have a certain ordering pattern. These variables do not have a true measured value, they are not result of a count, however we can assign a numerical value (a score) to each category according to the natural order. Examples of ordinal variables are education level, pain scale, anxiety score, level of agreement. If you ask a student “how much are you satisfied with the service in the college library?” The answers could be “not at all”, “a little”, “satisfied” and “very much satisfied”. Theses answers have a natural ordering. We can assign scores for these answers giving for example 0 to “not at all”, a for “ a little” and so on. Here are 2 other examples:

Education level: what is the highest education level you have achived?

None (1)

Primary education (2)

Secondary (3)

University (4)

Intensity of pain on a scale: On a scale from 1 to 4, where 1 is the least pain and 4 is the most intense pain, how much pain do you feel right now?

- 1 Least intense pain
- 2
- 3
- 4 Most intense pain

3) Nominal variables: Nominal variables are categorical variables that can take more than two values and these values do not have any specific listing order. These variables are also unordered categorical. So, the only difference between nominal and ordinal variables is that nominal variables do not have a natural ordering pattern. The categories of nominal variables can be lists in any order. For example blood group has 4 categories, A, B, AB, and O. These categories could be arranged in other forms like A, O, B, AB it does not affect the results of the analysis.

Marital status

- Never married
- Currently married
- Separated
- Widowed

Blood group

- A
- B
- AB
- O

### ***B) Quantitative variables***

A quantitative variable is a variable that represents data which can be counted or measured i.e. these variables are result of a count or a measurement. When we can count or measure some characteristics this characteristic is a quantitative variable. Quantitative variables are also called numeric or numerical data. Numeric variables have two types, discrete and continuous.

1) Discrete variables: A discrete variable is a numerical variable which is usually the result of a count. When some characteristic is counted such as when answering “how many”, the result will be a discrete variable and the values will always be positive integers. For example how many children do you have?

Number of episodes of diarrhea per day

- 1
- 2
- 3 ...etc

Number of children

- 1
- 2
- 3...etc

- 2) Continuous variable: Continuous variables are numerical variables which are usually obtained by some form of measurement and the value of the variable can be anything not restricted to an integer. They are called continuous because the value theoretically can continue to anything. For example weight is a continuous variable because it can take any number of fractions such as 50 kg, 50.5 kg, 60.2 kg etc.

Systolic blood pressure in mmHg

100  
102  
110.5  
115.8  
...etc

Total serum bilirubin in

0.8  
1.0  
1.3  
3.3  
...etc

**Question:**

Identify type of the following variables and list possible categories(answers) for each variable:

Occupation  
Blood sugar  
Income level  
Income in dinars  
Presence of diarrhea  
Number of children  
City of residence  
Cause of death  
Season  
Age in years  
Hospital stay in days  
Pints of blood given  
Job satisfaction