Numeracy & Quantitative Methods: Numeracy for Professional Purposes

Types of Data

Laura Lake
Introduction

- When collecting or gathering data we collect data from individuals cases on particular variables.
- A variable is a unit of data collection whose value can vary.
- Variables can be defined into types according to the level of mathematical scaling that can be carried out on the data.
- There are four types of data or levels of measurement:

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<tbody>
<tr>
<td>1. Nominal</td>
<td>2. Ordinal</td>
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<td>3. Interval</td>
<td>4. Ratio</td>
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Nominal data

- Nominal or categorical data is data that comprises of categories that *cannot* be rank ordered – each category is just different.

- The categories available cannot be placed in any order and no judgement can be made about the relative size or distance from one category to another.

- What does this mean? No mathematical operations can be performed on the data relative to each other.

- Therefore, nominal data reflect qualitative differences rather than quantitative ones.
Nominal data

Examples:

What is your gender? (please tick)

Male
Female

Did you enjoy the film? (please tick)

Yes
No
Nominal data

• Systems for measuring nominal data must ensure that each category is mutually exclusive and the system of measurement needs to be exhaustive.

• Variables that have only two responses i.e. Yes or No, are known as dichotomies.
Ordinal data

• Ordinal data is data that comprises of categories that can be rank ordered.

• Similarly with nominal data the distance between each category cannot be calculated but the categories can be ranked above or below each other.

• What does this mean? Can make statistical judgements and perform limited maths.
Ordinal data

Example:

How satisfied are you with the level of service you have received? *(please tick)*

- Very satisfied
- Somewhat satisfied
- Neutral
- Somewhat dissatisfied
- Very dissatisfied
Interval and ratio data

• Both interval and ratio data are examples of scale data.

• Scale data:
  • data is in numeric format (£50, £100, £150)
  • data that can be measured on a continuous scale
  • the distance between each can be observed and as a result measured
  • the data can be placed in rank order.
Interval data

- Interval data measured on a *continuous* scale and has *no* true zero point.

- Examples:
  - Time – moves along a continuous measure or seconds, minutes and so on and is without a zero point of time.
  - Temperature – moves along a continuous measure of degrees and is without a true zero.
Ratio data

• Ratio data measured on a continuous scale and does have a true zero point.

• Examples:
  • Age
  • Weight
  • Height
Hierarchical data order

- These levels of measurement can be placed in hierarchical order.
Hierarchical data order

• Nominal data is the least complex and give a simple measure of whether objects are the same or different.

• Ordinal data maintains the principles of nominal data but adds a measure of order to what is being observed.

• Interval data builds on ordinal by adding more information on the range between each observation by allowing us to measure the distance between objects.

• Ratio data adds to interval with including an absolute zero.
Knowing the hierarchy of data is useful.

Why? It is possible to recode or adjust certain types of data into others.

Can go from most complex (interval and ratio) to least complex (nominal) but cannot go the other way around.

Interval/ratio can be re-formatted to become ordinal or nominal, ordinal can become nominal.
Hierarchical data order

• Example: salary data for is often recorded as interval data (i.e. just a number).

• Why? Because it can then be analysed in many ways:
  • Any mathematical operation e.g. average salary
  • reformatted into ordinal or nominal data e.g. salary bands (£10,000 to £14,999, £15,000 to £19,999)
Hierarchical data order

• If salary data is collected as an ordinal variable i.e. in salary bands, then it becomes impossible to perform mathematical operations such as finding the average salary.

• So, if possible data such as this should be collected as scale data and these issues should be thought about at the research design stage.
Data types – important?

• Why do we need to know what type of data we are dealing with?

• The data type or level of measurement influences the type of statistical analysis techniques that can be used when analysing data.

• See the next set of lectures on descriptive statistics.

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