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Numeracy & Quantitative Methods:
Numeracy for Professional Purposes

# Types of Data

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# 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:

| | |
|---|---|
| **1. Nominal** | **2. Ordinal** |
| **3. Interval** | **4. Ratio** |

# 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

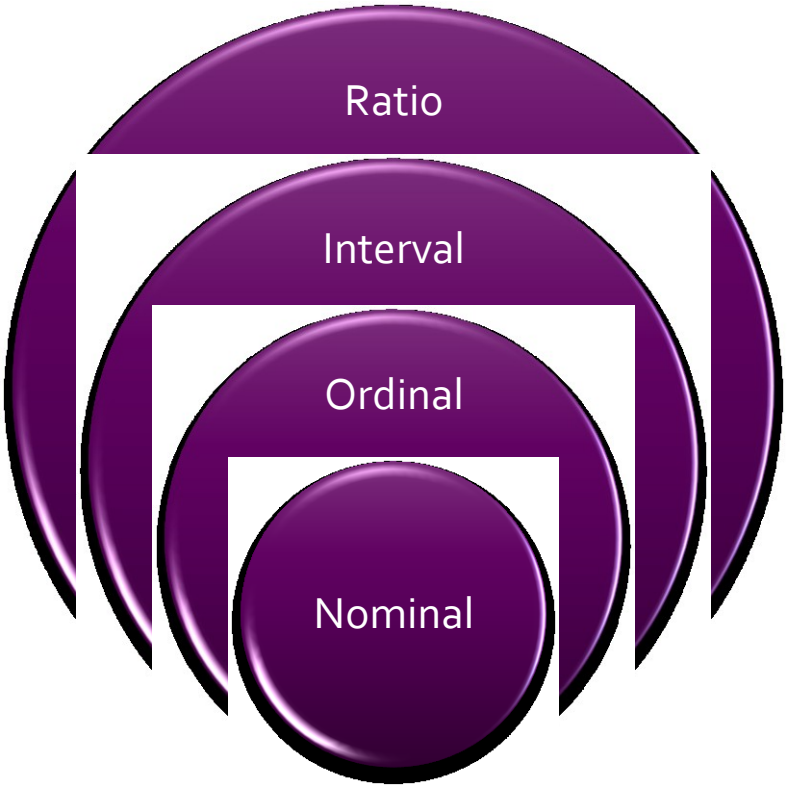

- Interval data measured on a *continuous* scale and has *no* true zero point.
- Examples:
  - Time – moves along a continuous measure or seconds, minutes and so on and is without a zero point of time.
  - Temperature – moves along a continuous measure of degrees and is without a true zero.

# 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.

# Hierarchical data order


- 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.

# References


Bryman, A. (2008) *Social Research Methods*. 3rd Ed. Oxford: Oxford University Press.

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