Authors

E A Hesketh
J M Laidlaw

Instructional Design
J M Laidlaw

Desktop Publishing
L E Bell
M C Gunn

Computing
N K McManus

Quantitative Research

Designed and produced by the
Education Development Unit
NHS Education for Scotland

Initial development sponsored by the
Scottish Higher Education Funding Council

Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Snippets on quantitative research

Quantitative research tends to focus on measurement and proof. This research adopts a 'scientific approach'. It is based on the premise that something is meaningful only if it can be observed and counted. Its key characteristics are numerical data that permits a range of statistical analysis. There are several approaches to quantitative research which include experimental, descriptive, correlational and causal comparison. Inferential statistics are frequently used to generalise what is found about the study sample to the population as a whole.

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

The Problem

The Solution

All these different research methods – experimental, descriptive, correlational and more – which do I choose?

Research methodology is a big subject area. If your skills need refreshed from your undergraduate days, this unit will give you an overview of quantitative research and start you off in the right direction.

I'm put off doing research – my knowledge of statistics isn't that hot!

Quantitative research concentrates on the collection and analysis of numerical data. Statistics, although not an integral part of a quantitative study, are used to confirm or contradict the conclusions you draw from your analysed data. Getting the choice of study type right, then getting advice from a statistician at the planning stage will help.

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Introducing quantitative research

Research is often described as either quantitative or qualitative. Studies which involve the collection and analysis of numerical data are known as quantitative research. Quantitative research adopts the scientific method and focuses on controlling variables, gathering measurable evidence and coming to generalisable conclusions or providing new explanations.

A typical quantitative study will specify the number of participants from a defined population and present data on, for example, the number of events occurring or some biological variable. It will include a statistical section which may show cause and effect relationships. Many research studies have an element of both quantitative and qualitative data. Read the 'Qualitative research' unit to find out when this approach is more appropriate.

Back Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Quantitative research in action

The aspects listed below take you through the various steps of the research process.

- Selecting and defining the research question
- Deciding on study type
- Deciding data collection tools
- Selecting the sample
- Sample size
- Analysing, interpreting and validating findings

Click the appropriate option if you wish to find out more

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Selecting and defining the research question

Deciding on study type

Deciding data collection tools

Selecting the sample

Sample size

Analysing, interpreting and validating findings

Read up on the subject to find out if your question has already been answered. Jot down the key concepts and concerns then form these into a meaningful question.

Ask yourself:

? Can I answer this through data collection and analysis?

? Will this contribute to knowledge in the subject area?

Show this to colleagues, if their reaction is 'Who cares', then think again.

Back Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Selecting and defining the research question

Deciding on study type

Deciding data collection tools

Selecting the sample

Sample size

Analysing, interpreting and validating findings

Some research problems suggest one type of strategy rather than another. For example:

If you want to know the effect of a drug or treatment

then a tightly controlled experimental methodology is appropriate.

If, however, you want to know whether some disease or symptom is related to age, smoking or some other life style factor

then a correlational approach is appropriate.

Four different strategies are now briefly described. These are Experimental, Descriptive, Correlational and Causal Comparison.

Experimental...

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Experimental

In an experimental study an intervention is made under controlled conditions with the sole purpose of evaluating its effect. The gold standard is the 'Randomised Controlled Trial' or RCT, most commonly used in clinical trials to assess whether a therapeutic intervention is effective.

A randomised selection of the population is split into the following two groups:

one group being given the new treatment or intervention

and

the other the control treatment or no intervention

Note...

Blinding, where the allocation of the intervention is concealed, is often used. Valid outcome measures are identified and assessed.

Descriptive...

Back

Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Descriptive

Descriptive research involves collecting data to test a hypothesis. It is commonly used in epidemiological studies to look at the incidence or distribution of disease, or assessing current health problems and needs. Data is usually collected through questionnaires.

Correlation...

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Correlational

This method is used to discover relationships between two variables, eg is there a link between birth weight and the development of disease over time?

Note...

The down side of this approach is that although links can be made and insight gained into the strength of the link, direct cause and effect relationships cannot be considered proven.

Causal comparative research...

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Causal comparative research

If a cause and effect relationship is being investigated, eg truancy and exam results; family income and health etc. the researcher can observe the status quo without intervention. The independent variable (truancy, income) having already occurred, cannot be manipulated.

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Selecting and defining the research question

Deciding on study type

Deciding data collection tools

Selecting the sample

Sample size

Analysing, interpreting and validating findings

Your chosen tool will be determined by the information you want to collect.

Typical data for a quantitative study may be morbidity and mortality trends, hospital admissions or prescribing patterns.

Data sources will be:

- **existing documents**
- **patient records**
- **surveys and questionnaires.**

Note...

Questionnaire design is an art in itself. Use an existing design or take advice.

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Selecting and defining the research question

Deciding on study type

Deciding data collection tools

Selecting the sample

Sample size

Analysing, interpreting and validating findings

Define the population you are interested in. The sample should be representative with minimum bias. To learn more about commonly used sampling procedures, cllck on the following:

Random

Non-random

Back

Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Random

Simple : using published random number tables everyone in the population has an equal chance of being selected.

Systematic: a sampling interval is calculated based on the population size and the required sample size. Then every nth subject is selected.

Stratified: sub-groups which may influence the outcome of a study, eg sex, age, ethnicity, are identified and a random sample taken.

Non-random

Purposive: subjects typical of the characteristics under investigation are chosen, eg patients from practices with a high incidence of a particular health problem.

Volunteers: there is a danger of creating a biased sample but may be a necessary option where legal or ethical issues arise, eg drug testing.

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Selecting and defining the research question

Deciding on study type

Deciding data collection tools

Selecting the sample

Sample size

Analysing, interpreting and validating findings

Sample size is important, too big increases costs, too small and you don't have sufficient data to reach any meaningful conclusions. Take advice from a statistician who will help you decide the numbers required to give validity to your results.

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Selecting and defining the research question

Deciding on study type

Deciding data collection tools

Selecting the sample

Sample size

Analysing, interpreting and validating findings

Decide at the planning stage what statistical tests will be used and thus the statistical database package best suited to your needs. Look for patterns, correlation's and cause and effect relationships in the data.

Back
Forward

Home
Units

Examples in practice

Here are examples in practice of two of the approaches commonly used.

Correlational

Experimental

Click the appropriate option if you wish to find out more

Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Back

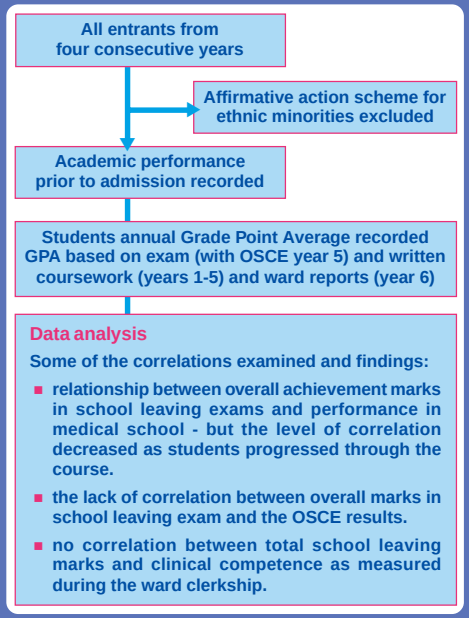
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Correlational

A study on the relationship between academic requirements and subsequent performance in medical school.

Taken from Collins JP, White GR & Kennedy JA (1995). Entry to medical school: an audit of traditional selection requirements. *Medical Education* 29: 22-28.



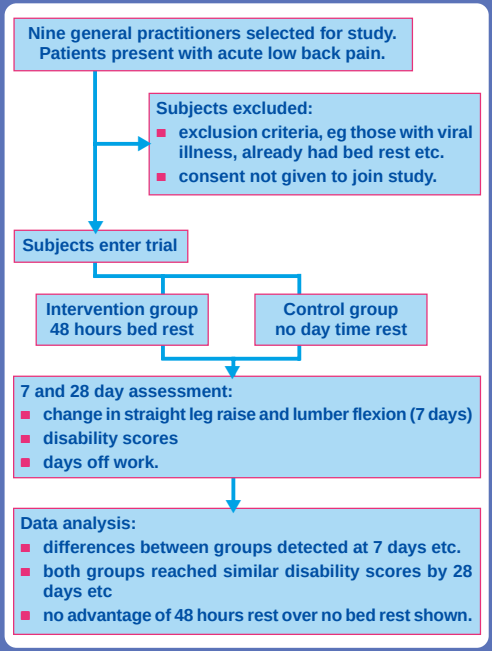
Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Experimental

A Randomised Control Trial on Bed Rest for Acute Lower Back Pain

Taken from Wilkinson MJB (1995). Does 48 hrs bed rest influence the outcome of acute low back pain? *British Journal of General Practice* 45: 481-4.



Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Practical tips

- If you can't think of a research idea ask for suggestions or advice from your line manager. They may have ideas that would be useful to your unit/organisation.
- Alternatively look at previous research work. Many research articles suggest areas that need further work. Remember most research is about building on the work of others.
- Let your idea mature for a little while and then talk it through with a colleague. They may help you to see some of the pitfalls and assist you to hone in on your research question.
- Make sure you get approval from any relevant Ethics Committee and that the data is stored according to the Data Protection Act.

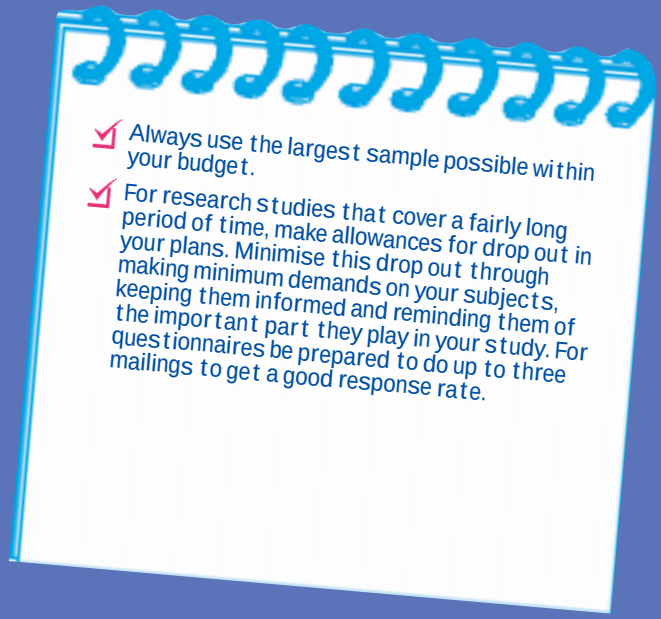
continued...

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

- Take advice on statistics, sampling etc at an early stage of planning.
- Always pilot your data collection tools and try to analyse the data. This gives you the opportunity to improve on their effectiveness or, if necessary, reduce the scope of what you had planned to do.
- Questionnaires - Avoid ambiguous words like regular, normal, recently – they mean something different to every one and need to be defined eg twice a week, within the last two weeks
- Check the consistency of answers in your questionnaires through asking one or two questions again with different wording.

continued. . .

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget



- Always use the largest sample possible within your budget.
- For research studies that cover a fairly long period of time, make allowances for drop out in your plans. Minimise this drop out through making minimum demands on your subjects, keeping them informed and reminding them of the important part they play in your study. For questionnaires be prepared to do up to three mailings to get a good response rate.

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Other learning opportunities

There are many books and other resources on Quantitative Research. Here is a short resume of our suggestions.

Click the appropriate button if you wish to find out more

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Kumar R (1999) ***Research Methodology - A step by step guide for beginner.*** **Sage Publications, London**

Blaxter L, Hughes C & Tight M (1996). ***How to research.*** **Open University Press, Milton Keynes**

Carter Y & Thomas C (eds) (1997). ***Research methods in primary care.*** **Radcliffe, Oxford**

All these books take you through the research process from designing your question to study design, analysis, interpretation and dissemination.

Back
Forward

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

Oxman AD, Sackett DL & Guyatt GH (1993). Users' guides to the medical literature 1 How to get started. *JAMA* 270 2093-2095

The first of a series of articles dealing with critical appraisal skills.

Greenhalgh T (1998). Randomised controlled trials. *British Journal of General Practice* 48 1448-1449

A short interesting account of the history of RCTs and an introduction to the shorthand terms commonly used in such research. The article also stresses the importance of true randomisation without which the benefits of an intervention may be overestimated.

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

The international database TimeLIT (Topics in Medical Education Literature) www.timelit.org gives free access to articles relating to education in medicine, dentistry, nursing, patient health and the professions allied to medicine.

Other useful websites for those interested in Medical Education are that of the Association for the Study of Medical Education www.asme.org.uk and that of the Association for Medical Education in Europe www.amee.org

Home
Units
Snippets
Core
Examples
Practical Tips
Opportunities
Activities
Don't Forget

You might now wish to look at the related unit on Qualitative Research.

Qualitative Research

Click the option to take you to a summary of the unit

Back
Forward

Group activities

Get together with about five colleagues and have a go at investigating whether Body Mass Index (BMI) is related to the amount of junk food you eat. You will require scales and a stadiometer. Take measurements of each group member's height and weight. Then assess the frequency of their junk food intake per week, where for example a bag of crisps or one small portion of cake could be counted as one unit of junk food. Analyse your data by calculating each subject's BMI. Plot BMI against junk food frequency and discuss the spread of results on the graph and/or perform a correlational analysis using a statistical package such as SPSS. Afterwards consider what other variables/factors could/should have been taken into account to improve the study design.

Make sure your research aims and questions are clear from the outset. Then ask an expert or experienced person for advice to ensure the right methods, tools and statistics are employed.