



Epidemiological Research Strategies & Study Design

The basis of a good research study is an appropriate study design, one that will best answer the questions you have set with the resources you have available. This fact sheet outlines a number of study designs along with some of their advantages & disadvantages.

Descriptive Vs. Analytical Research Designs

When choosing your study design the first decision is usually whether you wish to conduct a descriptive or an analytical research study. If your study aims to gain more information about a subject and use this to generate theories or hypotheses, then a descriptive study may be used. However, if your study aims to actually test pre-planned hypotheses, based on existing knowledge or findings, then you will need to use an analytical research method.

For example, a psychologist may see a patient with a very unusual pattern of brain injury that has not been documented before. The psychologist could then conduct a **single case study** with the patient trying to ascertain whether he has any psychological impairments. This would be a descriptive study, as it is used to generate knowledge about a given situation, paving the way for future studies. Such studies are very useful in describing new diseases or side effects of treatment (Bowling, 2002). The psychological impairments seen in that single patient may then be used by other researchers to **generate testable hypotheses** regarding how particular areas of the brain may be involved in behaviour. Further analytical research would be able to test these hypotheses regarding brain function.

Therefore, descriptive studies are usually opportunistic and unplanned. Examples of descriptive studies include single case studies, case series, ecological studies, planned exploratory studies, or add-ons to an existing study. All of these studies are useful for generating hypotheses, but do not test them.

Analytical research is usually pre-planned and tests one or more pre-stated hypothesis. Such studies are usually motivated by one or more hypothesis generating studies. Sometimes analytical research is called evaluative, as it determines the strength of a possible relationship between an exposure or intervention and outcome.

Observational Vs. Experimental Studies

In an observational study investigators attempt to observe a system without any interference, e.g. aetiological epidemiological studies. However, in an experimental study investigators deliberately change one or more variables in a system in order to examine the effects, e.g. a controlled clinical trial. Quasi experimental studies refer to experiments where the desired change cannot be isolated from other changes, e.g. non-controlled clinical trial. Research studies can be either **retrospective** or **prospective**. In a prospective study relationships are considered from a start point and followed forward in time. All experimental studies are prospective.

In a retrospective study relationships are considered from an end point and followed backwards in time.



Observational Research

Cross sectional Study

Cross sectional studies are usually used to determine the prevalence of a condition, i.e. the number of cases in a given population at a given point in time and any associated factors (Mann, 2003). Such studies are often used to identify possible causative factors in disease by comparing respondents that report having a particular condition to participants who do not have the condition. Findings from cross sectional research can show associations between variables, however they do not establish causality. Therefore the findings may be used to identify associations that may be investigated further using a different experimental technique.

They are relatively inexpensive as they often rely on questionnaires and no follow ups are required. The disadvantages are that response rates can be low and they are not suitable for studying rare conditions, as even very large samples may not identify anyone with the condition of interest.

Longitudinal Studies

In a cross sectional study all observations occur at one time point, therefore the relationships of interest are not examined temporally and they are unable to distinguish cause and effect. In a longitudinal survey observations are typically taken at more than one time point and relationships are considered temporally. They are usually prospective, but retrospective studies are possible. They are useful for studying the effects of new interventions or possible trends in behaviour. They are analytical as they analyse events at more than one point in time, thus they can suggest the direction of cause and effect associations (Bowling, 2003).

Case Control Study

A case control study is an epidemiological study to assess the strengths of association between an exposure and outcome of interest. In a case control study groups are identified on the basis of the condition or outcome of interest (cases) and are then compared with a control group who do not have the condition. Such studies are retrospective as they ask whether the participants have ever had the exposure of interest. They are relatively quick and inexpensive and they may be the only feasible method for rare disorders as they usually require fewer subjects than prospective studies. However, they do rely on subject recall or past records to determine exposure, both of which may be unreliable. It may also be difficult to select and locate a suitable control group.

Cohort Study

Cohort studies involve looking at a population who all share a common feature of interest, for example, a group of people all born in the same year or a group of people who have all smoked cigarettes. They are very useful for describing the incidence & natural history of a condition. They can be either prospective or retrospective; however, the prospective study is most useful to investigate the causes of disease. For example, it is possible to identify a group of people who do not have the condition of interest and then over time see how many people in your group go on to develop the condition.



Cohort studies are often used when randomised control trials may be unethical, such as examining the effects of asbestos inhalation. Although it would be unethical to expose people to asbestos, it is possible to study people who have already been exposed. However, it is important that all confounding variables are measured, as missing one may lead to problems in analysis.

Experimental Research

Randomised Clinical Trial

In a clinical trial one group of participants is given a new drug/ treatment or intervention, whereas another group (i.e., the control group) is given either a standard treatment for the disease or a placebo. The main feature is that the allocation of participants to either the experimental or control group is randomised. This design can indicate the nature of any causal relationships. The main disadvantage is that ethical questions can arise regarding the use or non use of new treatments or interventions.

Quasi Experimental Designs

In a quasi experimental design there is no random allocation of participants into treatment or control groups. The experimenters control over participant selection and the administration of any interventions is more difficult, therefore it is more difficult to interpret causal hypotheses (Bowling, 2002). Examples of quasi experimental designs are time series studies, within subject designs and non controlled clinical trials.

In more detail in:-

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