

Health Research Methods: an introduction

Health research covers descriptive and or analytical investigation of diseases and conditions related to health; people's perceptions of health; assessment of the needs of people in relation to health (needs assessment); evaluation of the health services in relation to their appropriateness, effectiveness and costs (health services research) as well as audit and quality assurance.

Depending on their objectives and the way they are undertaken, health research methods could be classified qualitative and quantitative; observational and interventional; descriptive and analytical; and retrospective and prospective studies. These categories are briefly described below.

Qualitative methods

Qualitative research is more interested in the broad understanding of an event or condition and meanings of data than their quantification. It aims to answer questions like "what is this condition", "what does it mean", "why and how does it happen". Qualitative research may use a combination of procedures including case studies, un-structured and semi-structured interviews, in-depth interviews, key informant interviews, rapid appraisal procedures, participant and non-participant observation and focus groups. These methods are more commonly used in social sciences. They could also be used in health as exploratory research or to provide meanings to quantitative findings.

Quantitative methods

Quantitative research aims to quantify events and conditions and present them in numbers. It tries to answer questions of how many, how much, how often and the strength of associations between exposures and outcomes. Examples include surveys, case-control studies, cohort studies and interventional studies.

Observational studies

Studies in which we describe patterns of health and disease of a population, without doing anything to change the factors which influence these patterns i.e. we don't deliberately expose the subjects to a risk factor. Observational epidemiology includes both descriptive and analytical studies such as surveys, case-control and cohort studies.

Interventional (experimental) studies

These are studies where we don't just observe the participants but interfere and subject them to an intervention (such as a giving a new drug) or an alternative treatment (such as a placebo or standard treatment). Randomized controlled trials have been increasingly used to evaluate new treatments and interventions. Example: we want to study effect of a new drug on hypertension. We divide the subjects randomly, we give some of them the new drug and we give the rest the standard drug. We compare the effect of each drug on hypertension.

Descriptive studies

Studies that describe differences in the distribution of health and disease within and between populations without trying to explore the causes of these differences i.e. we don't look for associations. Descriptive studies show the burden of disease within a population. For example, we might use descriptive epidemiology to describe the prevalence of TB in an area, or to examine how the birth-weight of babies has changed in a country over the last 50 years, or to describe differences in the prevalence of hypertension between men and women

Descriptive studies include routine collection and analysis of data on the health situations and needs, case series (reports on cases of the same disease) and cross-sectional surveys.

Analytical studies

Studies that try to interpret the differences in occurrence of disease i.e. try to investigate associations between certain risk factors and certain outcomes. For example, we can study prevalence of hepatitis B infection and of the incidence of primary liver cancer to see whether there is an association between the hepatitis B and liver cancer. All quantitative epidemiological methods can be analytical such as cross sectional studies, cohort and case-control studies.

Prospective studies

When data on exposures and outcomes are collected from a point in time forwards into the future the study is called prospective. Interventional and cohort studies are usually prospective when subjects are followed for a certain period of time into the future and data on outcomes and change in exposures are collected when these happen. In a case-control study, cases could be recruited prospectively when they happen. Prospective methodologies are considered less prone to errors of completeness, consistency and bias.

Retrospective studies

In retrospective methodologies, we collect data on exposures and outcomes that have occurred in the past such as the use of existing hospital records or vital statistics. Cross-sectional studies are retrospective because we collect data on exposures and outcomes that have already happened. Most case-control studies recruit past/existing (retrospective) cases therefore data are about the past exposures and diseases.

Common epidemiological study methods

1- Cross sectional studies

In a cross-sectional study we collect data on the exposure and the outcome in the same time from a sample of the population. We measure prevalence of the outcome in a descriptive study and prevalence ratio in an analytical study.

Example: we do a survey on risk factors of smoking among school children. We collect data on smoking and potential risk factors and measure prevalence of smoking among the students. We can measure prevalence ratio of smoking between males and females.

2- Case-control studies

The Starting point in a case control study is the outcome (case). When we want to investigate the association between an exposure and an outcome, we start by identifying individuals with the outcome of interest (cases), and compare them with individuals without this outcome (controls). We obtain information about one or more previous exposures from cases and controls, and compare the two groups to see if each exposure is significantly more (or less) frequent in cases than in controls. We measure odds of exposure and odds ratio.

Example: A case control is done to investigate the association between smoking and lung cancer. We select a number of individuals who have (had) lung cancer and select the same number of comparable individuals who have no lung cancer. We then collect data on smoking among the two groups and we measure odds of smoking in the two groups and compare the odds of smoking between the two groups (odds ratio).

3- Cohort studies

The starting point for cohort studies is exposure to a risk factor. We select a group of subjects who have experienced an exposure of interest, and follow them over a period of time to determine the incidence (risk) of the outcome. We can compare the risk in this exposed group to another group not exposed to the exposure of interest (risk ratio).

Example: A cohort study can follow up for several years, the workers of a factory who are exposed to asbestos and determine the incidence of lung cancer among the workers. The study can simultaneously follow up a similar group of other workers who are not exposed to asbestos and compare the incidence of lung cancer between the 2 groups (risk ratio).

4- Interventional Studies

We actively allocate the exposure (or intervention) to one of the study groups. The group that is allocated not to receive the intervention acts as a control group. We then follow the groups over a period of time. We compare the frequency of the outcome in the group allocated to receive the intervention with the frequency of the outcome in the group who were allocated not to receive the intervention.

Example: if we wanted to investigate the effect of nicotine patches in helping smokers to give up smoking. We would allocate a number of smokers to a treatment group and an equal number of individuals to a control group. The

treatment group would receive nicotine patches and the control group would receive placebo patches. We follow the two groups up over a period of time and compare the frequency of smoking in the nicotine patch group and the placebo group (risk ratio).

5- Ecological Studies

Ecological studies compare the exposure and outcome status of groups rather than individuals. An ecological study thus looks for an association between an exposure and an outcome at the group level e.g. city, country, ethnic group. In other words, we want to see whether the outcome is more frequent in groups where the exposure is more frequent. Ecological studies are the only studies that enable us to investigate the differences between groups

Example: in an ecological study of the association between smoking and lung cancer in several cities, we compare the proportion of the adult population who smoke in each city with the incidence rate of lung cancer for each city. In such a study, we would not know whether any particular individual who developed lung cancer was a smoker or not.

In an ecological study of the association between chronic hepatitis B infection and primary liver cancer in several countries, we would compare the chronic hepatitis B prevalence rate in each country with the incidence rate of primary liver cancer for each country.

Suggested reading

- Gordis, L. Epidemiology. London: Saunders, 2000.
- Bowling, A. Research methods in health. Open University Press, 2005