

Epidemiologic study design



RUNNING HEAD Study Designs Epidemiologic Study Designs here here July 3, 2009 Epidemiologic Study Designs This paper tackles three epidemiological study designs: case-control study, cohort study and cross-sectional study. The characteristics of the three study designs were discussed together with their main strength(s) and limitation(s). The most appropriate measure(s) of association for each study design was/were also identified.

Case Control Study

Characteristics of a case-control study

In a case control study, selection of research subjects is based on whether or not the research subjects have the condition (or disease) under study. The term case refers to a subject who has the condition, whereas control refers to a subject who does not have the condition. This study design finds good application in epidemiology for investigating conditions which are relatively rare and in conditions with long latency periods.

A researcher performs analysis by looking back in time to evaluate the case and control groups in terms of exposure history and indication of characteristics that may put the subjects at risk for developing the condition under study. Analysis is conducted under the assumption that differences in the history of exposure will explain the occurrence of more cases than controls (Portney and Watkins, 2009).

Strengths of a case-control study

The two main strengths of case-control studies are: ease in gathering subjects, and their utility to provide estimates which may support causal relationship between risk factors and the condition (disease) in combination with other evidences (Portney and Watkins, 2009).

Limitations of a case-control study

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Case-control studies are, somehow, limited in the sense that there is a possibility of uncertainty in the temporal relationship between the exposure and the condition (disease). Another limitation in this type of study design is that the proportion of cases and controls in the study is not related to the proportion of cases and controls in the population. Case control studies require further analysis pertaining to the potential for bias (Portney and Watkins, 2009). Moreover, in a case-control study design, control of selection is difficult; it may be applied to the study of only one disease outcome at a time and is usually subject to recall bias (Jekel, Katz and Elmore, 2001).

Measure of association in a case control study

In a case-control study, neither absolute risk nor odds can not be measured since “ it is only possible to calculate risk in a study where subjects have been followed forward in time” (Daly and Bourke, 2000, p. 166). However, Daly and Bourke (2000) revealed that “ the cross-product ratio in a case-control study, which legitimately estimates the ratio of the odds of exposure, must also be a valid estimate of the ration of the odds of disease” (p. 167).

Cohort Study

Characteristics of a cohort study

A cohort study, which is also called a follow-up study is one in which the investigator selects subjects who have not yet manifested an outcome of interest (a disease or disorder) and follows the chosen subjects to determine whether or not the disease or disorder develops at a later time.

In a cohort study, research subjects are either interviewed or observed to evaluate the presence or absence of risk characteristics or exposures. Cohort studies may be purely descriptive, but are oftentimes analytic. In this study design, the risk associated with exposure is identified through a comparison

of the incidence of the outcome of interest between those who were exposed to the risks and those who were not. Cohort study design is best for examining multiple disorders. (Portney and Watkins, 2009).

Strengths of a cohort study

With a cohort study, the onset of a condition can be determined, and this serves as one of its key advances over case-control studies. Since the research subjects are followed forward in time, use of a cohort study allows the definition of relationship between exposure and risk from a established time sequence. Such sequence is a pre-requisite for developing inferences pertaining to contributing variables (Portney and Watkins, 2009). Cohort studies also have the advantages of being performed retrospectively or prospectively (Jekel, Katz and Elmore, 2001).

Limitations of cohort study

The main limitation of a cohort study design is its non-applicability to rare conditions in the population because of the impracticality of following a large number of subjects for a long time to obtain documentation for a suitable number of cases for generalizability of results (Portney and Watkins, 2009). Additionally, this design is time-consuming and costly for prospective studies; and is subject to losses due to follow-up (Jekel, Katz and Elmore, 2001).

Measures of association in a cohort study

In a cohort study, appropriate measures of association include relative risk, excess risk (also called attributable risk), attributable risk per cent and odds ratio (Daly and Bourke, 2000; Szklo and Nieto, 2007).

Cross-sectional Study

Characteristics of a cross-sectional study

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A cross-sectional study investigates the relationship between exposure and the prevalence of disease. There are three ways of looking at the prevalence of a disease: point prevalence, period prevalence and/or lifetime prevalence. Point prevalence refers to the proportion of people with the disease during the time of the study, whereas period prevalence refers to proportion of people with the disease over a past period of time (e. g., the last two years). Meanwhile, lifetime prevalence refers to the proportion who have the disease during the past and the present. In a cross-sectional study, no time period is specified and does not delimit the investigation to incident cases only (Susser, Sxhwartz, Morabia and Bromet, 2006).

Cross-sectional studies are most applicable for the measurement of current health status and in the determination of health practices (Bailey, et al., 2005).

Strengths of a cross-sectional study

The most important strength of a cross-sectional study is its efficiency over a longitudinal study or a cohort study, since the former is relatively quick and easy to perform (Portney and Watkins, 2009; Bailey, et al., 2005). Since the research subjects are observed or tested only one and at approximately the same time, this type of study design is not threatened by the effects of testing and history (Portney and Watkins, 2009).

Limitations of cross-sectional study

The key limitation of the cross-sectional study design is selection. Difficulty is usually experienced in determining the extent to which results of the investigation show the effects of the passing of time against the effects of extraneous sampling variables ((Portney and Watkins, 2009). Further, temporal relationships can not be determined in a cross-sectional study. The

only way that results of cross-sectional studies can be used to test hypotheses in epidemiology is when exposure status does not differ with the passage of time. Moreover, since these studies also include prevalent cases, potential bias is seen towards subjects with chronic disease because those with acute and fatal illnesses would have already died before the survey and, therefore, would not have been included (Bailey, et al., 2005).

Measures of association in a cross-sectional study

The most appropriate measures of association for a cross sectional study are prevalence difference, prevalence ratio and prevalence odds ratio (Susser, et al., 2006).

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