PRENATAL SCIENCES RESEARCH INSTITUTE SOPHIA

Longitudinal studies

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In a longitudinal study, **subjects are followed over time with continuous or repeated monitoring of risk factors or health outcomes, or both**.

Such investigations vary enormously in their size and complexity.

At one extreme a large population may be studied over decades. For example, the longitudinal study of the Office of Population Censuses and Surveys prospectively follows a 1% sample of the British population that was initially identified at the 1971 census. Outcomes such as mortality and incidence of cancer have been related to employment status, housing, and other variables measured at successive censuses. At the other extreme, some longitudinal studies follow up relatively small groups for a few days or weeks. Thus, firemen acutely exposed to noxious fumes might be monitored to identify any immediate effects.

Most longitudinal studies examine associations between exposure to known or suspected causes of disease and subsequent morbidity or mortality. In the simplest design a sample or cohort of subjects exposed to a risk factor is identified along with a sample of unexposed controls. The two groups are then followed up prospectively, and the incidence of disease in each is measured. By comparing the incidence rates, attributable and relative risks can be estimated. Allowance can be made for suspected confounding factors either by matching the controls to the exposed subjects so that they have a similar pattern of exposure to the confounder, or by measuring exposure to the confounder in each group and adjusting for any difference in the statistical analysis.

A problem when the cohort method is applied to the study of chronic diseases such as cancer, coronary heart disease, or diabetes is that large numbers of people must be followed up for long periods before sufficient cases accrue to give statistically meaningful results. The difficulty is further increased when, as for example with most carcinogens, there is a long induction period between first exposure to a hazard and the eventual manifestation of disease.

One approach that can help to counter this problem is to carry out the follow up retrospectively. In developing ideas about the fetal origins of coronary heart disease, it was possible to find groups of men and women born in the county of Hertfordshire before 1930 whose fetal and infant growth had been documented. These people were traced, and the cause of death was ascertained for those who had died. **Death rates from coronary heart disease could thus be related to weight at birth and at one year old**. Obviously, such a study is only feasible when the health outcome of interest can be measured retrospectively. Mortality and cancer incidence can usually be ascertained reliably, but disorders such as asthma may be harder to assess in retrospect. A further requirement is that the selection of exposed people for study should not be influenced by factors related to their subsequent morbidity.

Another modification of the method is to use the recorded disease rates in the national or regional population for control purposes, rather than following up a specially selected control group. This technique is legitimate when exposure to the hazard in the general population is negligible. Thus, in a cohort study of people occupationally exposed to ethylene oxide (used as a sterilant gas and in the manufacture of antifreeze), exposure in the general population was minimal and national death rates could be used as a reference. The numbers of deaths in the cohort were compared with the numbers that would have been expected if subjects had experienced the same death rates specific for age, sex, and calendar period as the general population.