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Module Index

Causal Inference

Causal inference – the art and science of making a causal claim about the relationship between two factors – is in many ways the heart of epidemiologic research. Under most circumstances if we see an association between an exposure and a health outcome of interest, we would like to answer the question: is one causing the other? We care about causal inference because, ultimately, we want to intervene to improve public health, and interventions can be targeted on removing known causes of adverse health outcomes (or adding known causes of beneficial health outcomes).

SARS Outbreak Study 1

One of the most important tools of Infectious Disease Epidemiology is outbreak investigation. This exercise will show you how epidemiological methods were applied to an outbreak of SARS in the fictitious city of Epiville.

SARS Outbreak Study 2

In this module you will continue with the remaining steps of the outbreak investigation and begin to learn how to frame a hypothesis, design a study, and draw conclusions from your investigation.

Randomized Trials

The randomized trial is often described as the “gold standard” of epidemiological research. In contrast to observational study designs such as the cohort study and the case-control study, randomized trials are experimental in nature: the researchers randomly assign exposure to individuals, rather than simply observing the patterns of exposure occurring in the study population. This exercise will highlight the key features of the randomized trials design, along with investigating its strengths and weaknesses.

Cohort Study

Methodologically, the cohort study best approximates the randomized controlled trial (RCT), it samples on exposure and follows study participants through time for the development of the outcome of interest. As such, the cohort study is considered one of the leading observational epidemiological study designs. This exercise will show you the key features of the cohort design.

Case-Control Study

Traditionally, case-control studies have been viewed as an alternative to cohort studies in which individuals were selected on the basis of whether or not they had the disease outcome of interest, with investigators then comparing exposure history between those with the disease (the cases) and those free of the disease (the controls). More recently, the theory behind the case-control study has been re-imagined as a method of selecting a subset of an underlying cohort giving rise to the cases in the study. The case-control study design is an excellent choice of study when the disease is rare, has a long induction period, the exposure data are difficult to obtain, or very little is known about the disease. In these situations a cohort study is generally prohibitively expensive or the time frame of the study required for data collection is impractical. Unlike cohort studies, case-control studies identify cases of the disease of interest in their population and then compare their exposure experience to sampled controls. As you will learn in this exercise, this method is deceptively simple, and if not planned carefully, can lead to spurious findings.

Ecological Study

While many consider the ecological study design methodologically inferior to the cohort and case control designs, this exercise will highlight some of its unique strengths (in addition to key limitations).

Bias

Bias is defined as a systematic error which results in an incorrect or invalid estimate of the measure of association. Elucidating methods for eliminating bias from observational studies has long been one of the central goals of the field of epidemiology. This exercise will

introduce several different types of bias and some important ways of avoiding it.

Confounding

You have learned that random error and bias must be considered as possible explanations for an observed association between an exposure and disease. This week we will examine the role of confounding. Unlike random error or bias, confounding is a property of the study population, and occurs when the effect of an exposure on an outcome is mixed together with the effect of a third variable. This exercise will examine the properties of confounders and describe methods to adjust for confounding through both study design and analysis.

Screening

Screening is the examination of asymptomatic people in order to classify them as likely or unlikely to have a particular disease. Epidemiologists study the screening of diseases for two reasons: the first is to determine the validity of a screening test, and the second is to evaluate the effectiveness of a screening test in a population. This exercise will lead you through the design and analysis of a study to determine the validity of a screening test in EpiVillage. At the conclusion of this exercise, you will read an article and answer questions about a study designed to evaluate the effectiveness of a screening test in a population.

