10.5C: Experimental Epidemiology

Experimental epidemiology uses an experimental model to confirm a causal relationship suggested by observational studies.

Learning Objectives

• Summarize the purpose of experimental epidemiology and the three case types: randomized control, field and community trial

Key Points

• Experimental epidemiology is the study of the relationships of various factors determining the frequency and distribution of diseases in a community.

• Experimental epidemiology contains three case types: randomized control trial (often used for new medicine or drug testing), field trial (conducted on those at a high risk of conducting a disease), and community trial (research on social originating diseases).

• The method employs prospective population experiments designed to test epidemiological hypotheses, and usually attempt to relate the postulated cause to the observed effect. Trials of new anthelmintics are an example.

Key Terms

• **epidemiology**: Epidemiology is the study (or the science of the study) of the patterns, causes, and effects of health and disease conditions in defined populations.

• **Experimental**: An experiment is a methodical procedure carried out with the goal of verifying, falsifying, or establishing the validity of a hypothesis.
• **statistical**: of or pertaining to statistics

Epidemiology is the study (or the science of the study) of the patterns, causes, and effects of health and disease conditions in defined populations. It is the cornerstone of public health, and informs policy decisions and evidence-based medicine by identifying risk factors for disease and targets for preventive medicine. Epidemiologists help with study design, collection and statistical analysis of data, and interpretation and dissemination of results (including peer review and occasional systematic review). Epidemiology has helped develop methodology used in clinical research, public health studies and, to a lesser extent, basic research in the biological sciences.

Figure: *Early epidemiology*: Original map by John Snow showing the clusters of cholera cases in the London epidemic of 1854. John Snow’s investigative work was one of the first examples of epidemiology. He discovered that families that drew their water from the Broad St well became infected with cholera.

Epidemiologists employ a range of study designs from the observational to experimental and they are generally categorized as descriptive, analytic (aiming to further examine known associations or hypothesized relationships), and experimental (a term often equated with clinical or community trials of treatments and other interventions). In observational studies, nature is allowed to “take its course”, as epidemiologists observe from the sidelines. Controversially, in experimental studies, the epidemiologist is the one in control of all of the factors entering a certain case study. Epidemiological studies are aimed, where possible, at revealing unbiased relationships between exposures such as alcohol or smoking, biological agents, stress, or chemicals to mortality or morbidity. The identification of causal relationships between these exposures and outcomes is an important aspect of epidemiology. Modern epidemiologists use informatics as a tool.

Experimental epidemiology contains three case types: randomized control trial (often used for new medicine or drug testing), field trial (conducted on those at a high risk of conducting a disease), and community trial (research on social originating diseases). Experimental epidemiology tests a hypothesis about a disease or disease treatment in a group of people. This strategy might be used to test whether or not a particular antibiotic is effective against a particular disease-causing organism. One group of infected individuals is divided randomly so that some receive the antibiotic and others
receive a placebo—a “false” drug that is not known to have any medical effect. In this case, the antibiotic is the variable, i.e., the experimental factor being tested to see if it makes a difference between the two otherwise similar groups. If people in the group receiving the antibiotic recover more rapidly than those in the other group, it may logically be concluded that the variable—antibiotic treatment—made the difference. Thus, the antibiotic is said to be effective.

Although epidemiology is sometimes viewed as a collection of statistical tools used to elucidate the associations of exposures to health outcomes, a deeper understanding of this science is that of discovering causal relationships.