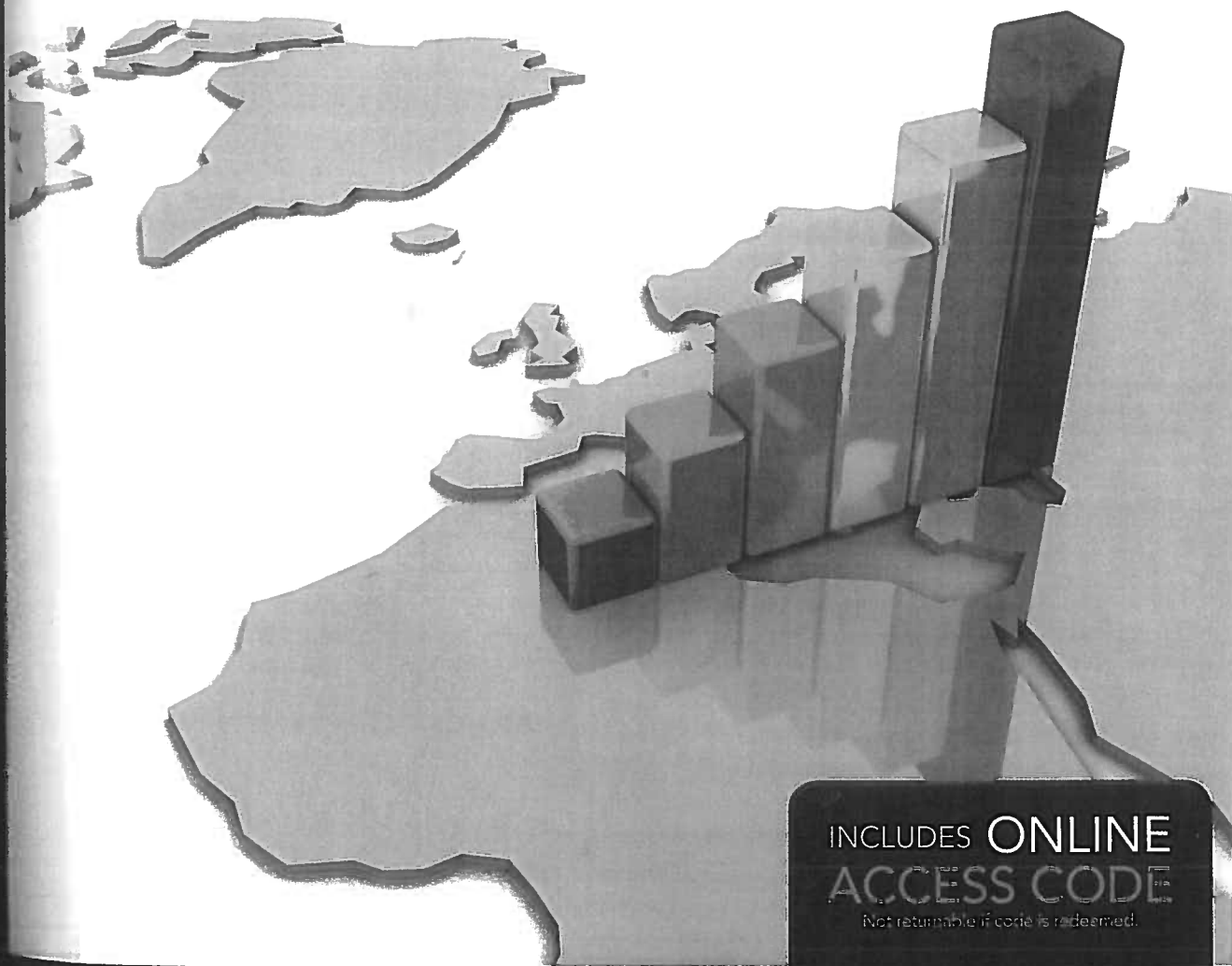


FIFTH
EDITION

Epidemiology for Public Health Practice

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All one

Study Questions and Exercises

1. Using your own words, give a definition of epidemiology. Before you read Chapter 1, what were your impressions regarding the scope of epidemiology? Based on the material presented in this chapter, what topics are covered by epidemiology? That is, to what extent does epidemiology focus exclusively upon the study of infectious diseases or upon other types of diseases and conditions?
2. How would the clinical and epidemiologic descriptions of a disease differ, and how would they be similar?
3. To what extent does epidemiology rely on medical disciplines for its content, and to what extent does it draw upon other disciplines? Explain the statement that epidemiology is interdisciplinary.
4. Describe the significance for epidemiology of the following historical developments:
 - a. associating the environment with disease causality
 - b. use of vital statistics
 - c. use of natural experiments
 - d. identification of specific agents of disease
5. Explain what is meant by the following components of the definition of epidemiology:
 - a. determinants
 - b. distribution
 - c. morbidity and mortality
6. The following questions pertain to the term epidemic.
 - a. What is meant by an epidemic? Give a definition in your own words.
 - b. Describe a scenario in which only one or two cases of disease may represent an epidemic.
 - c. What is the purpose of surveillance?
 - d. Give an example of a disease that has cyclic patterns.
 - e. What is the epidemic threshold for a disease? In what sense is it possible to conceive of the epidemic threshold as a statistical concept?
7. Epidemiologic research and findings often receive dramatic media coverage. Find an article in a media source (e.g., *The New York Times*) on a topic related to epidemiology. In a one-page essay, summarize the findings and discuss how the article illustrates the approach of epidemiology to the study of diseases (health conditions) in populations. You may search online for an appropriate article.

8. During the next week, read and review health-related articles available on the Internet or in your local or national newspaper. Try to find the following terms used in newspaper articles; keep a record of them and describe how they are used:
 - a. epidemiology
 - b. epidemiologist
 - c. infectious disease
 - d. chronic disease
 - e. clinical trial
 - f. increased risk of mortality associated with a new medication
9. What is the definition of a natural experiment? Identify any recent examples of natural experiments. To what extent might changes in legislation to limit smoking in public places or to increase the speed limit on highways be considered natural experiments?
10. Review Exhibit 1-2, Snow on Cholera. What do you believe was the purpose of each of the following observations by Snow?
 - a. "small white, flocculent particles" in the water from the Broad Street pump
 - b. the location of cholera deaths as shown in Figure 1-12
 - c. people who died avoided the pump in Marlborough Street and instead had the water from the Broad Street pump
 - d. "the greatest number of attacks in any one day occurred on the 1st of September, . . ."
 - e. "On September 8th—the day when the handle of the pump was removed . . ." To what extent do you think removing the pump handle was effective in stopping the disease outbreak?
11. How does quantification support the accomplishment of the four aims of epidemiology?
12. How did Koch's postulates contribute to the advancement of epidemiology? To what extent is identification of specific agent factors a prerequisite for tracking down the causes of disease outbreaks?
13. What are the characteristics that distinguish pandemic disease from epidemic disease? Name some examples of notorious pandemics that occurred in history. Why did the "Spanish Flu" of 1918 qualify as a pandemic? In giving your answer, be sure to distinguish among the terms epidemic, pandemic, and endemic.
14. Identify some infectious diseases that could reach pandemic occurrence during the 21st century. What conditions do you believe exist at present

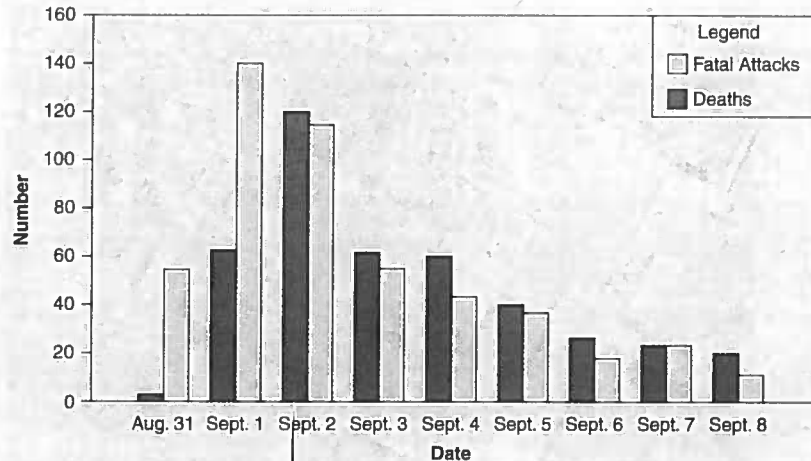
EXHIBIT 1-2 *continued*

FIGURE 1-13 The 1849 cholera outbreak in Golden Square district, London. Fatal attacks and deaths, August 31–September 8. *Source:* Data from Table I, Snow J. *Snow on Cholera*, p. 49, Harvard University Press, © 1965.

day the attacks fell from one hundred and forty-three to one hundred and sixteen, and the day afterwards to fifty-four . . . The fresh attacks continued to become less numerous every day. On September the 8th—the day when the handle of the pump was removed—there were twelve attacks; on the 9th, eleven; on the 10th, five; on the 11th, five; on the 12th, only one; and after this time, there were never more than four attacks on one day. During the decline of the epidemic the deaths were more numerous than the attacks, owing to the decrease of many persons who had lingered for several days in consecutive fever (**Figure 1-13**). ■

Source: Reprinted from Snow J. *Snow on Cholera*. Cambridge, MA: Harvard University Press: 1965:38-51.

cholera occurred. This epidemic was in an area that consisted of two-thirds of London's resident population south of the Thames and was being served by both companies. In this area, the two companies had their water mains laid out in an interpenetrating manner, so that houses on the same street were receiving their water from different sources.³⁹

Ass. two

Study Questions and Exercises

1. Define the following terms:
 - a. crude death rate
 - b. age-specific rate
 - c. cause-specific rate
 - d. proportional mortality ratio (PMR)
 - e. maternal mortality rate
 - f. infant mortality rate
 - g. neonatal mortality rate
 - h. fetal death rate and late fetal death rate
 - i. fetal death ratio
 - j. perinatal mortality rate
 - k. postneonatal mortality rate
 - l. crude birth rate
 - m. general fertility rate
 - n. age-adjusted (standardized) rate
 - o. direct method of adjustment
 - p. indirect method of adjustment
 - q. standardized mortality ratio (SMR)
2. Using **Table 3A-1**, calculate age-specific death rates for the category of malignant neoplasms of trachea, bronchus, and lung. What inferences can be made from the age-specific death rates for malignant neoplasms of trachea, bronchus, and lung?

Table 3A-1 Malignant Neoplasms of Trachea, Bronchus, and Lung Deaths by Age Group, United States, 2003

Age (Years)	Population	Malignant Neoplasms of Trachea, Bronchus, and Lung* Deaths
25-34	39,872,598	154
35-44	44,370,594	2,478
45-54	40,804,599	12,374
55-64	27,899,736	30,956
65-74	18,337,044	49,386

* Includes ICD-10, 1992 codes C33-C34.

Sources: Data are from Hoyert DL, Heron MP, Murphy SL, Kung H. Deaths: Final Data for 2003, *National Vital Statistics Reports*, Vol 54, No 13, p. 30. Hyattsville, MD: National Center for Health Statistics; 2006; and from Heron MP, Smith BL. Deaths: Leading Causes for 2003, *National Vital Statistics Reports*, Vol 55, No 10, p. 92. Hyattsville, MD: National Center for Health Statistics; 2007.

- a. Calculate the crude death rates (per 100,000) and the cause-specific death rates (per 100,000) for accidents, malignant neoplasms, and Alzheimer's disease. Repeat these calculations for males and females separately.
 - b. What are the PMRs (percent) for accidents, malignant neoplasms, and Alzheimer's disease? Repeat these calculations for males and females separately.
 - c. Calculate the maternal mortality rate (per 100,000 live births).
 - d. Calculate the infant mortality rate (per 1,000 live births).
 - e. Calculate the crude birth rate (per 1,000 population).
 - f. Calculate the general fertility rate (per 1,000 women aged 15–44 years).
5. The population of Metroville was 3,187,463 on June 30, 2013. During the period January 1 through December 31, 2013, a total of 4,367 city residents were infected with HIV. During the same year, 768 new cases of HIV were reported. Calculate the prevalence per 100,000 population and incidence per 100,000 population.
6. Give definitions of the terms prevalence and incidence. What are appropriate uses of prevalence and incidence data? State the relationships among prevalence, incidence, and duration of a disease.
7. Suppose that "X" represents the name of a disease. An epidemiologist conducts a survey of disease "X" in a population. The prevalence of disease "X" among women is 40/1,000 and among men is 20/1,000. Assuming that the data have been age adjusted, is it correct to conclude that women have twice the risk of disease "X" as men? Explain.
8. The following data regarding alcohol drinking status among persons in the United States were reported for 2005:

	Number in thousands	
	All persons 18 years of age and older	Current regular alcoholic beverage drinkers
Male	104,919	59,300
Female	112,855	44,373

- a. What is the sex ratio of male to female regular alcoholic beverage drinkers?
- b. What proportion (percent) of regular alcoholic beverage drinkers are women?
- c. What is the prevalence per 1,000 of regular alcoholic beverage drinking among men only, women only, and the total population aged 18 and older?

9. During 2005, the following statistics were reported regarding the frequency of diabetes, ulcers, kidney disease, and liver disease:

Diabetes	7% of adults had ever been told by their doctor that they had diabetes
Ulcers	7% had ever been told by their doctor that they had an ulcer
Kidney	2% had been told in the past 12 months that they had kidney disease
Liver	1% had been told in the past 12 months that they had liver disease

Which of the foregoing statistics were stated as incidence data and which as prevalence data?

- Diabetes
 - Ulcers
 - Kidney disease
 - Liver disease
10. The National Health Interview Survey reported the percent of respondents with a hearing problem by age group during 2005:

Age (years)	Reporting a hearing problem, %
18-44	8.2
45-64	19.2
65-74	30.4
75+	48.1

Would it be correct to state that the risk of hearing loss increases with age? Be sure to explain and defend your answer.

11. During January 1 through December 31, 2008, epidemiologists conducted a prevalence survey of type 2 diabetes; 500,000 cases were detected in a population of 10,000,000 persons. It was known that the incidence of diabetes in this population was 10 per 1,000. Estimate the percentage of the prevalent cases that were newly identified during the year.
12. The sex ratio for the entire United States was less than 100, indicating that there were more females than males. The sex ratio at birth exceeded 1.0, denoting a greater number of male births to female births. How could one account for the difference between the sex ratio for the United States and sex ratio at birth?

References

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- Hennekens CH, Buring JE. *Epidemiology in Medicine*. Boston, MA: Little, Brown; 1987.
- Folsom AR, Kaye SA, Sellers TA, et al. Body fat distribution and 5-year risk of death in older women. *JAMA*. 1993;269:483-487.

Conclusion

This chapter covered a variety of types and sources of data used in epidemiologic research. Epidemiologists need to find the best quality of data in order to describe the distribution of morbidity and mortality in a population or to conduct studies of disease etiology. To assess the potential utility of data, one needs to consider the nature, availability, representativeness, and completeness of the data. The criterion nature of the data includes whether the data are from vital statistics, case registries, physicians' records, surveys of the general population, or hospital and clinic cases. The criterion availability of the data relates to the investigator's ability to gain access to the data. The criterion representativeness or external validity refers to generalizability of findings to populations other than the one from which the data have been obtained. Related to the extent of population coverage is the criterion completeness of the data, which refers to the thoroughness of identification of all cases with a particular health phenomenon, including subclinical cases. The criterion strengths versus limitations denotes the utility of the data for various types of epidemiologic research.

Some of the diverse sources of epidemiologic data include statistics compiled by government, industry, or organizations such as the United Nations. Much progress has been made in the development of computerized databases and the Internet; a helpful starting point for epidemiologic research studies is a systematic retrieval of information from computerized bibliographic sources. Examples of epidemiologic data are those derived from the vital registration system, reports of absenteeism from work or school, disease registries, morbidity surveys of the general population, hospital statistics, and census tracts. Epidemiologic data from these sources have many valuable applications, including development of descriptive studies of trends in disease and analytic studies of disease etiology.

Study Questions and Exercises

1. Are you able to define the following?
 - a. disease registry
 - b. National Health Survey
 - c. NHANES I and HHANES
2. What is likely to be the best routinely available data source for each of the following kinds of studies?
 - a. incidence of influenza in the United States
 - b. cancer morbidity

- c. congenital malformations
- d. prevalence of selected disabling conditions
- e. work-related accidents
- f. precursive factors for heart disease among college graduates
- g. ethnic differences in mortality

3. Death certificates are an important source of information for epidemiologic studies. In the United States, death certificates have which of the following advantages (circle all that apply):

- a. There is a uniform national system of collection and coding.
- b. The cause of death is usually confirmed by autopsy.
- c. The international coding system for cause of death has remained constant since 1900.
- d. Data collection is comprehensive; virtually no deaths go unrecorded.
- e. The decedent's personal physician always completes the form and can add his or her own knowledge of past illnesses.

4. Which of the following data sources are best able to provide numerator data for the calculation of incidence of death by gunshot?

- a. hospital discharge survey
- b. autopsy or coroners' records
- c. National Health Survey
- d. disease registries
- e. prepaid group practice insurance programs

5. An abrupt drop in mortality due to a specific cause is observed from one year to the next. Identify at least three possible reasons for such a change.

6. Pick up the local newspaper and search for an article on a recent medical finding or public health issue. Conduct a Medline search to find relevant published articles on the same topic.

7. Access the University of Pittsburgh's "Guide to Locating Health Statistics" on the Internet. Determine five vital statistics on your city or county: income, education, health care, land, and mortality rates.

8. State funding for a childhood injury prevention program has just become available. To gather baseline data on childhood injuries, the staff is discussing whether to conduct a survey or establish a surveillance system. Discuss the advantages and disadvantages of these two approaches.

9. During the previous six years, one to three cases per year of Kawasaki syndrome had been reported by a state health department. During the past 3 months, 17 cases have been reported. All but two of these cases have been reported from one county. The local newspaper carried an

HS - Four

differences in designs, and practical considerations in the operation of cohort studies. Relative risk, a measure of interpretation, was defined and illustrated. Finally, the chapter concluded with many examples of cohort studies, a review of the related topic of nested case-control studies, and a comparison of OS designs.

Study Questions and Exercises

1. Define in your own words the following terms:
 - a. Cohort
 - b. Cohort effect
 - c. Population-based cohort
 - d. Exposure-based cohort
 - e. Comparison groups in cohort studies
 - f. Prospective cohort study
 - g. Retrospective cohort study
 - h. Ambispective cohort study
2. What are secular trends and cohort effects? Explain the relationship between these two terms.
3. Explain what is meant by the term relative risk and explain how it is used in cohort studies.
4. Describe the essential differences between life tables and survival curves.
5. A cohort study was conducted to study the association of coffee drinking and anxiety in a population-based sample of adults. Among 10,000 coffee drinkers, 500 developed anxiety. Among the 20,000 noncoffee drinkers, 200 cases of anxiety were observed. What is the relative risk of anxiety associated with coffee use?
6. How is a case-control study different from a retrospective cohort study? List the key criteria that, in general, would influence you to select one approach over the other.
7. Are relative risks of 2.0 and 0.5 the same or different in strength of association?
8. Cohort studies have some advantages over case-control studies in terms of the confidence with which their results are viewed. Suppose there have been four case-control studies of an exposure-disease association and that the range of the odds ratios is from 28.0 to 49.0. Would you advocate a cohort study? Justify your answer.

Ass. 9-2 ASS-FIVE

Study Questions and Exercises

1. Calculate the etiologic fraction when the RR for disease associated with a given exposure is 1.2, 1.8, 3, and 15.
2. The impact of an exposure on a population does not depend upon:
 - a. the strength of the association between exposure and disease.
 - b. the prevalence of the exposure.
 - c. the case fatality rate.
 - d. the overall incidence rate of disease in the population.

The next seven questions (3–9) are based on the following data: The death rate per 100,000 for lung cancer is 7 among nonsmokers and 71 among smokers. The death rate per 100,000 for coronary thrombosis is 422 among nonsmokers and 599 among smokers. The prevalence of smoking in the population is 55%. (If necessary, refer to the chapter on cohort studies for formulas for RR.)

3. What is the RR of dying of lung cancer for smokers versus nonsmokers?
4. What is the RR of dying of coronary thrombosis for smokers versus nonsmokers?
5. What is the etiologic fraction of disease due to smoking among individuals with lung cancer?
6. What is the etiologic fraction of disease due to smoking among individuals with coronary thrombosis?
7. What is the population etiologic fraction of lung cancer due to smoking?
8. What is the population etiologic fraction of coronary thrombosis due to smoking?
9. On the basis of the RR and etiologic fractions associated with smoking from lung cancer and coronary thrombosis, which one of the following statements is most likely to be correct?
 - a. Smoking seems much more likely to be causally related to coronary thrombosis than to lung cancer.
 - b. Smoking seems much more likely to be causally related to lung cancer than to coronary thrombosis.
 - c. Smoking seems to be equally causally related to both lung cancer and coronary thrombosis.
 - d. Smoking does not seem to be causally related to either lung cancer or coronary thrombosis.
 - e. No comparative statement is possible between smoking and lung cancer or coronary thrombosis.