

Epidemiology and Public Health PreTest® Self-Assessment and Review

Fourth Edition

Edited by

Thomas B. Newman

Warren S. Browner

Epidemiology and Public Health

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EPIDEMIOLOGY and PUBLIC HEALTH

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Introduction

Epidemiology and Public Health: PreTest Self-Assessment and Review, 4th Ed., has been designed to provide medical students, as well as physicians, with a comprehensive and convenient instrument for self-assessment and review within the field of epidemiology and public health. The 500 questions provided have been designed to parallel the format and degree of difficulty of the questions contained in Part II of the National Board of Medical Examiners examinations, the Federation Licensing Examination (FLEX), and the Foreign Medical Graduate Examination in the Medical Sciences (FMGEMS).

Each question in the book is accompanied by an answer, a paragraph explanation, and a specific page reference to either a current journal article, a textbook, or both. A bibliography that lists all the sources used in the book follows the last chapter.

Perhaps the most effective way to use this book is to allow yourself one minute to answer each question in a given chapter; as you proceed, indicate your answer beside each question. By following this suggestion, you will be approximating the time limits imposed by the board examinations previously mentioned.

When you have finished answering the questions in a chapter, you should then spend as much time as you need verifying your answers and carefully reading the explanations. Although you should pay special attention to the explanations for the questions you answered incorrectly, you should read every explanation. The authors of this book have designed the explanations to reinforce and supplement the information tested by the questions. If, after reading the explanations for a given chapter, you feel you need still more information about the material covered, you should consult and study the references indicated.

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Principles and Methods of Epidemiology

DIRECTIONS: Each question below contains five suggested responses. Select the **one best** response to each question.

- ✓ 1. Epidemiology can be defined as the study of
- (A) the etiology of disease in humans
 - (B) the determinants of disease frequency in humans
 - (C) the frequency of causes of death in humans
 - (D) the distribution and determinants of disease frequency in humans
 - (E) the patterns of health care organization and financing
2. A sample of 1,000 people includes 120 who are hearing-impaired and 50 who are diabetic. If the number who are both diabetic and hearing impaired is 6, then
- (A) diabetes and hearing impairment appear to be independent
 - (B) diabetics appear to be protected from hearing impairment
 - (C) diabetics appear to be at greater risk of hearing impairment
 - (D) there is an interaction between diabetes and hearing impairment
 - (E) there is not sufficient information to state any of the above
3. A measure of the amount of variation of a set of values about the mean of the set is the
- (A) regression coefficient
 - (B) standard error of the mean
 - (C) standard deviation
 - (D) range
 - (E) correlation coefficient
- ✓ 4. The association between low birth weight and maternal smoking during pregnancy can be studied by obtaining smoking histories from women at the time of their prenatal visit and then subsequently correlating birth weight with smoking histories. What type of study is this?
- (A) Clinical trial
 - (B) Cross-sectional
 - (C) Prospective (cohort)
 - (D) Retrospective (case-control)
 - (E) None of the above

5. Suppose that each time an individual receives pooled blood products, there is a 10 percent chance of that person developing a cytomegalovirus (CMV) infection. If an individual receives pooled blood products on 30 occasions, what is his or her chance of developing cytomegalovirus infection?

- (A) 300 percent
- (B) 3 percent
- (C) 30 percent
- (D) 95.8 percent
- (E) 10 percent

6. A study is undertaken to determine whether use of Newman and Browner's *PreTest Self-Assessment and Review* reduces sexual dysfunction related to anxiety before board examinations. One group of students studying for their board examinations was given the book to read; the other was not. The results are as follows:

Outcome	Got Book	Did Not Get Book
Sexual dysfunction	3	34
No sexual dysfunction	61	32

All the following statements are true EXCEPT

- (A) these data could be analyzed using the chi-square test
- (B) about half of the control group experienced sexual dysfunction
- (C) unless one knows on what basis group assignment was made (i.e., randomized or not), the results are difficult to interpret
- (D) the difference is probably due to chance
- (E) a t test is inappropriate to analyze the data because the variables are categorical rather than continuous

7. Reye syndrome is an acute encephalopathy of childhood, accompanied by fatty infiltration of the liver. It has been linked to use of aspirin during infections with chicken pox or influenza. Children commonly progress through a sequence of stages that are used to grade severity and prognosis. If 30 percent of children progress only to stage I, 40 percent only to stage II, 20 percent only to stage III, and 10 percent to stage IV, what is the probability that a child will progress to stage IV, once that child has already reached stage II?

- (A) 10 percent
- (B) 14 percent
- (C) 30 percent
- (D) 33 percent
- (E) None of the above

8. What is the slope of the line for the linear regression equation shown below?

$$y = 2.1 + 0.3x$$

- (A) 0.3
- (B) 0.7
- (C) 2.1
- (D) 6.3
- (E) None of the above

9. Which of the following measures is used frequently as a denominator to calculate the rate of a disease?

- (A) Number of cases observed
- (B) Number of new cases observed
- (C) Number of asymptomatic cases
- (D) Person-years of observation
- (E) Persons lost to follow-up

10. In 1971, the crude birth rate in the United States was approximately 17 per 1,000 population; the death rate was 10 per 1,000; and the net in-migration rate was 2 per 1,000. What was the net growth rate per 1,000?

- (A) 5
- (B) 7
- (C) 9
- (D) 15
- (E) 25

11. All the following statements regarding the normal (Gaussian) distribution are true EXCEPT

- (A) the mean = median = mode
- (B) approximately 50 percent of observations are greater than the mode
- (C) approximately 68 percent of observations fall within 1 standard deviation of the mean
- (D) the number of observations between 0 and 1 standard deviation from the mean is the same as the number between 1 and 2 standard deviations from the mean
- (E) the shape of the curve does not depend on the value of the mean

Questions 12–14

The results of a study of the incidence of pulmonary tuberculosis in a village in India are given in the table below. All individuals in the village are examined during two surveys made 2 years apart, and the number of new cases was used to determine the incidence.

Category of Household at First Survey	Number of Persons	Number of New Cases
With culture-positive case	500	10
Without culture-positive case	10,000	10

12. What is the incidence of new cases per 1,000 person-years in households that had a culture-positive case during the first survey?

- (A) 0.02
- (B) 0.01
- (C) 1.0
- (D) 10
- (E) 20

14. What is the relative risk of acquiring tuberculosis in households with a culture-positive case compared with households without tuberculosis?

- (A) 0.05
- (B) 0.5
- (C) 2.0
- (D) 10
- (E) 20

13. What is the incidence of new cases per 1,000 person-years in households that did not have a culture-positive case during the first survey?

- (A) 0.001
- (B) 0.1
- (C) 0.5
- (D) 1.0
- (E) 5.0

15. Which of the following statements concerning statistical inference is correct?
- (A) If the p value = 0.05, then there is a 95 percent probability that the results did not occur by chance
- (B) The null hypothesis generally states that there is a difference between the groups
- (C) If the p value is sufficiently high, the null hypothesis is not rejected
- (D) Knowledge of the sampling method is not important in determining statistical significance
- (E) None of the above
16. In the United States, approximately 14 percent of deaths in 1976 in children 5 to 14 years of age were due to cancer, compared with 28 percent in adults aged 35 to 64 years. What is the relative risk of death from cancer in adults aged 35 to 64 compared with children 5 to 14?
- (A) 0.5
- (B) 1.5
- (C) 2.0
- (D) 4.0
- (E) Cannot be concluded from data given

17. During the investigation of an outbreak of food poisoning at a summer camp, food histories were obtained from all campers as indicated in the table below. Which of the food items was probably responsible for the outbreak?

Food	Illness Rate (percent)	
	Campers Who Ate Specified Food	Campers Who Did Not Eat Specified Food
Hamburger	72	84
Potatoes	70	65
Ice cream	40	50
Milk	90	80
Lemonade	20	15

- (A) Hamburger
- (B) Potatoes
- (C) Ice cream
- (D) Milk
- (E) Lemonade

18. In the study of the cause of a disease, the essential difference between an *experimental* study and an *observational* study is that in the experimental investigation

- (A) the study is prospective
- (B) the study is retrospective
- (C) the study and control groups are of equal size
- (D) the study and control groups are selected on the basis of history of exposure to the suspected causal factor
- (E) the investigators determine who is and who is not exposed to the suspected causal factor

Questions 19–20

To determine whether prenatal exposure to tobacco smoke is a cause of undescended testes in newborns, the mothers of 100 newborns with undescended testes and 100 newborns whose testes had descended were questioned about smoking habits during pregnancy. The study revealed an odds ratio of 2.6 associated with exposure to smoke, with 95 percent confidence intervals from 1.1 to 5.3.

19. Which of the following statements is true?

- (A) The odds ratio could be falsely elevated by the inclusion of infants whose testes were descended (but retractile) in the case group (misclassification bias)
- (B) The odds ratio could be falsely elevated by recall bias if parents of affected infants were more likely to remember or report their exposures
- (C) Because the cases are newborns, but the exposure data came from their mothers, this is not a true case-control study
- (D) Since the study was not blinded, it is impossible to rule out a placebo effect
- (E) None of the above

20. Which of the following statements is true?

- (A) The results provide no evidence that maternal cigarette smoking is associated with undescended testes in the offspring
- (B) If the study results are accurate, they suggest that a baby boy whose mother smoked is about 2.6 times as likely to be born with testes undescended as a baby boy whose mother did not smoke
- (C) The fact that the confidence interval excludes 1 indicates that $p > .05$
- (D) The 90 percent confidence interval for these results would probably include 1.0
- (E) None of the above

21. In order to determine the relationship between serum levels of sodium and antidiuretic hormone (ADH) in patients who have meningitis, the most appropriate study design would be
- (A) repeated measurement of sodium and ADH in a patient
 - (B) measurement of sodium and ADH in a set of patients
 - (C) measurements of sodium in a set of patients and of ADH in a different set of patients
 - (D) measurements of ADH in a set of patients and a set of controls
 - (E) none of the above
22. The probability of being born with condition A is 0.10 and the probability of being born with condition B is 0.50. If conditions A and B are independent, what is the probability of being born with either condition A or condition B (or both)?
- (A) 0.05
 - (B) 0.40
 - (C) 0.50
 - (D) 0.55
 - (E) 0.60
23. Assume that the annual death rate from lung cancer for British doctors is 160 per 100,000 among heavy smokers compared with 8 per 100,000 among nonsmokers. What is the relative risk of dying of lung cancer for smokers compared with nonsmokers?
- (A) 152
 - (B) 20
 - (C) 19
 - (D) 8
 - (E) None of the above
24. All the following are important steps in decision analysis EXCEPT
- (A) construction of a decision tree
 - (B) estimation of probabilities at chance nodes
 - (C) assignment of utilities
 - (D) estimation of sample size
 - (E) determination of how changes in probability estimates affect the decision
25. In nine families surveyed, the numbers of children per family were 4, 6, 2, 2, 4, 3, 2, 1, 7. The mean, median, and mode numbers of children per family are
- (A) 3.4, 2, 3
 - (B) 3, 3.4, 2
 - (C) 3, 3, 2
 - (D) 2, 3.5, 3
 - (E) none of the above
26. Lou Stewells, a pioneer in the study of diarrheal disease, has developed a new diagnostic test for cholera. When his agent is added to the stool, the organisms develop a characteristic ring around them. (He calls it the "ring-around-the-cholera" [RAC] test.) He performs the test on 100 patients known not to have cholera and 8 of them have positive tests. This means
- (A) the sensitivity of the RAC test is 92 percent
 - (B) the specificity of the RAC test is 92 percent
 - (C) the predictive value of a positive RAC test is 92 percent
 - (D) the false negative rate is 8 percent
 - (E) none of the above

27. The ring-around-the-cholesterol (RAC) test was developed in India, where the prevalence of cholesterol is much higher than it is in the U.S. All the following statements are true EXCEPT

- (A) the test will have lower specificity in the U.S. than in India
- (B) the predictive value of a negative result will be higher in the U.S. than in India
- (C) the predictive value of a positive result will be higher in India than in the U.S.
- (D) there will be more false positives in the U.S.
- (E) if we took large random samples from the populations of India and the U.S., more of the Indian sample would be expected to have cholesterol

28. Randomization is a procedure used for assignment or allocation of subjects to treatment and control groups in experimental studies. Randomization ensures

- (A) that assignment occurs by chance
- (B) that treatment and control groups are alike in all respects except treatment
- (C) that bias in observations is eliminated
- (D) that placebo effects are eliminated
- (E) none of the above

29. In comparing the difference between two means, the value of p is found to be 0.20. The correct interpretation of this result is

- (A) the null hypothesis is rejected
- (B) the difference is statistically significant
- (C) the difference occurred by chance
- (D) the difference is compatible with the null hypothesis
- (E) sampling variation is an unlikely explanation of the difference

30. In a study of the cause of lung cancer, patients who had the disease were matched with controls by age, sex, place of residence, and social class. The frequency of cigarette smoking was then compared in the two groups. What type of study was this?

- (A) Prospective (cohort)
- (B) Retrospective (case-control)
- (C) Clinical trial
- (D) Historical prospective
- (E) None of the above

Questions 31-34

✓ During 1983, 200 newly diagnosed cases of diabetes occurred in city X, which has a population of 10,000 (estimated on July 1, 1983). At the beginning of the year, there were a total of 800 patients with diabetes in the city. During the year, 40 patients died of the complications of diabetes.

31. What was the average annual incidence of diabetes during 1983?

- (A) 4 per 1,000
- (B) 20 per 1,000
- (C) 80 per 1,000
- (D) 100 per 1,000
- (E) 200 per 1,000

32. What was the approximate point prevalence of diabetes on January 1, 1983?

- (A) 20 per 1,000
- (B) 80 per 1,000
- (C) 200 per 1,000
- (D) 800 per 1,000
- (E) 1000 per 1,000

33. What was the prevalence of diabetes on December 31, 1983?

- (A) 16 per 1,000
- (B) 20 per 1,000
- (C) 80 per 1,000
- (D) 96 per 1,000
- (E) 100 per 1,000

34. What was the mortality due to diabetes during 1983?

- (A) 0.4 per 1,000
- (B) 1.6 per 1,000
- (C) 2.0 per 1,000
- (D) 4.0 per 1,000
- (E) 9.6 per 1,000

DIRECTIONS: Each question below contains four suggested responses of which one or more is correct. Select

- | | | | |
|---|----|----------------|-------------|
| A | if | 1, 2, and 3 | are correct |
| B | if | 1 and 3 | are correct |
| C | if | 2 and 4 | are correct |
| D | if | 4 | is correct |
| E | if | 1, 2, 3, and 4 | are correct |

35. When direct, controlled experiments cannot be performed, the determination of whether or not an association between events is causal must rest on observational data. Which of the following types of evidence can be used in judging whether or not a cause-and-effect relationship between events exists?

- (1) The strength of the statistical association
- (2) Replication of the observation in independent studies
- (3) Proper time sequence in which cause precedes effect
- (4) Consistency of the association with existing knowledge

36. In the table below, data are presented on the number of children suffering from acute leukemia who were admitted to a hospital between 1970 and 1984. Correct conclusions about the data include which of the following?

Age (years)	Number of Children Admitted in Interval		
	1970-74	1975-79	1980-84
0-4	12	23	31
5-9	8	17	36
10-14	7	8	4
Total	27	48	71

- (1) The incidence of leukemia decreased in children 10 to 14 years old
- (2) The prevalence of leukemia increased in children between 1970 and 1984
- (3) The incidence of leukemia increased in children 5 to 9 years old
- (4) The number of children admitted to the hospital because of leukemia increased between 1970 and 1984

37. The *attributable risk* of a disease estimates the maximum proportion of the disease in the population attributable to a particular risk factor. For example, in the U.S., the attributable risk of lung cancer from smoking is about 85 percent; this means that smoking may explain up to 85 percent of the cases of lung cancer that occur in the U.S. For a particular disease and risk factor, the attributable risk depends on

- (1) the size of the population of interest
- (2) the prevalence of the risk factor in the population
- (3) the duration of the disease
- (4) the relative risk (risk ratio) of the disease associated with the risk factor

38. Correct statements concerning statistical inference include which of the following?

- (1) If the p value is very low, the difference between the groups must be very large
- (2) The standard error of the mean is used to estimate how closely the mean of a sample approximates the true population mean
- (3) If the sample size is large enough, it is easy to achieve statistical significance at the 0.05 level, even when there is no difference between the groups
- (4) All else being equal, use of one-tailed rather than two-tailed tests of statistical significance will more often lead to rejecting the null hypothesis when it is true

SUMMARY OF DIRECTIONS

A	B	C	D	E
1,2,3 only	1,3 only	2,4 only	4 only	All are correct

39. A randomized, double-blinded trial finds that oral corticosteroids are superior to placebo in hastening the resolution of otitis media with effusion. Possible reasons why this study might have given a falsely positive result include

- (1) it may be difficult accurately to determine which effusions have resolved, leading to errors in determining the outcome of the study
- (2) lax inclusion criteria may have led to inclusion of some subjects in the study who did not really have otitis media with effusion
- (3) the sample size may have been too small
- (4) the apparent effect might be a result of chance

40. An investigator is designing a randomized clinical trial to see whether vitamin E will prevent cancer in smokers. Which of the following would be important considerations in planning the sample size for the study?

- (1) The expected incidence of cancer in the placebo group
- (2) The frequency with which subjects are likely to be lost to follow-up or die from noncancer causes over the duration of the study
- (3) The magnitude of the preventive effect that the investigator wishes to be able to detect
- (4) The values for alpha and beta, the type 1 and type 2 error rates

41. According to the report form (U.S. Standard Report of Fetal Death) recommended by the National Center for Health Statistics, facts required in completing a report of a fetal death include which of the following?

- (1) Weight of fetus
- (2) The month in the pregnancy when prenatal care began
- (3) Complications of labor
- (4) Whether an autopsy was performed

42. Investigators determine that a significant difference exists between the incidences of a disease in two groups of subjects. This significant difference may be the result of

- (1) causal association
- (2) chance association
- (3) indirect association
- (4) artifactual association

43. The increasing need for day-care centers in the United States is a consequence of the increasing

- (1) number of women in the work force
- (2) number of people moving to suburbs
- (3) number of children living with single parents
- (4) availability of welfare

44. The rate at which a population grows is a function of

- (1) birth rate
- (2) death rate
- (3) immigration rate
- (4) emigration rate