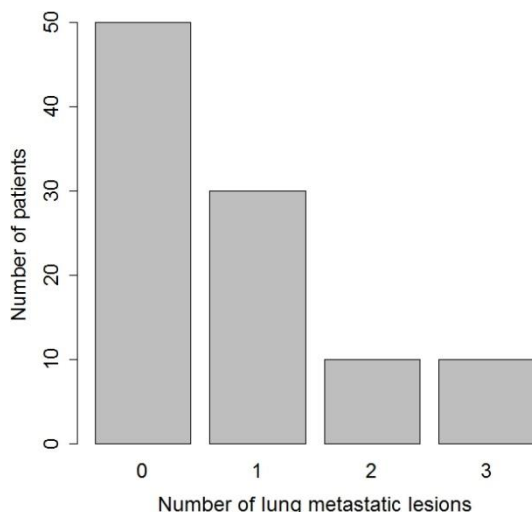


1. A study wishes to assess birth characteristics in a population. Which of the following variables describes the appropriate measurement scale or type?

- A. Continuous
- B. Ordinal
- C. Nominal
- D. Dichotomous

- a. _____ Birthweight in grams
- b. _____ Birthweight classified as low, medium, high
- c. _____ Birthweight classified as low, not low
- d. _____ Delivery type classified as cesarean, natural, induced

2. In an experimental study, patients with advanced breast cancer are treated with a new drug. After three years of follow-up, radiographic scans are used to determine the number of metastatic lesions for each study patient. The number of lung metastases for each subject is shown in the figure. Based on these data, what is the average number of metastatic lung lesions for patients treated with the new drug?



- a. Between 0 and 1
- b. 1
- c. Between 1 and 2
- d. 2
- e. Between 2 and 3

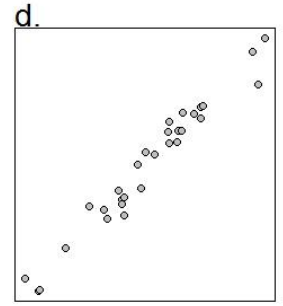
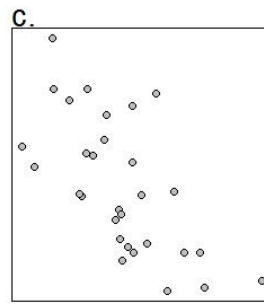
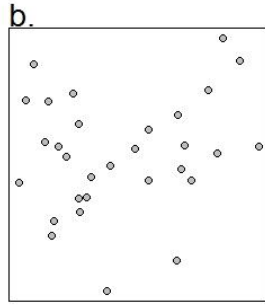
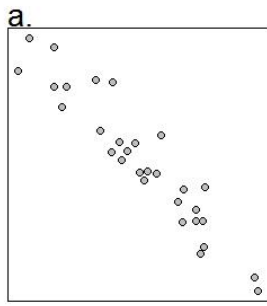
3. In a medical class of 147 students, the distribution of scores on a biochemistry final examination has a mean equal to 67, a median equal to 76, a mode equal to 80, a standard deviation equal to 5.5, and a variance equal to 30.25. Three students were unable to take the test on the scheduled date and were given a different form of the exam 1 week later. Which parameter is most likely to be the least biased estimator of central tendency for this distribution of biochemistry test scores?

- a. Mean
- b. Median
- c. Mode
- d. Standard deviation
- e. Variance

4. A large study of serum cholesterol levels in patients with diabetes mellitus reveals that the parameter is normally distributed with a mean of 230 mg/dL and standard deviation of 10 mg/dL. According to these results, 95% of serum cholesterol observations in these patients lie between which of the following limits?

- a. 220 and 240 mg/dL
- b. 225 and 235 mg/dL
- c. 210 and 250 mg/dL
- d. 200 and 260 mg/dL
- e. 220 and 260 mg/dL

5. Which of the following graphs most closely corresponds to a correlation coefficient of 1?



6. An investigator suspects that acetaminophen use during the first trimester of pregnancy can cause neural tube defects. She estimates the risk of neural tube defect in the general population is 1:1,000. Which of the following is the best study design to investigate the hypothesis?
- Cohort study
 - Case-control study
 - Clinical trial
 - Ecologic Study
 - Cross-sectional study
7. Officials at a large community hospital report an increased incidence of acute lymphocytic leukemia (ALL) among children aged 5 – 12. They point out that some households in the community are exposed to chemical waste from a nearby factory. They believe that chemical waste causes leukemia. If a study is designed to evaluate the hospital officials' claim, which of the following subjects are most likely to comprise the control group?
- Children exposed to the chemical waste who do not suffer from ALL
 - Children not exposed to the chemical waste who do not suffer from ALL
 - Children from the hospital's outpatient clinic who do not suffer from ALL
 - Children not exposed to the chemical waste who suffer from ALL
 - Children who suffered from ALL but got cured
8. 500 women aged 40 – 54 who present for routine check-ups are asked about their meat consumption. 20% of the women turn out to be vegetarian. During the ensuing 5 years, 5 vegetarians and 43 non-vegetarians develop colorectal cancer. Which of the following best describes the study design?
- Case series report
 - Cohort study
 - Case-control study
 - Cross-sectional study
 - Randomized clinical trial
9. A group of patients with lung cancer is matched to a group of patients without lung cancer. Their smoking habits over the course of their lives are compared. On the basis of this information, researchers compute the odds of smoking among patients with lung cancer compared to the odds of smoking among those without lung cancer. This is an example of a
- Case-control study
 - Cohort study
 - Cross-sectional study
 - Longitudinal study
 - Randomized controlled study

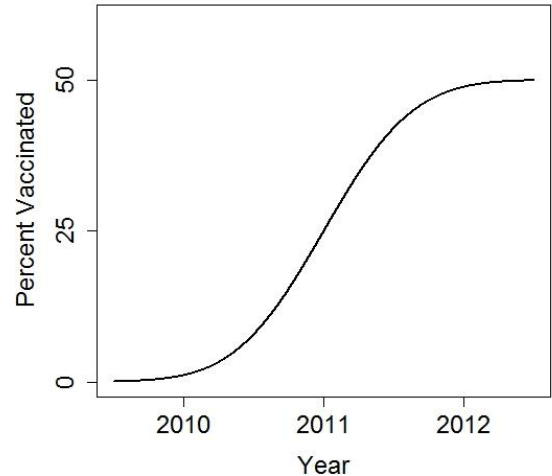
10. In a study, a group of people are exposed to an environmental toxin but are not treated. Instead, they are observed over time on a standard set of measures to ascertain the potential effects of the toxin. This type of study design is called
- Clinical trial
 - Double-blind
 - Longitudinal
 - Prospective cohort
 - Retrospective cohort
11. A new drug with *in vitro* activity against HIV is tested on a population of patients with Western-blot confirmed HIV infections. Out of the 200 individuals in the patient population, 100 are chosen by lottery to receive the drug. The drug, which is tasteless, is administered in a cup of orange juice; the other patients receive pure orange juice. Neither the nurses, doctors, nor the patients know which patients receive the drug. At the end of the study period, the number of CD4+ T cells is determined for all of the subjects. This is an example of a
- Case-control study
 - Case report
 - Cohort study
 - Cross-sectional study
 - Double-blind randomized clinical trial
12. A city has a population of 250,000. Of these, 10,000 have disease X, which is incurable. There are 1,000 new cases and 400 deaths each year from this disease. There are 2,500 deaths per year from all causes. The prevalence of this disease is given by
- 400/250,000
 - 600/250,000
 - 1,000/250,000
 - 2,500/250,000
 - 10,000/250,000
13. There were no new cases of Ebola virus in the United States from January 1, 1997 through January 1, 1998. Which of the following epidemiologic terms does this statement describe?
- Incidence
 - Lifetime expectancy
 - Lifetime prevalence
 - Period prevalence
 - Point prevalence
14. Based on the information in the 2 x 2 table below, which of the following expressions represents the prevalence of disease?

	Disease positive	Disease Negative
Exposed	W	Y
Unexposed	X	Z

- $W/(W + X)$
- $[W/(W + Y)]/[X/(X + Z)]$
- $(W/Y)/(X/Z)$
- $(W/X)/(Y/Z)$
- $(W + X)/(W + X + Y + Z)$

15. In a survey of 10,000 IV drug users in town A, 1,000 turn out to be infected with hepatitis. During one year of follow-up, 100 patients with hepatitis C infection die. Also during follow-up, 100 IV drug users acquire hepatitis C. Which of the following is the best estimate of the annual incidence of hepatitis C infection in IV drug users in town A?
- 1,000/10,000
 - 1,100/10,000
 - 100/10,000
 - 100/9,000
 - 100/9,800

16. The following graph represents the vaccination rate dynamics for hepatitis B in IV drug users in town A. Which of the following hepatitis B statistics is most likely to be affected by the reported data?



- Hospitalization rate
- Case fatality rate
- Median survival
- Incidence
- Cure rate

17. An observational study in diabetics assesses the role of an increased plasma fibrinogen level on the risk of cardiac events. 130 diabetic patients are followed for 5 years to assess the development of acute coronary syndrome. In the group of 60 patients with a normal baseline plasma fibrinogen level, 20 develop acute coronary syndrome and 40 do not. In the group of 70 patients with a high baseline plasma fibrinogen level, 40 develop acute coronary syndrome and 30 do not. Which of the following is the best estimate of relative risk in patients with a high baseline plasma fibrinogen level compared to patients with a normal baseline plasma fibrinogen level?

- $(40/30)/(20/40)$
- $(40*40)/(20*30)$
- $(40*70)/(20*60)$
- $(40/70)/(20/60)$
- $(40/60)/(30/70)$

18. A study is performed in which mothers of babies born with neural tube defects are questioned about their acetaminophen consumption during the first trimester of pregnancy. At the same time, mothers of babies born without neural tube defect are also questioned about their consumption of acetaminophen during the first trimester. Which of the following measures of association is most likely to be reported by investigators?

- Prevalence
- Median survival
- Relative risk
- Odds ratio
- Hazard ratio

19. At a specific hospital, patients diagnosed with pancreatic carcinoma are asked about their current smoking status. At the same hospital, patients without pancreatic carcinoma are also asked about their current smoking status. The following table is constructed.

	Pancreatic Cancer	No Pancreatic Cancer	Total
Smokers	50	60	110
Non-smokers	40	80	120
Total	90	140	230

What is the odds ratio that a patient diagnosed with pancreatic cancer is a current smoker compared to a patient without pancreatic cancer?

- $(50/90)/(60/140)$
 - $(50/40)/(60/80)$
 - $(50/110)/(40/120)$
 - $(50/60)/(40/80)$
 - $(90/230)/(140/230)$
20. The Third National Health and Nutrition Examination Survey was conducted in the United States in the 1990s to examine the relationship between obesity and depression. The authors investigated the association between major depression and body mass index (BMI) for males and females (*American Journal of Epidemiology*, 2003;158:1139-1147).

BMI category, kg/m²	Unadjusted Odds Ratio	95% Confidence Interval
Normal weight (BMI 18.5-24.9)	1.00	
Underweight (BMI < 18.5)	1.17	0.49 – 2.80
Overweight (BMI 25.0-29.9)	0.86	0.53 – 1.41
Obese (BMI ≥ 30)	1.88	1.02 – 3.46
Class 1 (BMI 30-34.9)	1.28	0.64 – 2.56
Class 2 (BMI 35-39.9)	1.76	0.78 – 3.95
Class 3 (BMI ≥ 40)	4.98	2.07 – 11.99

From the table above, what is the correct interpretation of the overweight value of 0.86?

- Overweight individuals' odds of having major depression are 14% lower than the odds of having major depression for individuals with normal weight.
- Overweight individuals' odds of having major depression are 14% higher than the odds of having major depression for individuals with normal weight.
- An overweight individual has a 0.86 probability of having major depression.
- An overweight individual has a 0.86 odds of having major depression.

21. As part of the Women’s Health Study, researchers investigated the role of systemic inflammation in predicting cardiovascular disease in women (*N Engl J Med.* 2002;347[20]:1557-1565). Researchers used a prospective study design with a large sample size. Blood levels of C-reactive protein (CRP) were measured at baseline and women were followed for an average of 8 years. The following table shows the relative risk estimates of cardiovascular event (heart attack or stroke) within 5 years by quintile of CRP level for the 30,000 women. The first quintile is used as the reference category.

	Quintile of CRP Level				
	1	2	3	4	5
	0.49 mg/dL	>0.49-1.08 mg/dL	>1.08-2.09 mg/dL	>2.09-4.19 mg/dL	>4.19 mg/dL
Relative Risk	1.0	1.8	2.3	3.2	4.5
Number of women	6000	6000	6000	6000	6000

Based on the relative risk data above, one can conclude:

- a. There is no risk of heart attack/stroke for women with CRP levels in the first quintile.
- b. Decreasing CRP level appears to increase the risk of heart attack/stroke.
- c. Increasing CRP level appears to increase the risk of heart attack/stroke.
- d. There appears to be no association between CRP levels and heart attack/stroke.

22. Any systematic error in the design, conduct, or analysis of a study that results in a mistaken estimate of an exposure’s effect on the risk of disease is called:

- a. Confounding
- b. Bias
- c. Interaction
- d. Stratification

23. The purpose of a double-blind or double-masked study is to:

- a. Achieve comparability of treated and untreated subjects
- b. Reduce the effects of sampling variation
- c. Avoid observer and subject bias
- d. Avoid observer bias and sampling variation

24. Randomization of study subjects in a clinical trial is most helpful for controlling for which of the following?

- a. Placebo effect
- b. Recall bias
- c. Non-compliance
- d. Effect modification (interaction)
- e. Confounding

25. A large-scale clinical trial is being planned to evaluate the effect of a non-selective beta-blocker on the clinical course of portal hypertension. The primary outcomes of the study are all-cause mortality and major gastrointestinal hemorrhage. The investigators are concerned about the possibility that episodes of major gastrointestinal hemorrhage could be over-reported in the placebo group. Which of the following is the most useful technique to reduce this possibility?

- a. Randomization
- b. Blinding
- c. Matching
- d. Stratified analysis

26. A case-control study is conducted to assess the association between alcohol consumption and lung cancer. 100 patients with lung cancer and 100 controls are asked about their past alcohol consumption. According to the study results, alcohol consumption is strongly associated with lung cancer (OR = 2.5). The researchers then divide the study subjects into two groups: smokers and non-smokers. Subsequent statistical analysis does not reveal any association between alcohol consumption and lung cancer within either group. The scenario described is an example of which of the following?
- Observer bias
 - Confounding
 - Placebo effect
 - Nonresponse bias
 - Recall bias
27. A study is conducted to assess the relationship between race and end-stage renal disease. Two groups of pathologists independently study specimens from 1,000 kidney biopsies. The first group of pathologists is aware of the race of the patient from whom the biopsy came, while the second group is blinded as to the patient's race. The first group reports 'hypertensive nephropathy' much more frequently for black patients than the second group. Which of the following types of bias is most likely present in this study?
- Confounding
 - Nonresponse bias
 - Recall bias
 - Referral bias
 - Observer bias
28. A study is conducted to assess the relationship between the use of an over-the-counter pain reliever during pregnancy and the development of neural tube defects in offspring. Mothers whose children have neural tube defects and age-matched controls with unaffected children are interviewed using a standard questionnaire. The study shows that use of the pain reliever during pregnancy increases the risk of neural tube defects, even after adjusting for race, other medications, family history of congenital abnormalities and serum folate level (OR = 1.3, $p = 0.03$). Which of the following biases is of major concern when interpreting the study results?
- Nonresponse bias
 - Recall bias
 - Observer bias
 - Confounding
 - Selection bias

Answers

1a. A

1b. B

1c. D

1d. C

2. A

3. B

4. C

5. D

6. B

7. C

8. B

9. A

10. C

11. E

12. E

13. A

14. E

15. D

16. D

17. D

18. D

19. B

20. A

21. C

22. B

23. C

24. E

25. B

26. B

27. E

28. B