

**Epidemiology-Biostatistics Exam**  
**Exam 2, 2002**

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Instructions: This exam is 25% of your course grade. The maximum number of points for the course is 1,000; hence this exam is worth 250 points. There are 20 questions on this exam. Each question is worth 12.5 points to yield the maximum total of 250 points for this exam. For questions 1 – 10, record the best answer in pencil on the answer sheet provided. For questions 11 – 20, write your answers in the spaces provided. Submit the exam and your answer sheet as directed after you have completed the exam. Be sure that you have printed your legal name on the top of each page.

1. Life expectancy for Americans has dramatically increased over the past 200 years. Of the following, which has had the most significant influence on this trend? Select the best answer.
  - a. Advances in biomedicine
  - b. Increased access to medical services
  - c. Improvements in food distribution and water sanitation
  - d. Decreased levels of stress
  - e. Increased levels of stress
  
2. Select the best answer. Practicing evidence-based medicine:
  - a. means basing all clinical decisions exclusively on outcomes research.
  - b. has the capacity to reduce practice variability.
  - c. means that a physician must have a detailed understanding of biostatistics to be an effective decision maker.
  - d. requires a physician to have a detailed knowledge of epidemiology and basic science research in physiology.
  - e. means that physicians are not allowed to consider the individual patient when making patient care decisions.
  
3. Select the correct statement:
  - a. As prevalence increases, the predictive value positive increases and the predictive value negative decreases.
  - b. As prevalence decreases, the predictive value negative decreases and the predictive value positive increases.
  - c. As the incidence of disease increases, the predictive value positive must increase and the predictive value negative must decrease.
  - d. There is no relationship between disease prevalence and predictive values.
  - e. A test that is 80% sensitive must have a predictive value positive that is at least 80%.

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4. You are conducting a study of heart attacks (the outcome) and blood levels of homocysteine. You wish to control for possible confounding by smoking status (yes or no), blood pressure (as a continuous variable) and cholesterol level (as a continuous variable). The best statistical technique to accomplish this goal is to use:
  - a. Correlation
  - b. Multiple linear regression
  - c. Simple linear regression
  - d. A non-parametric test
  - e. Logistic regression
  
5. Select the correct statement:
  - a. When two continuous variables are positively correlated there is a causal relationship between them.
  - b. Simple linear regression can be used if the dependent variable is dichotomous.
  - c. Logistic regression is appropriate for dependent variables that are log transformations of skewed data.
  - d. The regression of the dependent variable on the independent variable is the same as the regression of the independent variable on the dependent variable.
  - e. The Pearson Correlation Coefficient requires the variables to be randomly selected and the joint distribution of the variables to be Gaussian.
  
6. A sampling method that can be used with either simple random sampling or systemic sampling to ensure adequate representation of certain groups in the sample is called:
  - a. stratified sampling
  - b. matching
  - c. convenience sampling
  - d. Gaussian sampling
  - e. adjustment

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7. Following is a linear regression model:  
Energy Expenditure = 0.56 (Caloric Intake) + 502.  
Select the correct answer:
- The model adjusts for potential confounding by caloric intake.
  - For every unit change in energy expenditure there is a 0.56 unit change in caloric intake.
  - For every unit change in caloric intake there is a 0.56 unit change in energy expenditure.
  - For every unit change in energy expenditure there is a change in caloric intake of  $0.56 + 502$ .
  - 502 is the value of caloric intake when energy expenditure is zero.
8. Researchers conducted a study to determine if there is an association between drinking vs. not drinking caffeine before bed and having vivid nightmares. Both the researchers and the subjects were blinded. After the study was published, it was determined that there were a significant number of misclassifications of the outcome. It is known that the true relative risk for drinking caffeine before bed and having vivid nightmares vs. not drinking caffeine before bed is 1.40. Which of the following statements is most consistent with the information above?
- The study probably reported a relative risk greater than 1.40.
  - The study probably reported a relative risk less than 1.40.
  - The study probably reported a relative risk of 0.
  - The study must have reported a p value less than 0.05.
  - The study must have reported a p value greater than 0.05.
9. Select the correct statement:
- Prevalence is a measurement of the burden of disease.
  - Prevalence only includes new cases.
  - Incidence = (prevalence)(average duration of disease)
  - If prevalence increases, the incidence of disease must also increase.
  - Prevalence only includes old cases.

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10. Researchers want to compare medicine X vs. medicine Y in preventing strokes in patients at high risk for strokes. The best study to make this determination is:
- a. a randomized controlled trial.
  - b. a prospective cohort study.
  - c. a case control study.
  - d. an intervention case series
  - e. a cross sectional study.

**PROCEED TO THE NEXT PAGE FOR QUESTIONS 11 -20**

## This Section Contains Questions 11 – 20

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Write your answers to the questions in the space provided. Please write neatly.

11. Researchers follow 1000 exercisers and 1000 non-exercisers for 20 years. They note that 5 of the exercisers developed a stroke while 20 of the non-exercisers developed a stroke.

- a. Calculate the relative risk of developing a stroke for the exercisers vs. the non-exercisers. (Show your work.)
  
  
  
  
  
  
  
  
  
  
- b. Interpret the relative risk that you calculated.

12. List two advantages and two disadvantages of mailing surveys to patients.

13. Why is it more appropriate to report the median of a skewed distribution rather than the mean of a skewed distribution?

14. A study reports that 10% of the subjects on medicine A had a heart attack while 15% of the subjects on medicine B had a heart attack. Alpha was set at 0.05 and the p-value was 0.03. Write a sentence interpreting the p-value. (Do not simply report whether or not the p-value was statistically significant.)

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15. Assume that the prevalence of diabetes in nursing home patients is 20% and that a new blood test for diabetes is 70% sensitive and 70% specific.

a. Calculate the predictive value positive for the new diabetes blood test in this group. (Show your work.)

b. Interpret the predictive value positive that you calculated.

16. How is it possible for a disease to have a high case fatality rate but a low mortality rate?

17. A researcher wants to know if there is a statistically significant difference in the mean ages between students at four colleges. The researcher collects a random sample of students from each college and records their ages, which are normally distributed. What statistical test should the researcher use?

18. Under what circumstance is it most important to know a study's power?

19. Once the mode of administration is selected and the draft survey instrument is complete, what is the most important thing that should be done prior to implementing the survey?

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20. A researcher conducts a two-year clinical trial to determine if new Medicine A is better than Medicine B in preventing heart attacks in high-risk patients. Following is Table 1 showing the baseline characteristics of the subjects:

	<b>Medicine A (n = 50)</b>	<b>Medicine B (n = 60)</b>
% With Hypertension	10	60
Mean Age	65	35
% Females	30	50
% With College Degree	70	25
% Taller Than 70 inches	30	60
% Cigarette Smokers	20	20

It is known that hypertension, age, male sex and cigarette smoking are independent risk factors for heart attacks. Height and level of education are not independent risk factors for heart attacks.

The researcher calculates a crude relative risk of 0.8 for new Medicine A vs. Medicine B.

What should the researcher report as the relative risk when she writes her article? Be specific.

**END OF EXAM**