

Epidemiology-Biostatistics Exam
Exam 1, 2002

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Instructions: This exam is 20% of your course grade. The maximum number of points for the course is 1,000; hence this exam is worth 200 points. There are 20 questions on this exam. Each question is worth 10 points to yield the maximum total of 200 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 of the top of each page.

1. One important characteristic that distinguishes intervention studies from observation studies is:
 - a. observation studies allow you to directly calculate a relative risk
 - b. observation studies take advantage of natural events
 - c. observation studies require less time to complete
 - d. it is easier to control for confounding in observation studies
 - e. it is easier to recruit patients for observation studies

2. Proper hand washing by the staff is a way to reduce hospital acquired (nosocomial) infections. JBJ Memorial Hospital decided to implement a hand washing training program, but it was only possible to conduct the program on two of its four medical floors. The staff on two floors volunteered to participate in the training. Several months after the completion of the program on the two floors, the JBJ staff decided to conduct a study and prospectively collect nosocomial infection data of all four floors. The nosocomial infections on the two floors that underwent the program were 7/10,000 patient days while there were 12/10,000 patient days on the floors without the training. This study is an example of a:
 - a. case-control study
 - b. cohort study
 - c. case series
 - d. randomized controlled trial
 - e. cross-sectional study

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3. Referring to the scenario in question # 2 above, what measure would you use to assess the impact, expressed in patient days, on nosocomial infections that is due to the hand washing program. Select the best answer.
 - a. relative risk
 - b. incidence density (rate)
 - c. cumulative incidence
 - d. attributable risk
 - e. prevalence

4. Select the correct statement:
 - a. Interaction suggests that there is an imbalance in the distribution of baseline characteristics across study arms.
 - b. Methods to avoid interaction should be considered when designing a prospective cohort study.
 - c. Interaction effects on the relative risk can be corrected by adjustment.
 - d. Interaction can't be assessed in a case-control study.
 - e. For interaction to be present by gender, one gender's relative risk must be higher than the overall reported relative risk and the other gender's relative risk must be lower than the overall reported relative risk.

5. Select the correct statement:
 - a. Because a crude relative risk was reported as 1.0, confounding can't be present.
 - b. Gender may be a confounder even if the percentage of females in each study arm is comparable.
 - c. The definition of confounding requires that the potential confounder must be an independent risk factor for the exposure.
 - d. A potential confounding variable can't be the result of the exposure.
 - e. Confounding does not occur in randomized controlled trials.

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6. Researchers are studying an antioxidant level in apples. Team one collects the antioxidant level in 10 apples while team two collects the antioxidant level in 100 apples. The antioxidant levels are normally distributed. Both teams report a mean antioxidant level and a 95% confidence interval. Select the correct answer.
- The 95% confidence interval reported by team one will probably be wider than the 95% confidence interval reported by team two.
 - The 95% confidence intervals will probably have the same width.
 - The team with the higher mean antioxidant level will probably have the wider 95% confidence interval.
 - Given the small sample sizes, it would have been better for the teams to report 90% confidence intervals.
 - By reporting the 95% confidence intervals, the teams are providing information on how many apples were within two standard deviations of the mean antioxidant levels.
7. Assume that height is normally distributed in U.S. adults with a mean of 68" and a standard deviation of 2". Suppose that you randomly select a sample of 100 adults and determine their average height. You repeat this process 35 more times such that you have a total of 36 samples of $n = 100$. Select the correct statement:
- The variance in the distribution of sample means will probably be about 4".
 - The standard error of the mean for any one sample will probably be about 18".
 - The distribution of the sample means would probably be wider if there were 50 samples of $n = 100$ vs. the 36 samples of $n = 100$.
 - The distribution of the sample means must be skewed if the heights are not normally distributed in the U.S. population.
 - The mean, median and mode of the distribution of the sample means will probably be the same number.

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8. Researchers randomly assign 50 subjects to Med A and 50 subjects to Med B. The investigators determine that they need a total sample size of 90 subjects to achieve 80% power to detect a true difference of at least 25% for the outcome. The authors report that 10% of subjects on Med A had the outcome while 12% of subjects on Med B had the outcome. Alpha was set at 0.05 and the resulting p value was 0.15. Select the correct answer:
- Given the alternate hypothesis is true, the study had an 80% chance of detecting a true difference of at least 2%.
 - A Type II error occurred.
 - If alpha were set at 0.10 and not 0.05, the researchers' conclusion regarding the study result would remain the same.
 - Given the null hypothesis is true, the study had an 80% probability of detecting a true difference of at least 15%.
 - Given the null hypothesis is true, the study had a 5% chance of detecting a true difference of at least 15%.
9. Select the correct answer:
- Study results can be clinically significant even if the results are not statistically significant.
 - The p value is a measure of association between the exposure and outcome.
 - Calculating a p value is one way of adjusting for a potential confounder.
 - The higher the p value, the higher the study's power.
 - The higher the beta, the higher the study's power.
10. Select the correct answer. Randomization:
- helps to avoid misclassification of exposure status in randomized controlled trials.
 - reduces the probability of selection bias in randomized controlled trials.
 - reduces the probability of recall bias.
 - helps to avoid the necessity of performing an adjustment.
 - helps to avoid interaction.

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This section contains questions 11 – 20

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15. Researchers are today given the medical records of 100 patients who died of lung cancer and 200 patients who died from other causes. Using information in the medical records, the researchers determined that 20 of the lung cancer patients worked in ship factories during WWII while 10 of the individuals in the other group worked in ship factories during WWII. Calculate the strength of association between the exposure and the outcomes. Show your work.

16. A study concludes that adults who eat a diet high with Vitamin M have a 0.08 relative risk of developing colon cancer vs. adults who do not eat a diet high with Vitamin M. The researcher wants to assess if there is interaction by sex. How should the researcher do this? Be specific. (Draw a 2X2 table as a way to help you answer this question.)

17. Write a few sentences giving a specific hypothetical example of recall bias. (Do not simply define recall bias.)

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18. Researchers want to be 100% certain that a randomly selected study group has the same number of subjects with and without hypertension. What type of sample method should the researchers use?

19. What is the essential difference between an intention to treat analysis and an efficacy analysis?

20. An investigator gathers 100 teenagers who do not exercise and she determines that their mean heart rate is 85 beats per minute. All of the subjects then participate in an exercise program and she determines that their average heart rate is now 70 beats per minute. Assume that the data are normally distributed. What statistical test should the researcher use to determine if there is a statistically significant difference in these two mean heart rates?

END OF EXAM