

EPIDEMIOLOGY-BIOSTATISTICS EXAM
Exam 1, 2000

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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.) A researcher conducts a prospective cohort study to determine if there is a difference in CABG (Coronary Artery Bypass Graft) mortality between Hospital A and Hospital B.

Table 1 is shown below:

	Hospital A n = 1,000	Hospital B n = 1,000
% Females	30	50
% With Low LVEF	30	50
Average Age	62	62

It has been definitively determined from several studies that sex is not an independent risk factor for CABG mortality while a low left ventricular ejection fraction (LVEF) and age over 60 are independent risk factors for CABG mortality.

To avoid confounding when reporting the relative risk of Hospital A vs. Hospital B, the researcher must:

- a.) adjust for sex and low LVEF
- b.) adjust for age only
- c.) adjust for sex only
- d.) adjust for low LVEF only
- e.) adjust for sex, low LVEF and age

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2.) Investigators examine data from police records to identify crash factors associated with a driver fatality vs. a driver non-fatality. The crash factors they consider are driver blood alcohol level, driver age and driver use of the seat belt. This is an example of a:

- a.) case control study
- b.) retrospective cohort study
- c.) case series study
- d.) prospective cohort study
- e.) large case report study

3.) Researchers conducted a study to determine the relationship between male pattern baldness and the risk of myocardial infarction (MI) in men under the age of 60. Cases were men younger than 60 admitted with an MI to one of five hospitals. Controls were men younger than 60 admitted to these hospitals with a different diagnosis. The physicians who cared for the patients were unaware that this study was being conducted. The nurses collecting data did not know whether the men were cases or controls and they definitely did not know the purpose of the study. The nurses, however, were poorly trained in the use of the male pattern baldness scale. Select the best answer:

- a.) This study is prone to a differential misclassification of exposure status
- b.) This study is prone to a non-random misclassification of outcome status
- c.) A randomized controlled trial should be conducted to eliminate the guessing bias associated with this study
- d.) This study is prone to a random misclassification of exposure status
- e.) Investigators should report patient compliance to this protocol

4.) German Measles is a potentially dangerous disease in adults. It spreads quickly unless health officials intervene immediately. The Department of Public Health (DPH) requires physicians by law to report all cases of adult German Measles to them by phone. A 25-year-old graduate student reports to Dr. Smith in a college infirmary with symptoms and a rash that suggest German Measles, but the definitive blood test won't be available for one month. Select the best answer:

- a.) Dr. Smith should not report the case to the DPH at this point in time as it might not be German Measles
- b.) Dr. Smith should wait to see if other students develop similar symptoms before reporting the case to the DPH
- c.) Dr. Smith should only report the case to the DPH if the patient has given him permission to do so
- d.) Dr. Smith should report the case to the DPH immediately and tell the patient the case is being reported
- e.) Dr. Smith should consult the World Health Organization's case definition of German Measles to assure his patient meets the case definition before reporting to the DPH

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- 5.) Select the correct statement:
- a.) The attributable risk is the excess risk of disease in the exposed compared to the non-exposed during a defined period of time
 - b.) The attributable risk is a ratio of the disease risk in the exposed compared to the non-exposed during a defined period of time
 - c.) The attributable risk is a ratio of the disease risk in the non-exposed compared to the exposed during a defined period of time
 - d.) The attributable risk is the prevalence of disease in the exposed minus the prevalence of disease in the non-exposed
 - e.) The attributable risk is the disease risk in a defined group at a specific point in time
- 6.) Select the correct statement:
- a.) A study result is more generalizable if it is statistically significant vs. not statistically significant
 - b.) A study result is clinically important if it is statistically significant
 - c.) Failure to blind subjects and investigators is a potential threat to external validity
 - d.) Failure to consider the cost of treatment is a potential threat to internal validity
 - e.) A study result with a p-value less than 0.0000001 might have no clinical importance
- 7.) Investigators feel it is important to reduce the probability of a Type I error so they set alpha at 0.01. The resulting p-value from their study is 0.02. Select the correct answer:
- a.) The study result might be a Type II error
 - b.) The study result is statistically significant
 - c.) The study result is not important to patient care
 - d.) The study's power is 99%
 - e.) Under the assumption that the null hypothesis is true, the probability of getting a result as large or larger than 0.01 is 2%
- 8.) Disease X is incurable. It is known that the incidence of Disease X has been constant during the past 30 years. Researchers have determined that the prevalence of Disease X is higher today than it was 15 years ago. Select the answer that best explains this observation:
- a.) Patients with Disease X lived longer 15 years ago compared to today
 - b.) The relative risk of getting Disease X has decreased during the past 15 years
 - c.) The attributable risk of Disease X has increased during the past 15 years
 - d.) The odds ratio of getting Disease X has increased during the past 15 years
 - e.) Patients with Disease X had a shorter life span 15 years ago compared to today

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9.) An epidemiologist in New York receives a phone call from a father in Yankeyville who is concerned that several children in his neighborhood have been diagnosed with juvenile alopecia (hair loss). The father is specifically concerned that a nearby oil refinery is the cause of the alopecia. An initial review suggests there are more new cases of juvenile alopecia in Yankeyville than expected. After establishing a case definition of juvenile alopecia, one of the first things the epidemiologist should do is to:

- a.) conduct a case control study with vicinity to the oil refinery as the exposure of interest
- b.) describe the natural history of juvenile alopecia in terms of person, place and time
- c.) conduct a prospective cohort study comparing children in Yankeyville to children who live elsewhere with juvenile alopecia as the outcome of interest
- d.) collect ticks in Yankeyville for analysis
- e.) conduct a randomized controlled trial to determine if topical Minoxidil will help the children grow back hair

10.) The main benefit of a randomized controlled trial (RCT) compared to all other epidemiology study designs is that the RCT:

- a.) is prospective thereby eliminating the need for historical data
- b.) has better external validity
- c.) guarantees that confounding bias will not occur
- d.) tends to equally distribute into the study arms characteristics which may be independent risk factors for the outcome of interest
- e.) tends to avoid random misclassification of the outcome of interest

TURN TO THE NEXT PAGE TO CONTINUE WITH QUESTIONS 11 - 20

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Instructions: Write the answers for questions 11 – 20 in the spaces provided.

11.) A researcher follows 200 women who exercise regularly and 300 women who do not exercise regularly. After 30 years of follow-up, 20 of the women in the exercise group are diagnosed with osteoporosis while 30 women in the non-exercise group are diagnosed with osteoporosis.

a.) Draw the 2X2 contingency table showing the disease on top and the exposure on the side.

b.) Calculate the relative risk of developing osteoporosis between the two groups. (Show your work.)

The following refers to questions 12 and 13. Researchers determine in a case control study that 20 of 100 patients with bladder cancer smoke cigarettes while 40 of 600 patients without bladder cancer smoke cigarettes.

12.) Calculate the appropriate measure of association for developing bladder cancer in smokers vs. non-smokers. (Show your work.)

13.) Interpret the measure of association you calculated in question # 12.

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The following refers to questions 14 and 15. On January 1, 2000 there were 20 Tufts medical students with Influenza A and there was a total of 600 students in the class. These 20 students were immune from contracting Influenza A again during the next nine months. From January 2, 2000 through April 2, 2000, 30 more students developed Influenza A and the class size remained at 600.

14.) What was the cumulative incidence of Influenza A from January 2, 2000 through April 2, 2000? (Show your work.)

15.) What was the prevalence of Influenza A on January 1, 2000? (Show your work.)

The following refers to questions 16 and 17. It is known that having a high HDL level is protective of having a fatal myocardial infarction (MI). It is also known that cigarette smoking is an independent risk factor of having a fatal MI. In a randomized controlled trial comparing Medicine A to Medicine B in the prevention of fatal MIs in men older than 60, the following Table 1 was noted:

	Medicine A n = 600	Medicine B n = 580
% Cigarette Smokers	25	25
% With High HDL Levels	15	5

The authors compare the outcomes of patients on Medicine A vs. Medicine B and report a relative risk of 0.4. The authors then report a relative risk of 0.9 after adjusting for high HDL levels.

16.) Why did the relative risk change from 0.4 to 0.9?

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17.) Interpret the 0.9 relative risk.

The following refers to questions 18 and 19. A researcher randomizes 500 coronary artery disease (CAD) patients to either Medicine A or Medicine B. The outcome of interest is myocardial infarction (MI). In the statistical section of the published paper, the researcher writes that alpha was set at 0.05 and 500 patients were required to achieve 80% power to detect a difference of 10% or more between the two study arms. The researcher reports that 20% of the patients on Medicine A had an MI while 5% of patients on Medicine B had an MI with $p = 0.03$.

18.) Is the study result statistically significant?

19.) Write a sentence that interprets the p value of 0.03 in relation to the study results. Use 0.03 in your sentence.

20.) At the beginning of a study three medical students are disease free from an upper respiratory infection (URI) and they are all at risk for developing a URI. Following are the study results:

- Student Smith is followed for four months and does not develop a URI
- Student Jones is followed for five months and does not develop a URI
- Student Shea is followed for two months and she does develop a URI

Calculate the incidence density of URI in this group. (Show your work.)