

Quiz 2

(Please, be sure to write your name on all pages!)

Note: Attached statistical tables and abstract

1. A. How is incidence different than prevalence? (5 points)

B. What are the 3 main factors used for evaluating patterns of illness in human populations? Compare and contrast features of each of these factors for the cases of illness associated with a caustic toxic spill in a factory versus a reported recent increase in the incidence of a chronic disease in a neighborhood. (15 points)

2. If exposure to a dietary supplement is found to be associated with a 1.75-fold increase in the risk of a common illness, what factors should be considered in the evaluation of whether a public health department response is needed? (10 points)

3. What type of distribution is most likely to arise for data collected from the following three processes. Explain your answers. How would you confirm each type of distribution?

A. Counts of the number of cars passing Simmons Hall on Vassar St. during randomly selected 2 minute intervals between 2:30AM and 3:30 AM on week-end nights. (5 points)

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B. Measurements of the weights of MIT undergraduates. (5 points)

C. Measurements of the weights of MIT faculty members. (5 points)

4. You are the leader of a clinical team investigating a newly developed test that may be predictive for sub-clinical (i.e., no symptoms) heart disease. As a first trial of your test you perform it on 25 apparently healthy volunteers. Your first set of test values shows a bimodal distribution that looks like overlapping normal distributions. The first "bell" in the distribution contains 80% of the tested individuals, has a mean value of 5 and an estimated standard deviation of 1 (from normal modeling). The second "bell" in the distribution has a mean value of 7 and an estimated standard deviation of 2.

A. How likely is it that the individuals in the two different bells of the data are *not* different in their physiology? **(5 points)**

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B. What recommendations should you make to your team to increase the power of your test? **(5 points)**

C. To evaluate whether the age of the subject is a factor effecting the value of your test, you determine the Pearson Product Moment Correlation Coefficient for age versus test value for 22 individuals whose ages are known. The determined coefficient is 0.4. How much of the variance in the test values in your sample is explained by the variance in age? Is this a statistically significant observation? **(5 points)**

D. During the next 5 years you complete a prospective trial and establish that normal individuals have a mean test value of 6, and individuals with evidence of previous sub-clinical heart disease have a mean test value of 10. Both populations have normally distributed test values with similar variance. Which of the following threshold levels is likely to provide the highest quality test? Explain your answer. **(5 points)**
6, 7, 8, 9, or 10

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Read the attached abstract (**only**) from Pekka *et al.*, 2000, *NEJM* 342, p. 681 to answer the questions 5-9 below.

5. Using any or all of the following terms, retrospective, prospective, cross-sectional, historical analysis, meta analysis, how is this study best described? Explain your reasoning. (**5 points**)

6. What feature of the case and control groups exemplifies a common problem in studies of this type? Explain your answer. (**5 points**)

7. What types of bias are likely to be significant in this study (name at least two)? Which is addressed somewhat by the study design and how? (**5 points**)

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8. Is the odds ratio used appropriately? Give your reasoning. If not, how might it affect the conclusion of this study? **(10 points)**

9. What two features of the reported results suggest the possibility of a cause-effect relationship between smoking and increased incidence of pneumococcal disease? Explain in terms of formal cause-effect concepts. **(5 points)**

10. A. Based on its relationship to PCBs (polychlorobiphenyls), is chloracne a toxicity or a disease? Explain your answer. **(2 points)**

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B. What type of environetics studies were at the heart of the disagreement between R. A. Fisher and Jerry Cornfield on the question of whether cigarette smoking causes cancer?

(3 points)

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