

QUESTIONS 1-4 (20 points)

In a certain population, the prevalence of the disease of interest is **0.005**.

A diagnostic test is available for the disease, and it has the following properties:

The probability that persons test positive, when they have the disease is **0.80**.

The probability that persons test negative, when they do not have the disease is **0.90**.

1) What are the Sensitivity and Specificity of the test? (2 points)

2) What % of those persons testing positive has the disease? (6 points)
(This is the Predictive Value of a Positive Test, PVP)

3) What % of those persons testing negative does not have the disease? (6 points)
(This is the Predictive Value of a Negative Test, PVN)

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4) How do Prevalence, Sensitivity, Specificity each affect (*i.e.*, increase or decrease) PVP and PVN? (6 points)

QUESTIONS 5-7 (55 points)

5) You decide to conduct a study to determine the relative risk for sleeping in class after staying up later than 2 AM compared to going to bed earlier than 12 PM. You enroll several of your classmates to participate in the study. You observe them for several days in one of your classes noting whether you catch them nodding off or not. Afterwards, you administer a questionnaire to them for information regarding their sleeping habits on the nights before you made your observations.

5a) What kind of study have you designed? Explain your answer. (5 points)

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5b) You determined a relative risk of 5.0 with 95% CI = 1.005 to 15. What do you conclude about the effects of staying up past 2 AM on the risk of sleeping in class? Explain your reasoning. (5 points)

5c) Name three shortcomings of your study design. See 5d first! (10 points)

5d) Design a better study that improves on the shortcomings that you noted in 5c above. (10 points)

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6) At the conclusion of your improved study in #5, you have a high degree of confidence that late nights contribute to sleeping in class.

6a) How would you establish whether a cause-effect relationship exists between late nights and sleeping in class? (5 points)

6b) Formally (per C-E schemes presented in class), what features of sleeping in class might lead you to erroneous conclusions? (5 points)

7a) What are the advantages of the Pearson product-moment correlation coefficient over simple linear regression analysis for detecting and evaluating associations between two environmental factors? (5 points)

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7b) What does the Pearson coefficient (R^2) of 1.0 mean in terms of variance? (5 points)

7c) Is a correlation coefficient of 1.0 significant? (5 points)

QUESTION 8 (25 points)

Read the attached article: "Milk: Got proof?" *Consumer Reports*. September 2001, pp. 62-63. (IGNORE PAGE 63 INSET!)

8a) Regarding "Does Milk Strengthen Bones?" to what type of study bias do the milk critics point? (5 points)

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8b) Regarding "Does Milk Help or Harm the Heart?" what type of cause-effect error does the milk industry make? (5 points)

8c) Is lactose intolerance a disease or toxicity? Explain your answer. (5 points)

8d) Give an example of a phenocopy (1 point) and a toxocopy (2 points) for lactose intolerance. Which is described in the article (2 points)?

8e) Why might there be more attention given by government health agencies to potential adverse health effects of milk, if 3-12 year old children were thought to be the ones at risk? (5 points)

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