Recitation 2 - P8310 Fall 2017

September 21, 2017

Problem 1

Let A={serum cholesterol = 240 - 289}, B={serum cholesterol $\geq$ 290}, C={serum cholesterol $\leq$ 270}.

1) Are the events A and B mutually exclusive?

2) Are the events C and D mutually exclusive?

3) Suppose P(A)=0.3, P(B)=0.2. What is P(serum cholesterol $\geq$ 250)?

4) What does $A \cup C$ mean?

5) What does $A \cap C$ mean?

6) What does the event $\bar{B}$ mean? What is its probability?

Problem 2

Two psychological tests aimed at measuring Depression were administered to a sample of individuals. A definitive diagnosis was made using the SCID. The other instrument contained 7 items. The following table provides the distribution of outcomes based on these tests:

Items answered "Yes"	Depressed	Not Depressed
0	0	3
1	1	4
2	5	2
3	7	5
4	11	2
5	20	0
6	30	1
7	34	1

Suppose a cutoff value of ≥ 5 on the test is used to identify people with depression.

1) What is the sensitivity of the test?

2) What is the specificity of the test?

3) Suppose we want to develop an ROC curve to reassess the cutoff value for the test. What are the sensitivity and specificity at each of the cutoffs (starting with 1 to 7 items answered "Yes"? Make a table of your results.

4) Construct an ROC curve based on the table constructed in question 3).

5) Suppose we want both the sensitivity and specificity to be at least 70%. Use the ROC curve to identify the best value(s) to use as the cutoff for identifying people with depression.

Problem 3

Use the following information to answer the questions below. An experiment is designed to test the potency of a drug on 15 mice. Previous students have shown that a 5 mg dose of the drug is lethal 3% of the time within the first 2 hours; of the animals alive at 2 hours 4% will die within the next two ours.

1) What is the probability that at least 3 rats die within the first two hours?

2) Suppose 3 rats die within the first two hours, what is the probability that 2 or fewer die in the next two hours?

Problem 4

Use the following information to answer the questions below. An article was recently published concerning the evidence of a cardiac death attributable to an earthquake in San Francisco on –. In the week before the earthquake there were on average 12.4 cardiac deaths per day in San Francisco. On the day of the earthquake there was 41.

1) What is the exact probability of 23 deaths occurring on one day if the cardiac death rate in the previous week continued to hold on the day of the earthquake?

2) Is the occurrence of 23 deaths an unusual occurrence?

Problem 5

Based on an analysis of data collected by the National Center for Health Statistics, it was reported that 19.7 percent of U.S. adults were overweight. If we select a simple random sample of 25 U.S. adults, find the probability that the number of overweight people in the sample will be:

1) Exactly 3

2) 3 or more

3) Fewer than 4

4) Between 3 and 7, exclusive

5) How many overweight adults would you expect in find in the sample of 25?

6) What is the variance of the number of overweight adults in the sample of 25?

Problem 6

Rosner textbook 8th edition, 5.21 - 5.24.