

Introduction to Biostatistics BC 203
Midterm Exam
Tuesday, October 24, 2003
(Closed Book)

There are 33 `questions', each worth 3 points.

Write out your solutions and circle your final answer. Show all your work on these pages. If you need more space write on the back of the page.

You have one and one half hours to complete this exam.

Name: _____

1. The following stem and leaf plot displays the average miles per gallon for 19 new car models.

Stem	Leaf	
0	1	
1	9,3,7,0,8,7,9	
2	2,7,4,1,1,3,2	
3	3,3,1,0	
4		

- (a) What is the median miles per gallon in this sample of new cars?
- (b) What is the 25% percentile in this sample of new cars?
- (c) What is the 75% percentile in this sample of new cars?
- (d) What is the Inter-quartile range in this sample?
- (f) Are there any outliers in this data set? If so, identify them.

2. The number of reported stolen hats (crimes) in New York City and Phoenix are given in the following table, which is broken down by hair color, along with the population size (in thousands):

New York City					Phoenix				
Hair	Crimes	Pop			Hair	Crimes	Pop		
Blond	16	1			Blond	40	5		
Brown	6	3			Brown	20	20		
Black	12	6			Black	35	35		
Red	52	13			Red	84	42		
Grey	112	7			Grey	64	8		
None	1600	20			None	600	15		
Total	1798	50			Total	843	125		

(a) What is the crude crime rate in NYC (in thousands)?

(b) What is the crude crime rate in Phoenix (in thousands)?

Problem 2 (continued)

- (c) What is the ratio of directly adjusted crime rates (NYC to Phoenix), if Phoenix is used as the standard population?

(Check **one** box)

- (d) Suppose you were able to pick any standard population and then you re-calculated the ratio of directly adjusted rates as you did in part (c) above. Then it is true that

- ☐ You could only make the ratio as large as you wish
- ☐ You could only make the ratio as small as you wish
- ☐ You can not change the ratio
- ☐ You can make the ratio as large or as small as you wish

(Check **one** box)

- (e) Suppose you were able to pick any standard population and then you calculated the same ratio using the indirectly adjusted rates. Then it is true that

- ☐ You could only make the ratio as large as you wish
- ☐ You could only make the ratio as small as you wish
- ☐ You can not change the ratio
- ☐ You can make the ratio as large or as small as you wish

3. The following table shows data on 518 primary diagnosis stratified by age.

Age	Diabetes	Asthma	Arthritis	Cardiac
30-39	27	56	20	30
40-49	32	32	25	24
50-59	30	14	43	43
Over 60	29	7	65	41

- (a) What is the probability of being diabetic and under 40 in this population?
- (b) What is the probability of being Arthritic or over 60, but not both?
- (c) For individuals who are between 40 and 49, what is the probability of being Asthmatic?
- (d) What is the probability of being over 50 given that you are not Diabetic?

4. Suppose I take one Vioxx pill a day and the probability of an adverse event from Vioxx is 0.1. Assume that the effects of Vioxx are not cumulative, that is, the effect of Vioxx is independent from day to day.
- (a) What is the probability that I will have at least one adverse event in a single week?
- (b) What is the probability that I have an adverse event on Monday and Friday of that week?

Problem 4 (continued)

- (c) What is the probability that I have two weeks in a row where I have adverse events on Monday and Friday?

- (d) How many adverse events would I expect to have over a period of one year?

- (f) What is the standard deviation of the number of adverse events in one year?

5. Scholastic Aptitude Test (SAT) scores are standardized into percentiles to make them comparable across different versions of the test. In Rhode Island, college-bound high school seniors have a mean SAT verbal score of 502 (with a standard deviation of 108, i.e., $\sigma = 108$) and a mean SAT math score of 504 ($\sigma = 111$). Assume that verbal and math scores are independent and normally distributed.
- (a) What is the probability that a randomly selected senior will score between 340 and 664 on the verbal portion of the exam?
- (b) What is the probability that a randomly selected senior will score over 600 on the verbal portion of the exam?
- (c) Find the top 10th percentile of SAT verbal scores for seniors.

Problem 5 (continued)

- (d) Suppose your friend is excellent in English and always scores 600 or more on the verbal SAT. What is the probability that your friend will score over 700 on the verbal SAT?
- (f) What is the expected combined math and verbal score for a high school senior?
- (g) What is the standard deviation of the combined math and verbal score for a high school senior?
- (h) Calculate the interval that captures the middle 80% of the combined test score distribution for seniors.

6. Suppose a voter poll is taken in three states. In state A, 50% of voters support the liberal candidate, in state B, 60% of the voters support the liberal candidate, and in state C, 35% of the voters support the liberal candidate. Of the total population of the three states, 40% live in state A, 25% live in state B, and 35% live in state C.

(a) How often do the voters support a liberal candidate?

(b) What is the probability that a voter lives in state B if we know that they supported the liberal candidate?

- ### Problem 6 (continued)