

Math4310/Biol6317, Fall 2011
Problem Set 3, due Thursday, Sep 15

- Problem 1. In some population, 30% of the persons smoke and 8% have heart disease. Moreover, 12% of the persons who smoke have the disease.
- What percentage of the population smoke and have the disease?
 - What percentage of the population with the disease also smoke?
 - Are smoking and the disease independent?
- Problem 2. When at the free-throw line for two shots, a basketball player makes at least one free throw 90% of the time. 80% of the time, the player makes the first shot, while 70% of the time both shots succeed.
- Does it appear that the player's second shot success is independent of the first?
 - What is the conditional probability that the player makes the second shot given that the first succeeds? What is the conditional probability if the first shot misses?
- Problem 3. A study by Bastian et al. [Diagnostic efficiency of home pregnancy test kits, Archives of Family Medicine 7, 465-469 (1998)] investigated home pregnancy tests with the following findings:
- When women collected and tested their own samples, the overall sensitivity of the testing kits was 75%. Specificity was also low, in the range from 52% to 75%.
- Interpret a positive and a negative test result using diagnostic likelihood ratios using both extremes of the specificity.
 - A woman taking a home pregnancy test has a positive test. Draw a graph of the positive predictive value depending on the prior probability (prevalence) that women in the population are pregnant. Assume the specificity is 63.5%
 - Repeat the previous question for a negative test and the negative predictive value.