

Conditional Probability and Independence*

Worksheet 7

1. With the monsoon season, we can have more cases of dengue fever, a mosquito-borne tropical disease caused by the dengue virus. Antibody tests are recommended during a dengue outbreak. However, the presence of other viruses in the human body can have cross-reactive results yielding a high false positive rate. Assume a false positive rate of 10% and a false negative rate of 1%.
 - (a) Given that a person has dengue, what is the probability of a positive test.
 - (b) If one percent of a population has dengue, what fraction of the population will test positive.
 - (c) If the individual tests positive, what is the probability that this individual has dengue?
 - (d) The public health department suggests aggressive screening so that half of those tested have dengue. In this case, what is the probability that an individual testing positive actually has dengue?
 - (e) Given a proportion p of those tested having dengue, graph the probability that an individual testing positive actually has dengue. Indicate the values in parts (b) and (d).
2. Presently, 1.84% of Americans have Alzheimer's disease. Here is the distribution of those with Alzheimer's.

below 65	65 to 74	75 to 84	above 85
0.03	0.16	0.44	0.37

The goal of this exercise is to find what fraction each of these groups has Alzheimer's. Here is the age distribution of the United States.

below 65	65 to 74	75 to 84	above 85
0.870	0.070	0.042	0.018

Use Bayes theorem to find the prevalence of Alzheimer's, that is, the proportion of each population that has Alzheimer's.

below 65	65 to 74	75 to 84	above 85

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