

Discussion

1. In a certain city, 80% of all licensed drivers have auto insurance. Those who have insurance have a 5% chance of being involved in an auto accident, while those who do not have insurance tend to be more cautious, and have an accident rate of only 3%. Suppose you are hit by a licensed driver. What is the probability that this driver has insurance?
2. The Enzyme-Linked ImmunoSorbent Assay (ELISA) test was approved by many countries around the world in the mid-1980s to screen donated blood for the presence of HIV. The test works by detecting antibodies - substances that the body produces when the virus is present - but it makes some mistakes. ELISA was designed so that when a given blood sample does in fact contain HIV, the test gives a positive result 97% of the time. When the blood being tested does not have the virus ELISA will announce a negative result 95% of the time.

- (a) What is the sensitivity and the specificity of the test?
- (b) Assume the prevalence of HIV in the population of people who donate blood is 1%. Fill the table below on a hypothetical set of 10,000 samples.

	Person has HIV	Person doesn't have HIV	Totals
ELISA positive			
ELISA negative			
Totals			10,000

- (c) Use the completed table to show that if someone donates blood and the ELISA test comes out negative the probability that the person does not in fact have HIV given this negative result is virtually 100%, but if ELISA comes out positive the probability the person actually has HIV is only $97/592$ which is about 16%
 - (d) Explain these results by identifying the two kinds of mistakes ELISA could make and discussing their implications from the blood bank's point of view.
3. Problem 14, page 157.
 4. Problem 19, page 159.