

Probability Rules

- Sensitivity: probability that a test or procedure result will be positive when the disease is present.
- Specificity: probability that a test or procedure result will be negative when the disease is not present.
- True Positive Rate: sensitivity (in percent)
- False Positive Rate: probability that a test or procedure result will be positive when the disease is not present. [100 minus specificity (in percent)]
- True Negative Rate: specificity (in percent)
- False Negative Rate: probability that a test or procedure result will be negative when the disease is present. [100 minus sensitivity (in percent)]
- Positive Predictive Value: probability that the disease is present when the test or procedure result is positive.
- Negative Predictive Value: probability that the disease is not present when the test or procedure result is negative.

A common test for AIDS is called the ELISA test. Among 1,000,000 people who are given the ELISA test, we can expect results similar to those given in the table.

	B_1 : Carry AIDS Virus	B_2 : Do Not Carry AIDS Virus	Totals
A_1 : Test Positive	4,885	73,630	78,515
A_2 : Test Negative	115	921,370	921,485
Totals	5,000	995,000	1,000,000

If one of these 1,000,000 people is selected randomly, find the following probabilities and interpret

1. $P(B_1)$
2. $P(A_1)$
3. $P(A_1$ given that B_2 has occurred)
4. $P(B_2$ given that A_1 has occurred)
5. $P(B_1$ given that A_1 has occurred)
6. $P(A_1$ given that B_1 has occurred)
7. $P(A_2$ given that B_2 has occurred)
8. $P(A_2$ given that B_1 has occurred)
9. $P(B_2$ given that A_2 has occurred)

		True State	
		No Virus	Virus
Conclusion	Positive test	Type I Error	Correct Decision
	Negative test	Correct Decision	Type II Error