Case Study: Bayes' Theorem

> **!** Important
>
> Please note that you can download PDF and Microsoft Word versions of this case study using the links on the right.

Case 1 Description

You have a new test for detecting non-small cell lung cancer. When compared to the "Gold Standard", your new test has a sensitivity of 93% and a specificity of 98%. A patient presents with persistent cough and mediastinal lymphadenopathy. Your pre-test probability that they have non-small cell lung cancer is 0.1%.

Instructions

- *Using Bayes Formula, calculate the post-test probability of disease. In other words, suppose your patient tests positive on the screening test. What is the probability that they actually have small cell lung cancer? Interpret your result (You can check your answer by calculating PPV in a 2X2 table)*

- *Using Bayes Formula, calculate the post-test probability of non-disease. In other words, suppose your patient tests negative on the screening test. What is the probability that they are actually disease-free? Interpret your result (You can check your answer by calculating NPV)*

- *Post-test probability of lung cancer if you have a negative test*

- *Post-test probability of having a noncancerous infection if you have a positive test.*

Table 1: 2x2 Table for Case 1

	D+	D-	Total
T+			
T-			
Total			100,000

Case 2 Description

Suppose you add a confirmatory test. This test is only performed on patients with a positive result on the initial screening test (2,091 individuals from case above above) and works by a different mechanism. This test has 88% sensitivity and 99.9% specificity.

Instructions

Presuming the test was just given to patients with a positive initial screening test, please calculate:

- *Post-test probability of noncancerous infection if you have a positive test*

- *Post-test probability of lung cancer if you have a negative test*

- *Are using the 2 sequential tests a good strategy for detecting non-small cell lung cancer? Why or why not?*

Table 2: 2x2 Table for Case 1

	D+	D-	Total
T+			
T-			
Total			2,091