Day Three: Worksheet

SOC Methods Camp

September 5th, 2019

Zika

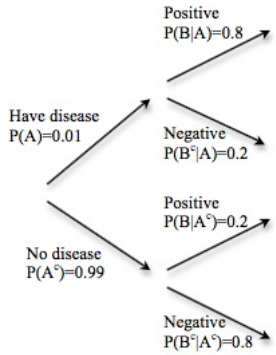
To answer these questions, you will need Bayes' Rule and the Law of Total Probability:

$$\text{Bayes' Rule:} P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(B|A) * P(A)}{P(B)}$$

$$\text{Law of Total Probability:} P(A) = P(A \cap B) + P(A \cap B^C)$$

Combined:

$$P(A|B) = \frac{P(B|A) * P(A)}{P(B|A) * P(A) + P(B|A^C) * P(A^C)}$$



Given the above information about the probability of having the Zika virus, the probability of testing positive or negative given having the virus, and the probability of testing positive or negative given being virus-free, what is the probability of *actually* having the virus given that you got a positive result? What is the probability of *not* having Zika given a negative test?

Prosecutor's Fallacy

$$P(\text{Match} \mid \text{Innocent}) = 1/1,000,000$$

$$P(\text{Innocent}) = 399,999/4,000,000$$

$$P(\text{Guilty}) = 1/4,000,000$$

$$P(\text{Match} \mid \text{Guilty}) = 1$$

Given the above, what is the probability that a person is innocent given that their DNA was a match? If it helps, feel free to draw a diagram!