Consider the example you saw in lecture involving the Zika virus. We will start with the same set-up: A woman lives in a country where only 1 out of 1000 people has the virus. There is a test available that is positive 5% of the time when the patient does not have it, negative 1% of the time when the patient does have it, and otherwise correct. Recall that we computed that the woman's chance of having the virus, conditional on a positive test, is less than 1.9%. (By the way, in Bayesian parlance, we call the initial, unconditional probability the "prior" and the resulting conditional probability, after updating based on observations, the "posterior.")

Question 6

(1/1 point)

Let the conditional probability we computed (1.9%) serve as the new prior. Compute the new probability that she has the virus (new posterior) based on her receiving a second positive test.

Note: Round your answer to the hundredth decimal place. For example, if your answer is 0.3111*, you should input* 0.31

0.28

Answer: 0.28

- Exit Survey

0.28

EXPLANATION

Using the updated information, follow the same procedure given in the lecture. The probability that she has a second positive test is given by: $0.019 * 0.99 + 0.981 * 0.05 = 0.06786$. Using Bayes rule, the probability that she has the virus conditional on having a second positive test is then given by: $0.019 * \frac{0.99}{0.06786} = 0.2818323 \approx 0.28$.

You have used 2 of 2 submissions

Question 7

(1/1 point)

How many positive test results would she have to receive in order to be at least 95% sure that she has the virus?

Note: You will need the correct answer from Question 6 in order to obtain the correct response for this question

- ○ Two
- ○ Three
- ◉ Four ✔

Five

Not possible to infer from the available information

EXPLANATION

We can continue with the same procedure! After the second positive test the new prior would be 0.28. Thus, the probability of having the virus conditional on a third test being positive is given by $\frac{(0.28*0.99)}{(0.28*0.99+0.72*0.05)} \approx 0.89$. After a fourth positive test, this would be given by $\frac{(0.89*0.99)}{0.89*0.99+0.11*0.05} \approx 0.99.$

You have used 1 of 2 submissions

Question 8

(1/1 point)
Assess whether the following statement is True or False:

We obtain the same probability of having the Zika virus after a second positive test if instead of sequentially updating the conditional probability, we used the unconditional probability and treated both tests as independent.

a. True ✔

b. False

c. Not possible to infer from the available information

EXPLANATION

The statement is true. The probability of having the virus using the unconditional probability and treating the two tests independently would be given by:

P(zika|test1+ and test2+)=P(test1+ and test2+|zika)*P(zika)/P(test1+ and test2+)

Since both tests are independent we know that:

P(test 1+ and test2+|zika)=P(test+| zika)* P(test+| zika)=0.992

Similarly, we know that the probability of the two tests being positive conditional on not having the Zika virus would be given by:

P(test1+ and test2+|no zika)=P(test+|no zika)* P(test+|no zika)=0.052

This implies that:

P(test1+ and test2+)= $0.992 * 0.001 + 0.052 * 0.999$

Thus, we have that:

P(zika|test1+ and test2+)= $\frac{(0.992*0.001)}{(0.992*0.001+0.052*0.999)} = 0.28183230 \approx .28.$

You have used 1 of 1 submissions