Transcript of Training Video

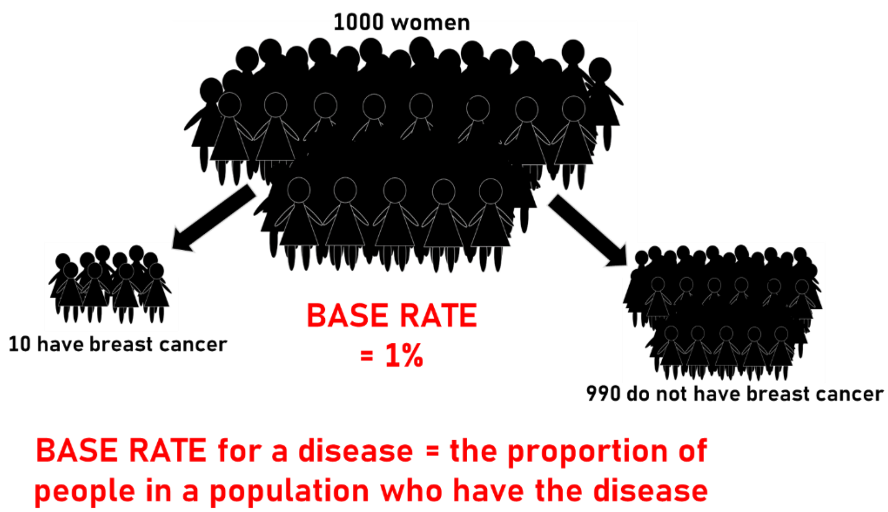
Reasoning Training

Hi there, I'm John Wilcox, and I'm a cognitive psychologist at Stanford University.

In this video, I'm going to talk about base rate neglect. Base rate neglect is a so-called fallacy—that is, an error in our reasoning. The purpose of this video is to teach you the fallacy, so that you can avoid it. To do this, we are going to walk you through the following hypothetical scenario.

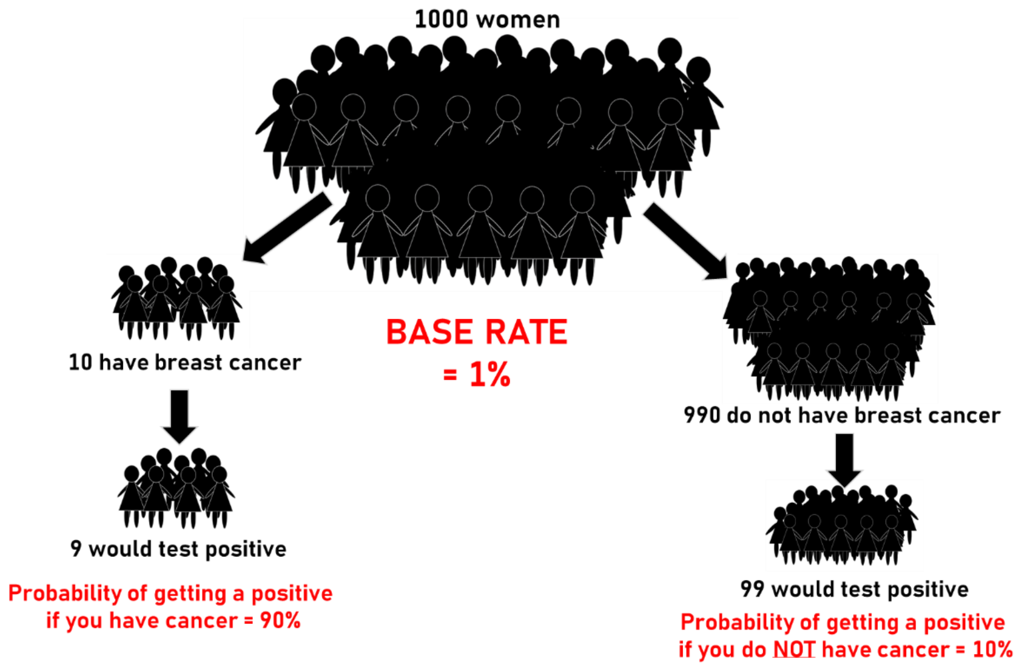
Imagine that Sally takes a test for breast cancer. If she has breast cancer, there is 90% probability she would test positive. Suppose Sally then tests positive. What is the probability that Sally has breast cancer? An intuitive answer is to say she has a 90% probability of breast cancer. But this intuitive answer is incorrect. It results from base rate neglect. The correct answer is actually that we simply cannot determine the probability that Sally has breast cancer given the positive test. We're going to explain why this is so. To do this, imagine the following is true.

Suppose that out of every 1000 women, only 1 percent or 10 of them have breast cancer. This means that 99 percent or 990 of them do not have breast cancer. This statistic is called the *base rate* of breast cancer among women. The base rate for a disease is the proportion of people in a population who have the disease. Remember this!

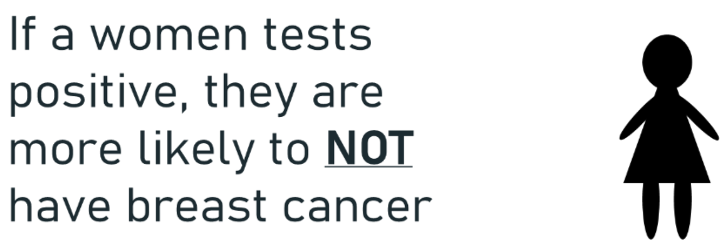


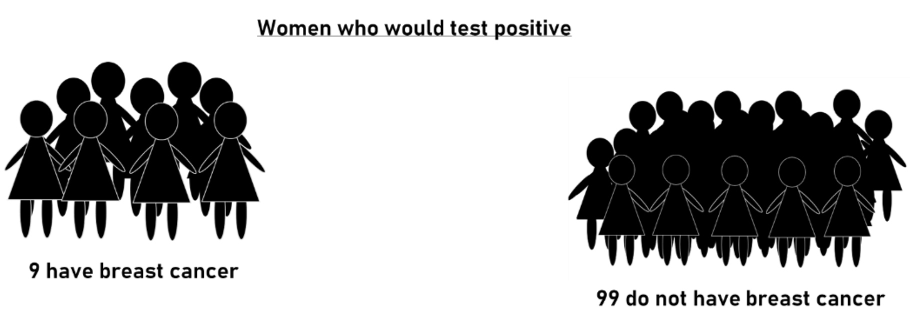
Anyway, as mentioned before, imagine that if a woman has breast cancer, then there is a 90% probability that she would test positive. This means that for every 10 women who have breast cancer, 9 would test positive. So let us imagine that 9 of the 10 women with breast cancer would test positive.

Also imagine that if a woman does not have breast cancer, then she would test positive with a probability of 10%. If this is the case and 990 out of 1000 women do not have breast cancer, then 10 percent or 99 of those 990 would test positive. So let us imagine that 99 out of the 990 women without cancer would test positive. That means 99 women out of every 1000 would test positive even though they do not have breast cancer.



If a woman tests positive, they might be one of the 9 women who would test positive and do have breast cancer, but it is actually much more likely that they would be one of the 99 women who do not have breast cancer but would still test positive. For that reason, if a woman tests positive, she is more likely to not have breast cancer.





Of course, when I first asked you about the probability that Sally has breast cancer, I did not tell you the base rate.

Regardless, the whole point of this example is to show that we simply cannot tell the probability that someone has breast cancer if we only know the probability of them getting a positive test if they have breast cancer.

Instead, we need more information to determine the probability that someone has cancer given a positive test result. And more specifically, what we need is information about:

1. The base rate, such as how many women have breast cancer in the first place
2. The probability of the test result if they do not have the disease
3. The probability of the test result if they do have the disease

If we do not consider base rates when we should, then we commit the base rate fallacy. So please, avoid the base rate fallacy!

Thank you for watching this video. Please answer the questions below this video and carry on with the study.