MMV Question

- MMV is a viral infection that can cause a serious disease (called MMD)
- MMD patients are unable to control their natural urge to make mathematical models that attempt to describe biological phenomena
- The rapid MMV test gives a positive result:
  - 100% of the time for people with the virus
  - 5% of the time for people without the virus
- A certain population has a prevalence of 1%
- You pick a person from this population at random, and test them, and the test is positive.
  - What is the probability that they have MMV?
- You learn that your friend has a positive rapid test for MMV. What do you tell them?

True positive: 1

True negative: 0.95

False positives: 0.05

Population prevalence: 0.01

PPV = True positive/Tested positive = proportion/probability of a person having MMV out of the positive tests

$$P(MMV \mid Positive\ Test) = Probability\ a\ person\ has\ MMV\ given\ that\ they\ test\ positive$$

$$P(MMV \mid Positive\ Test) = \frac{P(Positive\ Test \mid MMV)\ P(MMV)}{P(Positive\ Test)}$$

$$= \frac{P(Positive\ Test \mid MMV)\ P(MMV)}{P(Positive\ Test \mid MMV)\ P(MMV) + P(Postitive\ Test \mid {\sim}MMV)\ P({\sim}MMV)}$$

$$= \frac{1 * 0.01}{1 * 0.01 + 0.05 * 0.99} = \frac{0.01}{0.01 + 0.0495} \approx 17\%$$

If I were to pick a person from this population at random, test them, and the test is positive, there would be a 17% chance that they have MMV.

If I believe my friend is from the same population, I will tell them that although they tested positive the probability of them actually being positive for MMV is about 17% or just under a 1/5 chance of having the disease.