COVID Testing

Suppose I get a positive test for COVID.
What's the chance that I'm sick.

X = sample space = population.

S/W sick vs well

+/− pos/neg test

$(S,+)$ true pos

$(S,-)$ false neg

$(W,+)$ false pos

$(W,-)$ true neg

$$P(S|+) = \frac{P(S,+)}{P(+)}$$

$P(+|W) = .005$

$P(-|W) = .995$

$P(-|S) = .25$

$P(+|S) = .75$

$$P(S|+) = \frac{P(+|S)P(S)}{P(+)}$$

$P(S)$ = incidence of disease in population. $= p$.

$$P(+) = P(S,+) + P(W,+)$$
$$= P(+|S)P(S) + P(+|W)P(W)$$
$$= .75p + (.005)(1-p)$$
$$= .005 + .745p.$$

$$P(S|+) = \frac{.75p}{.005 + .745p} = \frac{750p}{5 + 745p}$$

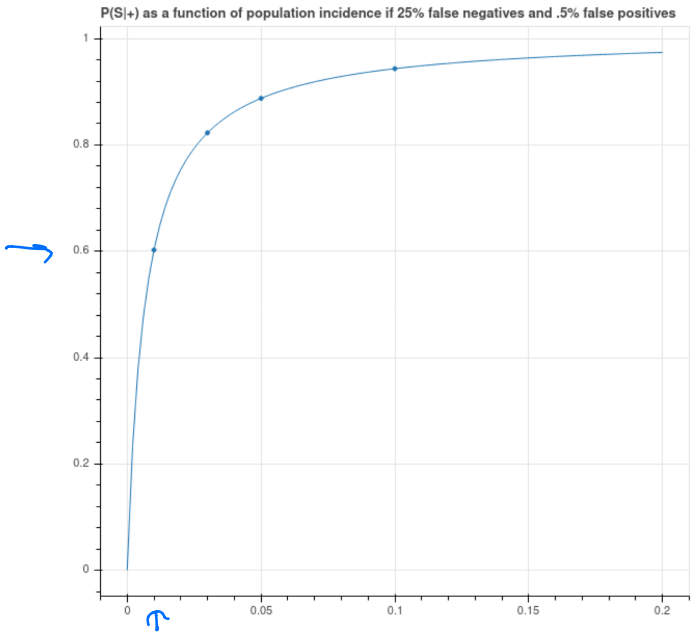

Figure 2: P(S|+) vs P(S)