- We compute:

$$\mathbb{P}(V = 1 | T = 1) = \frac{\mathbb{P}(V = 1 \wedge T = 1)}{\mathbb{P}(T = 1)},$$

  but we don't know either of these numbers.
- For example, $\mathbb{P}(T = 1)$ is the probability of a random person testing positive.
- We cannot answer this without knowing the prevalence of the virus.

Prevalence

- We assume that the prevalence of the virus— specifically the fraction of people who have the virus — is $\alpha \in [0, 1]$.
- Then

$$\begin{aligned}\mathbb{P}(T = 1) &= \mathbb{P}(T = 1 | V = 1)\mathbb{P}(V = 1) + \mathbb{P}(T = 1 | V = 0)\mathbb{P}(V = 0) \\ &= 0.99\alpha + 0.01(1 - \alpha) \\ &= 0.01 + 0.98\alpha.\end{aligned}$$

- $\mathbb{P}(T = 1 \wedge V = 1) = 0.99\alpha$.