

Breast Cancer

$$P(\text{Breast cancer}) = 0.008$$

$$P(+ \text{ mam.} \mid \text{BC}) = 0.9$$

$$P(+ \text{ mam.} \mid \text{no BC}) = 0.07$$

Want: $P(\text{BC} \mid + \text{mam})$

$$P(\text{BC} \mid + \text{mam}) = \frac{P(+ \text{mam} \mid \text{BC}) P(\text{BC})}{P(+ \text{mam})}$$

$P(+ \text{mam}) \rightarrow$ need to use a marginal prob

$$\begin{aligned} P(+ \text{mam}) &= P(+ \text{mam} \mid \text{BC}) P(\text{BC}) + P(+ \text{mam} \mid \text{no BC}) P(\text{no BC}) \\ &= (0.9 \cdot 0.008) + (0.07 \cdot (1 - 0.008)) \end{aligned}$$

$$P(\text{BC} \mid + \text{Mam}) = \frac{0.9 \cdot 0.008}{(0.9 \cdot 0.008) + (0.07 \cdot (1 - 0.008))}$$

$$= \frac{0.9 \cdot 0.008}{0.07664}$$

$$= 0.0939 \dots$$