

Define variables:

$T$  (twin brothers),  $I$  (identical twins) and  $F$  (fraternal twins).

Define probabilities:

$\mathbf{P}(I) = \frac{1}{300}$  (the probability of having an identical twin)

$\mathbf{P}(F) = \frac{1}{125}$  (the probability of having an fraternal twin)

Assuming that there is an equal probability for boys and girls being born, the probability that Elvis's twin was a boy,  $\mathbf{P}_{twin} = \frac{1}{2}$

The probability that both twins are boys (twin brothers),  $\mathbf{P}(T) = \mathbf{P}_{twin} \times \mathbf{P}_{twin} = \frac{1}{4}$

We want to compute the conditional probability for having an identical twin brother *given* that Elvis had a twin brother, i.e.  $\mathbf{P}(I | T)$ .

Baye's rule implies:

$$\mathbf{P}(I | T) = \frac{\mathbf{P}(T|I) \mathbf{P}(I)}{\mathbf{P}(T)} = \frac{\mathbf{P}(T|I) \mathbf{P}(I)}{\mathbf{P}(T|I) \mathbf{P}(I) + \mathbf{P}(T|F) \mathbf{P}(F)} = \frac{5}{11} \approx 0.45$$