

$$\begin{aligned}
P'_b &= P(X_b = 1 | X_a = 0) = \frac{P(X_b = 1, X_a = 0)}{P(X_a = 0)} \\
&= \frac{P(X_b = 1) - P(X_b = 1, X_a = 1)}{1 - P(X_a = 1)} \\
&= \frac{P_b - P(X_b = 1 | X_a = 1)P(X_a = 1)}{1 - P_a} \\
&= \frac{P_b - P_{ba}P_a}{1 - P_a} = P_b \left( \frac{1 - \frac{P_{ba}}{P_b}P_a}{1 - P_a} \right)
\end{aligned}$$