

$$\begin{aligned}
P \left[\frac{i_o}{n_o} \middle| \frac{i_p}{n_p} \right] &= \left(\frac{n - i_o}{n} \right) \left\{ \left(1 - \frac{n - 1}{N} \right) P \left[\frac{i_o}{n_o - 1} \middle| \frac{i_p}{n_p - 1} \right] \right. \\
&\quad + \left(\frac{i_o}{N} \right) P \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_p}{n_p - 1} \right] \\
&\quad \left. + \left(\frac{n - i_o - 1}{N} \right) P \left[\frac{i_o}{n_o - 1} \middle| \frac{i_p}{n_p - 1} \right] \right\} \\
&\quad \left(\frac{i_o}{n_o} \right) \left\{ \left(1 - \frac{n - 1}{N} \right) P \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_p - 1}{n_p - 1} \right] \right. \\
&\quad + \left(\frac{i_o - 1}{N} \right) P \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_p - 1}{n_p - 1} \right] \\
&\quad \left. + \left(\frac{n - i_o}{N} \right) P \left[\frac{i_o}{n_o - 1} \middle| \frac{i_p - 1}{n_p - 1} \right] \right\}
\end{aligned}$$

Coalescent
event



Last parent is ancestral

Last parent is derived