

## SAMPLING DISTRIBUTION OF PROPORTIONS

$$\begin{aligned}\mu_{\hat{p}} &= E[\hat{p}] \\ &= E\left[\frac{X}{n}\right] \\ &= \frac{1}{n}E[X] \\ &= \frac{1}{n}(np) \quad \because X \sim b(n, p) \\ &= p\end{aligned}$$

$$\begin{aligned}\sigma_{\hat{p}}^2 &= \text{Var}(\hat{p}) \\ &= \text{Var}\left(\frac{X}{n}\right) \\ &= \frac{1}{n^2}\text{Var}(X) \\ &= \frac{1}{n^2}(npq) \quad \because X \sim b(n, p) \\ &= \frac{pq}{n}\end{aligned}$$