$\pi \sim \text{Beta}(\alpha, \beta)$ 1. Closure properties on BetaBinomial

$X_i | \pi \sim \text{BERNOULLI}(\pi)$ 2. Correct CBG model

$Y = \sum_{i=1}^{N} X_i \sim \text{BETABINOM}(N, \alpha, \beta)$

$\tau = \gamma(\text{Pop} \cdot \text{age\%} \cdot \text{occ\%})$ $\quad \mathbb{E}[\tau] = ?$

Expected # of people in CBG of age-occupation group

γ

$\mathbb{E}[\tau] = \gamma \mathbb{E}[Y]$

$= \frac{N \gamma \alpha}{\alpha + \beta}$

$\text{BetaBinom}(\gamma N, \alpha, \beta)$

$\text{TOTAL-VISITS}^{\text{CBG}} = \text{Pop} \cdot \sum_{\substack{\text{age} \\ \text{occ}}} Y_{\text{age,occ}} \cdot \text{age\%} \cdot \text{occ\%}$