FORMULAS

Binomial Coefficient: This is needed for the Binomial and Hypergeometric probabilities below. For integers $n \geq k \geq 0$,

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

Note that $0! \stackrel{\text{def}}{=} 1$.

Discrete Probability Distributions:

$$\text{Poisson:} \qquad p(y) = \frac{e^{-\mu}\mu^y}{y!}, \quad y = 0, 1, 2, \ldots$$

$$\text{Binomial:} \qquad p(y) = \binom{N}{y}\pi^y(1-\pi)^{N-y}, \quad y = 0, 1, 2, \ldots, N$$

$$\text{Hypergeometric:} \qquad p(n_{11}) = \frac{\binom{n_{1+}}{n_{11}}\binom{n_{2+}}{n_{+1}-n_{11}}}{\binom{n}{n_{+1}}}$$

Statistics:

$$\sigma(p) = \sqrt{\frac{\pi(1-\pi)}{N}} \qquad \sigma(p_1 - p_2) = \sqrt{\frac{\pi_1(1-\pi_1)}{N_1} + \frac{\pi_2(1-\pi_2)}{N_2}}$$

$$\hat{\sigma}(p) = \sqrt{\frac{p(1-p)}{N}} \qquad \hat{\sigma}(p_1 - p_2) = \sqrt{\frac{p_1(1-p_1)}{N_1} + \frac{p_2(1-p_2)}{N_2}}$$

$$\hat{\theta} = \frac{n_{11}n_{22}}{n_{12}n_{21}}$$

$$\text{ASE}(\log(\hat{\theta})) = \sqrt{\frac{1}{n_{11}} + \frac{1}{n_{12}} + \frac{1}{n_{21}} + \frac{1}{n_{22}}}$$

$$X^2 = \sum \frac{(n_{ij} - \hat{\mu}_{ij})^2}{\hat{\mu}_{ij}}, \qquad \hat{\mu}_{ij} = \frac{n_{i+}n_{+j}}{n}, \qquad \text{df} = (I-1)(J-1)$$

$$G^2 = 2\sum n_{ij}\log\left(\frac{n_{ij}}{\hat{\mu}_{ij}}\right), \qquad \hat{\mu}_{ij} = \frac{n_{i+}n_{+j}}{n}, \qquad \text{df} = (I-1)(J-1)$$

$$r_{ij} = \frac{n_{ij} - \hat{\mu}_{ij}}{\sqrt{\hat{\mu}_{ij}(1-p_{i+})(1-p_{+j})}}$$

$$\text{CMH} = \frac{\left[\sum(n_{11k} - \mu_{11k})\right]^2}{\sum \text{Var}(n_{11k})}, \qquad \text{df} = 1$$

$$\hat{\theta}_{\text{MH}} = \frac{\sum_k(n_{11k}n_{22k}/n_{++k})}{\sum_k(n_{12k}n_{21k}/n_{++k})}$$