

## Formulas for exam 1:

Binomial  $P(y) = \frac{n!}{y!(n-y)!} \pi^y (1-\pi)^{n-y}$ ,  $y = 0, 1, 2, \dots, n$ ,  $\mu = n\pi$ ,  $\sigma = \sqrt{n\pi(1-\pi)}$

Hypergeometric  $P(n_{11}) = \frac{\binom{n_{1+}}{n_{11}} \binom{n_{2+}}{n_{+1}-n_{11}}}{\binom{n}{n_{+1}}}$ ,  $\binom{a}{b} = a!/[b!(a-b)!]$

Poisson  $E(Y) = \mu$ ,  $Var(Y) = \mu$

odds =  $\pi/(1-\pi)$ ,  $\pi = \text{odds}/(1 + \text{odds})$ , relative risk =  $\pi_1/\pi_2$

odds ratio  $\theta = \frac{\pi_1/(1-\pi_1)}{\pi_2/(1-\pi_2)}$ ,  $\hat{\theta} = \frac{n_{11}n_{22}}{n_{12}n_{21}}$

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

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

$$G^2 = 2 \sum n_{ij} \log \left( \frac{n_{ij}}{\hat{\mu}_{ij}} \right), \quad df = (I-1)(J-1)$$

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

GLMs for binary data  $\pi = \alpha + \beta x$ ,  $\log[\pi/(1-\pi)] = \alpha + \beta x$

Poisson loglinear model for counts  $\log(\mu) = \alpha + \beta x$ ,

Inference Wald  $z = \hat{\beta}/SE$ , CI:  $\hat{\beta} \pm z_{\alpha/2}(SE)$ , LR statistic =  $-2(L_0 - L_1)$