

$$Y_i \sim \text{Poi}(\mu_i) \quad P(Y_i = y_i) = \frac{e^{-\mu_i} \mu_i^{y_i}}{y_i!}$$

$$E(Y_i) = \mu_i$$

$$\text{Var}(Y_i) = \mu_i$$

$$\text{Var}(Y_i) \neq \mu_i = E(Y_i)$$

$$\text{Var}(Y_i) = \phi_i \mu_i$$

(1) $\phi_i > 1$ over-dispersion ✓
dispersion parameter

(2) $\phi_i < 1$ under-dispersion

(3) $\phi_i = 1$ no dispersion. You are lucky!!