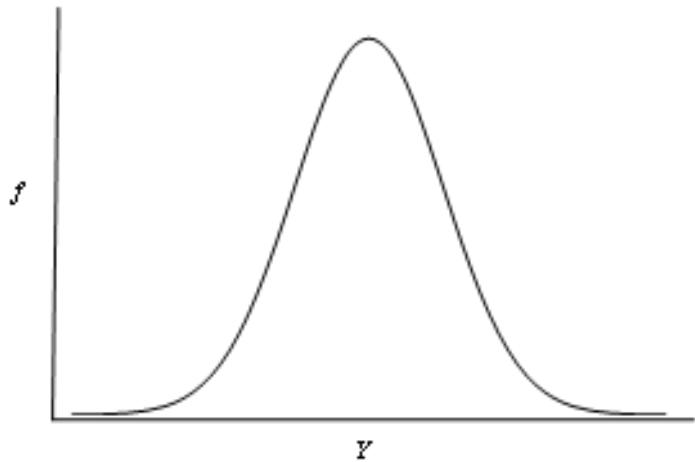


Some Members of the Exponential Family of Distributions

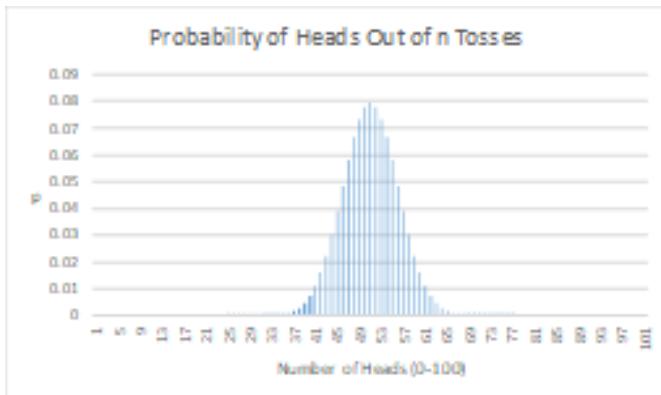
Normal (Gaussian) Distribution



$$f(y) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(y-\mu)^2/2\sigma^2}$$

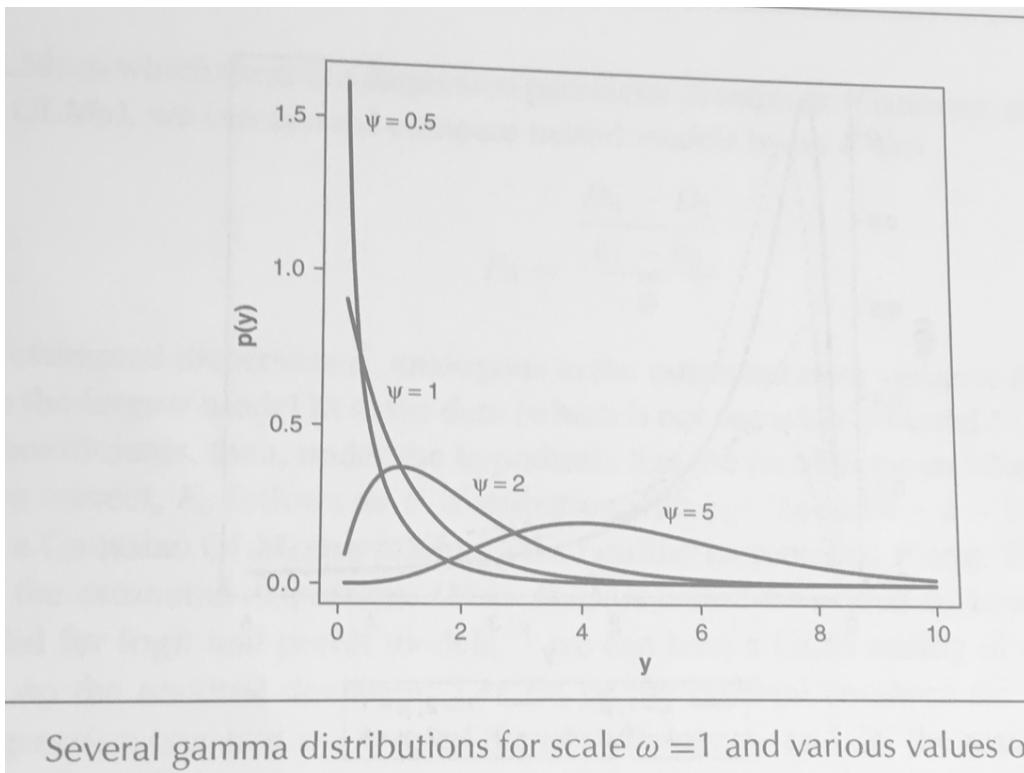
Myers, J.L., & Well, A.D., & Lorch, R.F., Jr. (2010). *Research design and statistical analysis (3rd Edition)*. Mahwah, NJ: Erlbaum

Binomial Distribution



$$P(Y = k; n, \pi) = \binom{n}{k} \pi^k (1 - \pi)^{n-k}$$

Gamma Distribution



Several gamma distributions for scale $\omega = 1$ and various values of parameter ψ .

Fox, J. (2008). *Applied regression analysis and generalized linear models, second edition*. Sage. P. 385

Gamma distribution equation for scale parameter ω and shaper parameter ψ :

$$p(y) = \left[\left(\frac{y}{\omega} \right)^{\psi-1} \right] \left[\frac{\exp\left(\frac{-y}{\omega}\right)}{\omega \Gamma(\psi)} \right] \quad \text{for } y > 0,$$

where $\Gamma(x) = \int_0^\infty e^{-z} z^{x-1} dx$

Poisson Distribution

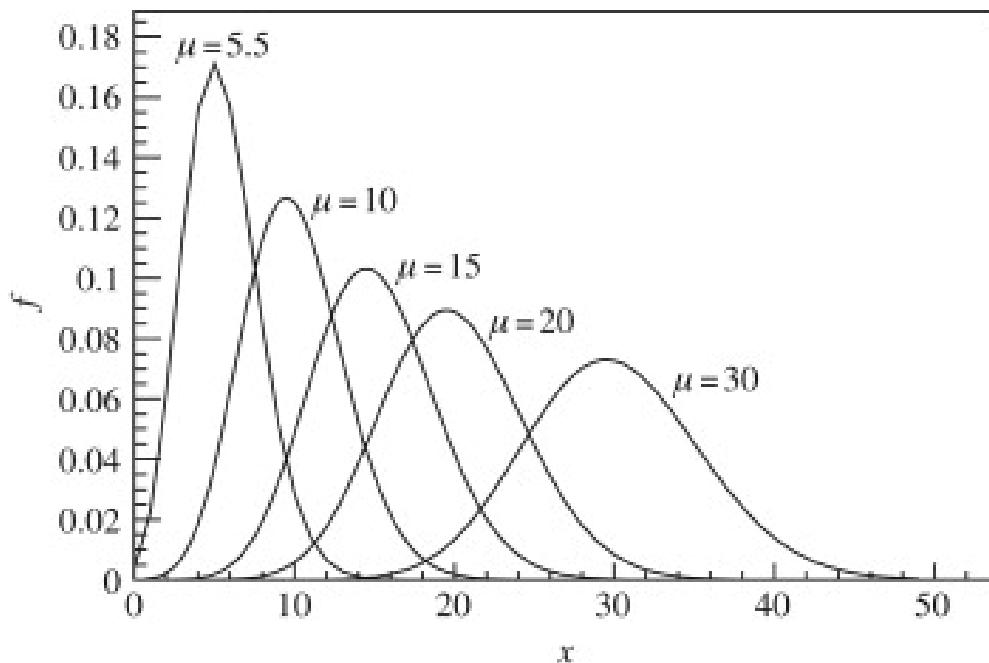


Figure 9.3.3. Poisson probability density for different values of μ . The width of the distribution, which is a reflection of the uncertainty in measurements, increases with increase in μ .

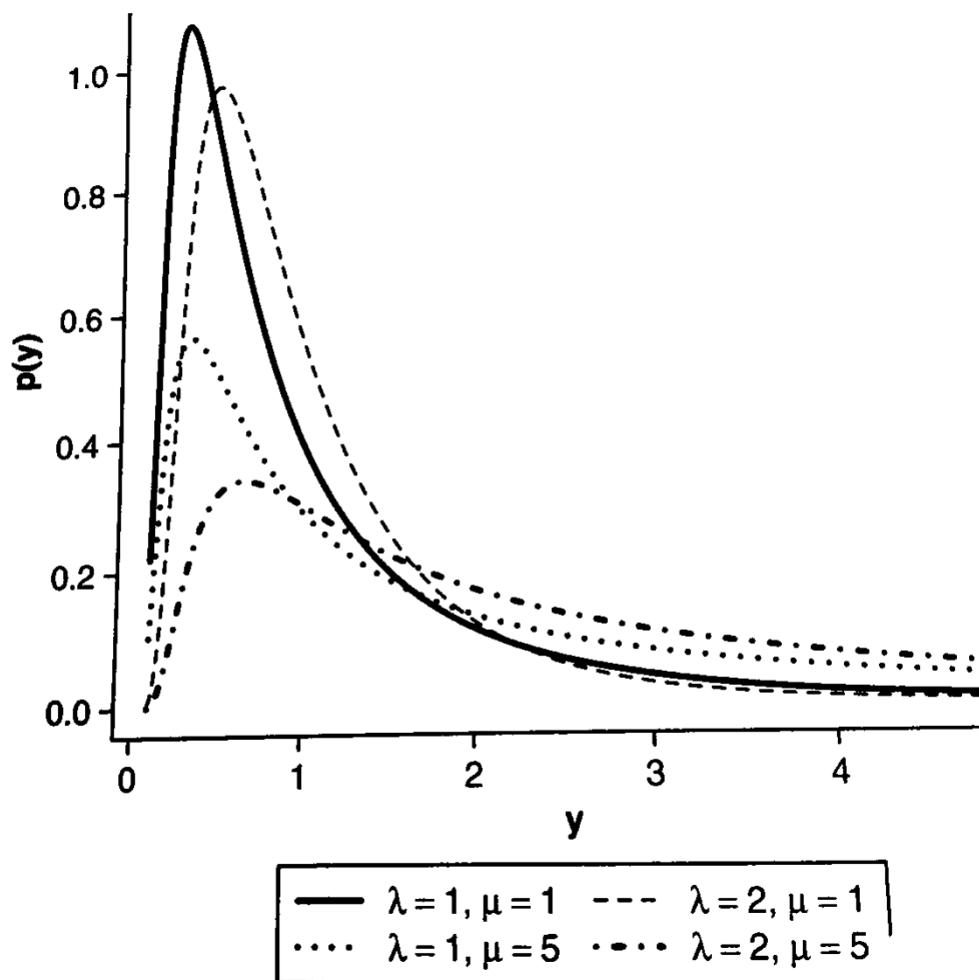
<https://www.sciencedirect.com/topics/mathematics/poisson-distribution>

Poisson distribution equation:

$$p(y) = \left(\mu^y \right) \left(\frac{e^{-\mu}}{y!} \right) \quad \text{for } y = 0, 1, 2, \dots$$

where μ is the rate parameter

Inverse Gaussian



Fox, J. (2008). *Applied regression analysis and generalized linear models*, second edition. Sage. P. 386

$$p(y) = \sqrt{\frac{\lambda}{2\pi y^3}} \exp\left[-\frac{\lambda(y-\mu)^2}{2y\mu^2}\right] \quad \text{for } y > 0,$$

where λ is the inverse of the dispersion parameter