Noncentral beta distribution (from http://www.math.wm.edu/~leemis/chart/UDR/UDR.html) The shorthand $X \sim$ noncentral beta(β, γ, δ) is used to indicate that the random variable X has the noncentral beta distribution with positive parameters β, γ, and positive noncentrality parameter δ. A noncentral beta random variable X with parameters β, γ, δ has probability density function

$$f(x) = \sum_{i=0}^{\infty} \frac{\Gamma(i+\beta+\gamma)}{\Gamma(\gamma)\Gamma(i+\beta)} \left(\frac{e^{-\delta/2}}{i!}\right) \left(\frac{\delta}{2}\right)^i x^{i+\beta-1}(1-x)^{\gamma-1} \qquad 0 < x < 1,$$

for all $\beta > 0$, $\gamma > 0$, $\delta > 0$.

The cumulative distribution, survivor, hazard, cumulative hazard, inverse distribution, moment generating, and characteristic functions on the support of X are mathematically intractable.

The population mean, variance, skewness, and kurtosis of X are mathematically intractable.