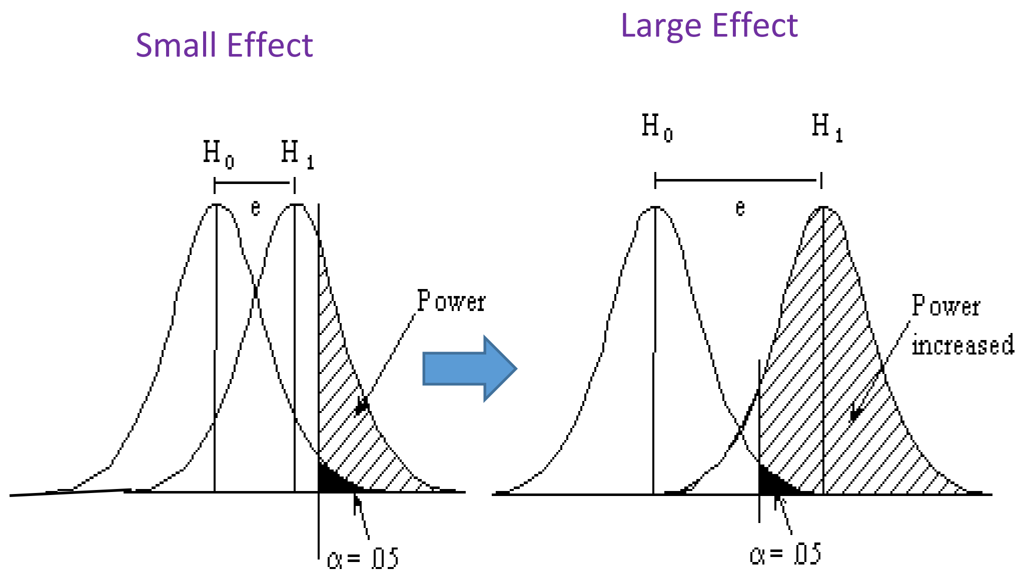
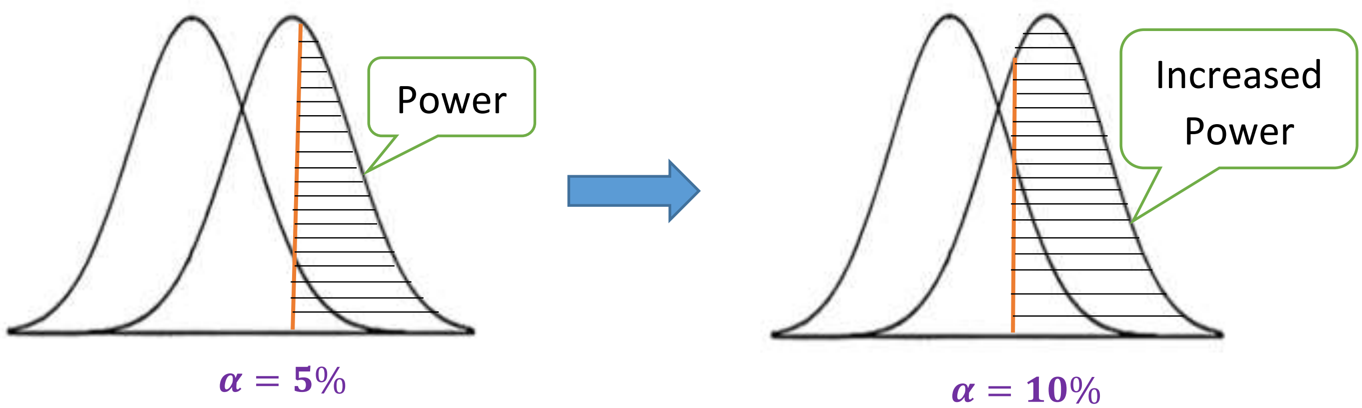


Effect Size Vs Power of Test



Increase in α Vs Power of Test

$\boldsymbol{E(\bar{x}) = \mu_0}$ **under** $\boldsymbol{H_0: \mu = \mu_0}$**.**

Since $x_i \cap N(\mu, \sigma^2)$,

$$E(\bar{x}) = E\left(\frac{1}{n}\sum x_i\right) = \frac{1}{n}\sum E(x_i)$$

$$= \frac{1}{n} \times n\mu = \mu$$

Page 21 (TOH) :

* M.L.E. of σ_0^2 under H_0

$$\ln L = -\frac{n}{2}\ln(2\pi) - \frac{n}{2}\ln(\sigma_0^2) - \frac{1}{2\sigma_0^2}\sum(x_i-\mu_0)^2$$

$$\left.\frac{\partial \ln L}{\partial \sigma_0^2}\right|_{\sigma_0^2=\hat{\sigma}_0^2} = -\frac{n}{2\hat{\sigma}_0^2} + \frac{1}{2\hat{\sigma}_0^4}\sum(x_i-\mu_0)^2 = 0$$

$$\Rightarrow \frac{1}{\hat{\sigma}_0^2}\sum(x_i-\mu_0)^2 = n \quad [\because 2\hat{\sigma}_0^2 \neq 0]$$

$$\Rightarrow \underline{\underline{\hat{\sigma}_0^2 = \frac{1}{n}\sum(x_i-\mu_0)^2}}$$

Page 22 (TOH) :

* M.L.E of μ & σ^2 under H_1

$$L' = \ln L = -\frac{n}{2}\ln(2\pi) - \frac{n}{2}\ln(\sigma^2) - \frac{1}{2\sigma^2}\sum(x_i-\mu)^2$$

- $\left.\frac{\partial L'}{\partial \mu}\right|_{\mu=\hat{\mu}} = 0$

$$\Rightarrow -\frac{1}{2\sigma^2}\times 2\sum(x_i-\hat{\mu})(-1) = 0$$

$$\Rightarrow \sum(x_i-\hat{\mu}) = 0 \qquad \Rightarrow \underline{\underline{\hat{\mu} = \frac{1}{n}\sum x_i = \bar{x}}}$$

- $\left.\frac{\partial L'}{\partial \sigma^2}\right|_{\sigma^2=\hat{\sigma}^2} = 0$

$$\Rightarrow -\frac{n}{2\hat{\sigma}^2} + \frac{1}{2\hat{\sigma}^4}\sum(x_i-\hat{\mu})^2 = 0$$

$$\Rightarrow \underline{\underline{\hat{\sigma}^2 = \frac{1}{n}\sum(x_i-\bar{x})^2}}$$

Page 65 (TOH)

2×2 contingency χ^2

We have, $\hat{a} = \frac{(a+b)(a+c)}{n}$, $\hat{b} = \frac{(a+b)(b+d)}{n}$

$\hat{c} = \frac{(c+d)(a+c)}{n}$, $\hat{d} = \frac{(c+d)(b+d)}{n}$

$\Sigma \frac{O_i^2}{E_i} - n$ gives

$$\frac{na^2}{(a+b)(a+c)} + \frac{nb^2}{(a+b)(b+d)} + \frac{nc^2}{(c+d)(a+c)} + \frac{nd^2}{(c+d)(b+d)} - n$$

$$= n\left[\frac{a^2(b+d)(c+d) + b^2(a+c)(c+d) + c^2(a+b)(b+d) + d^2(a+b)(a+c) - (a+b)(a+c)(b+d)(c+d)}{(a+b)(a+c)(b+d)(c+d)}\right]$$

On simplification, we will get the required expression.