

BETA & POWER

Tom Malloy
Psychology 3000

DECISION MATRIX:

Vaccine example

H_0

H_1

Type 1 error

Type 2 error

	H_0 True		OR		H_0 Not True	
Reject H_0			☰			
Do not Reject H_0			☷			

Alpha =

Beta =

Power =

Must assume a specific H_1

To calculate alpha and set critical values we assumed H_0 is true

H_0 True OR H_0 Not True

Reject H_0		≡	
Do not Reject H_0		≡	

In contrast

To calculate beta and power

Assume that H_0 is NOT true and H_1 has a specific value

H_0 True OR H_1 True

Reject H_0		≡	
Do not Reject H_0		≡	

To calculate β and power ($1 - \beta$) you have to assume that you know a specific **hypothetical value of H_1**

Generally we don't know....

For example if we assume $H_1: p = .2$

This means we think that people given the vaccine will have a

P(catching cold given vaccine) =

This would be hard to know in actuality

Finding Beta

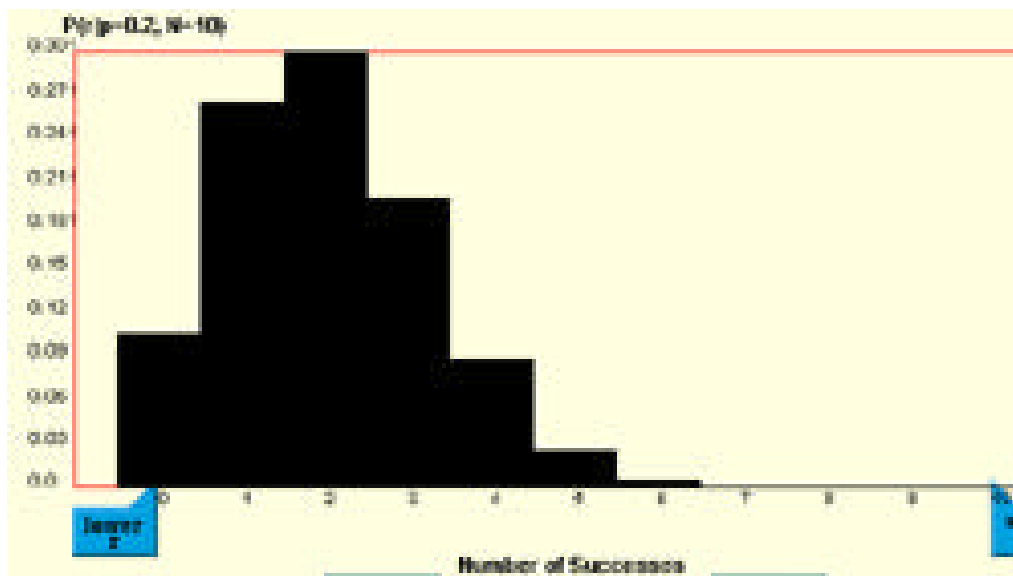
1) Assume a specific H1 is true

$$H_1: P(C) =$$

2) Keep the Critical Values of the TS exactly the same

3) Use the binomial to find the sampling distribution, but with a new parameter value

$$\text{Binomial: } N = 10, p =$$



Probability Distribution Assuming H_1 is TRUE

(Put the same critical values on this new sampling distribution)

If H_1 is true, then $P(\text{Head}) = .2$
and we have sampled 10 tries, so...

Binomial Table or StatCenter Binomial Tool gives us:

P(r given p = .2, N = 10)

$$P(0 C) = .1074$$

$$P(1 C) = .2684$$

$$P(2 C) = .3020$$

$$P(3 C) = .2013$$

$$P(4 C) = .0881$$

$$P(5 C) = .0264$$

$$P(6 C) = .0055$$

$$P(7 C) = .0008$$

$$P(8 C) = .0001$$

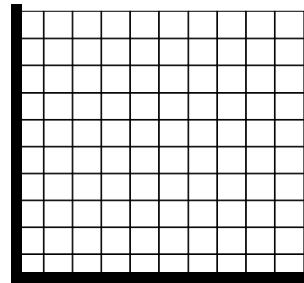
$$P(9 C) = .0000$$

$$P(10 C) = .0000$$

If the **critical value** has been set **between 2 and 3**
AND

If $H_1: p = .2$ is TRUE

Then



Define β :

What is the value of β

H_0 True **OR** H_1 True

XXXXX	===	
XXXXX	===	

Find Power

Define Power ($1 - \beta$)

What is the value of $1 - \beta$

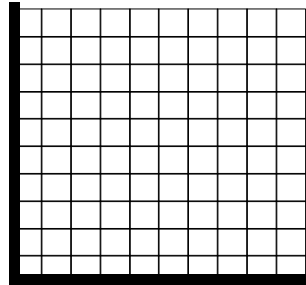
If H_1 is true

If the **critical value** has been set **between 2 and 3**

AND

If $H_1: p = .2$ is TRUE

Then



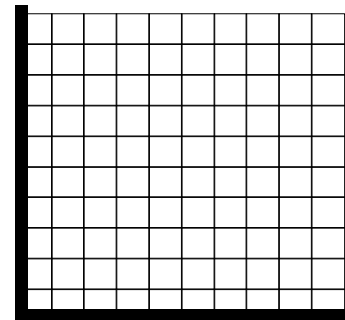
What is the value of $1 - \beta$

If the **critical value** has been set **between 1 and 2**

AND

If $H_1: p = .2$ is TRUE

Then



What is the value of $1 - \beta$

Ho and H1 distributions together

