

Degrees of Freedom

Psychology 3000

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REVIEW:

Scientific hypothesis: The effects found in the study are due to...

Scientific skepticism: There are no effects ...

Healthy skepticism produces hypotheses that compete with the scientific hypothesis (PCH's). These are other ways of interpreting the results of research

CHANCE--A universal Plausible Competing Hypothesis (PCH)

PCH OF CHANCE: The pattern of results is due to

Statistical Conclusion Validity is the strength of our argument that the pattern of results in the experiment was not due to chance.

Note: Just because we eliminate Chance as a PCH does not mean we have eliminated other PCH's....

A two-group study compared a Pill versus a no-treatment control. A t-test demonstrated that the lower average Blood Pressure in the Pill group was unlikely to be due to chance. Eliminating the PCH of chance (i.e., saying there is statistical conclusion validity) doesn't eliminate other PCH's such as the Placebo effect.

OPTIONAL REVIEW: SET CRITICAL VALUES**HOW DO WE SET THE CRITICAL VALUES THAT DEFINE THESE REGIONS?****Assume H_0 is true**Prob (cold) = $1/2$like a fair coinThen Use **Binomial Distribution** to find Probabilities $r = \#$ of colds (successes) $N = 10$, the number of $p = \text{Prob}(\text{success}) = P(\text{Cold}) =$

Review:

How can we use the binomial to find the Prob distribution of our TS?

Definition of alpha:

If H_0 is true,

the $P(\text{Cold}) = .5$, (and a Cold is defined as a “success,” r)
and we have sampled 10 tries, then...

Binomial Table or StatCenter Binomial Tool gives us:

$P(r \text{ given } p = .5, N = 10)$

$$P(0 \text{ C}) = .0010$$

$$P(1 \text{ C}) = .0098$$

$$P(2 \text{ C}) = .0439$$

$$P(3 \text{ C}) = .1172$$

$$P(4 \text{ C}) = .2051$$

$$P(5 \text{ C}) = .2461$$

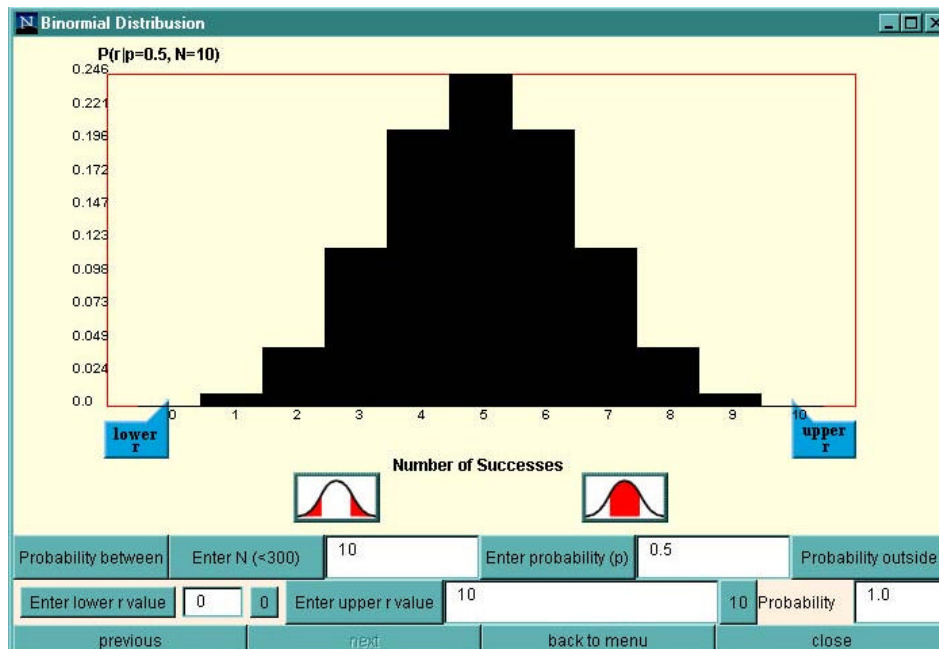
$$P(6 \text{ C}) = .2051$$

$$P(7 \text{ C}) = .1172$$

$$P(8 \text{ C}) = .0439$$

$$P(9 \text{ C}) = .0098$$

$$P(10 \text{ C}) = .0010$$

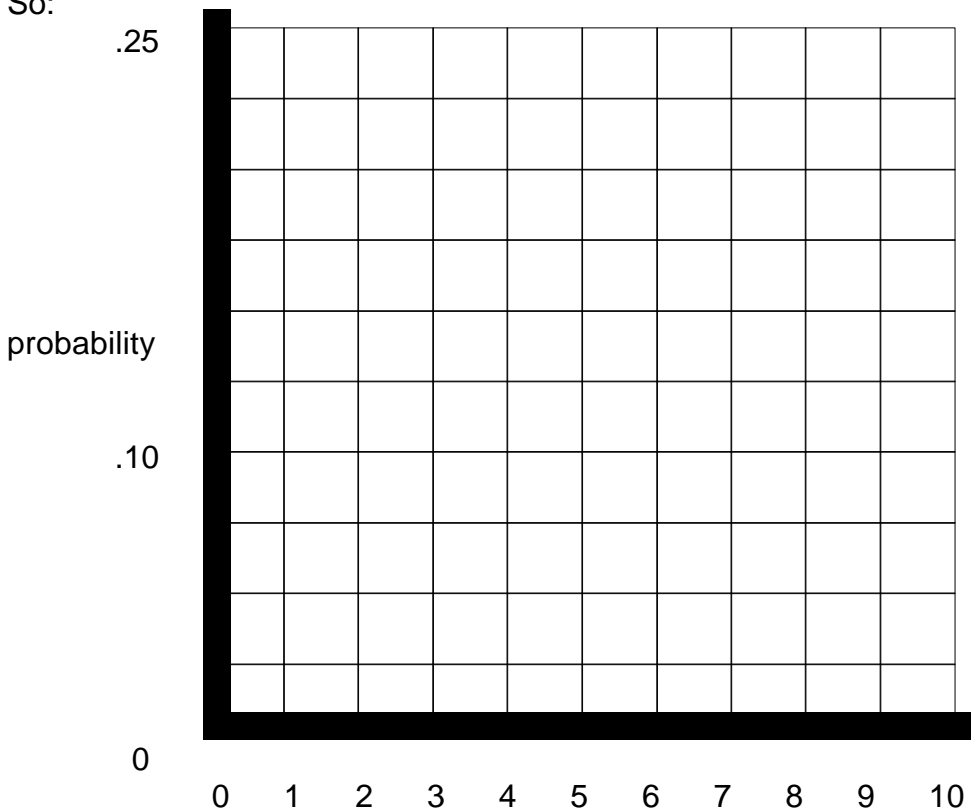


Probability Distribution Assuming H_0 is TRUE

What is alpha if we set the Critical Value at:

Critical Value set between 2 and 3:

So:



TS = Number of Colds
 Prob Dist of TS given that H_0 is TRUE

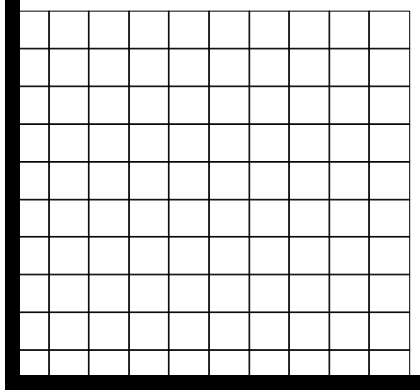
Given H_0 is true

What is alpha?

That is, what is the probability of falling in the rejection region by chance alone?

[This assumes Skeptic is right: Vaccine has NO EFFECT
 Volunteers are getting a chance number of colds]

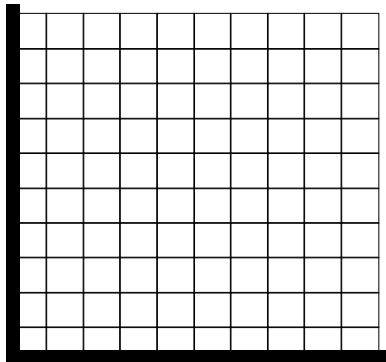
Set critical value between 1 and 2:



Given H_0 is true

What is alpha?

Set



the critical value between 0 and 1:

Given H_0 is true

What is alpha?

Summary Comments

Define alpha

To calculate alpha

Assume that

Then construct...

Alpha depends on

Where you set...

The details of the

STATISTICAL CONCLUSION VALIDITY

If alpha is small ($<.05$ or $,.01$, or $,.001$) that means that the probability of getting a value of the TS in the rejection region is very small

Therefore we argue that the prob of getting these results by...

p value is essentially the same as alpha.

p value is set after the test statistic is calculated:

Use the tables to find the smallest alpha-level (p-value) which you can report

Usually reported something like, “The association between gender and job status was significant, $\chi^2 = 17.62$, $df = 6$, $p < .01$.” Such a sentence means we calculated our test statistic (Chi Square, χ^2) and looked in the chi square tables to find that the smallest alpha level we could report was .01.

Effects of Degrees of Freedom (n) on Sampling Distributions

Vaccine Example for $n = 10$ in our sample

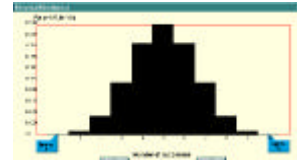
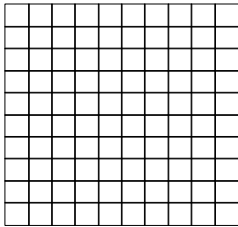
DV = $X =$

TS =

$H_0:$

4 Step Summary for $n = 10$

- 1 ASSUME H_0 TRUE
Population



4 Sampling Distribution of TS

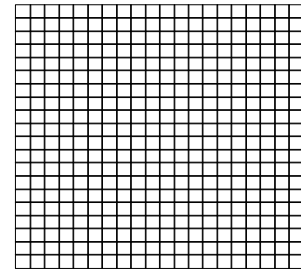
- 2 Sampling Procedure
Random Sample
3 Test Statistic =
n =

What happens if we change n to 20?

Now we use Binomial with...

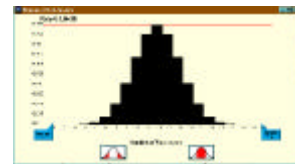
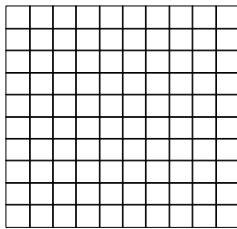
For $\alpha =$

Set Critical value of TS at...



4 Step Summary For n = 20:

Assume H_0 is true
Population



4 Sampling Distribution

2 Sampling Procedure
Random Sample

3 Test Statistic =

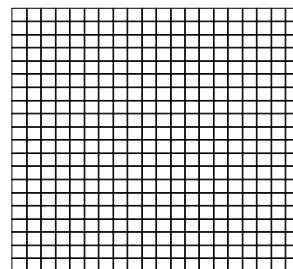
n =

What happens if we change n to 30?

Now we use Binomial with...

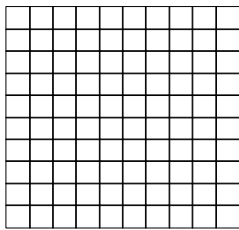
For $\alpha =$

Set Critical value of TS at...



4-Step Summary for $n = 30$

1 ASSUME H_0 TRUE
Population



4 Sampling Distribution of TS

2 Sampling Procedure
Random Sample
 $n =$

3 Test Statistic =

Summary comments on Sampling Distributions

Assume H_0

Population

n observation in random sample

Create Formula of Test Statistic
Calculate Degrees of Freedom

df depends on n

Find SD of...

Choose α and..