TOPIC: CHI-SQUARE HOMOGENEITY TEST
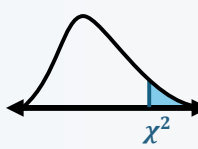
Homogeneity Test

◆ Two or more populations are **Homogeneous** if they have the same _____ of some characteristic.

▶ **Homogenity Tests** use the *same* steps & math as independence tests with *different* hypotheses & conclusions.

EXAMPLE

Test if the proportion of car ownership is the same for the different age groups, using a test statistic $\chi^2 = 50$, and $\alpha = 0.05$.

| Recall | **Independence Test** | New | **Homogeneity Test** |

Independence Test

"Does age group affect car ownership?"

Variable 1

Variable 1

Car Ownership

	Age Group		
	Teens	Adults	Tot.
Owns car	$O = 10$ $E = 30$	$O = 80$ $E = 60$	90
Does not own car	$O = 40$ $E = 20$	$O = 20$ $E = 40$	60
Tot.	50	100	150

Homogeneity Test

"When it comes to car ownership, is the proportion for teens the same as adults?"

Characteristic   **Populations**

Car Ownership

	Age Group		
	Teens	Adults	Tot.
Owns car	$O = 10$ $E = 30$	$O = 80$ $E = 60$	90
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1) Hypothesis

H_0: Variables are independent.

H_a: Variables are dependent.

H_0: All proportions of _____ are
        the SAME for all _____.
              (characteristic) ... *(populations)*

H_a: At least 1 proportion is _____ for the pop's.

2) Test Stat

$$\chi^2 = \sum \frac{(O-E)^2}{E} =$$

$$E = \frac{row\ total \cdot col\ total}{Grand\ Total}$$

O = observed freq.
E = expected freq.

3) P-value

$$df = (r-1)(c-1)$$

$$df = \_\_$$

x^2

P-value = Area "beyond" χ^2

P-value = _____

4) Conclusion

Because P-value **[< | >]** α,

we **[REJECT | FAIL TO REJECT]** H_0.

There is **[ENOUGH | NOT ENOUGH]** evidence

that car ownership is *dependent* on age group.

Because P-value **[< | >]** α,

we **[REJECT | FAIL TO REJECT]** H_0.

There is **[ENOUGH | NOT ENOUGH]** evidence that the

proportion of car ownership is different for 2 pop's.

Criteria

Random Samples?   ☐

Observed freq. for each category?   ☐

$E \geq 5$ for each category?   ☐

TOPIC: CHI-SQUARE HOMOGENEITY TEST

EXAMPLE

A pharmecutical company is testing the effectiveness of a new ADHD medication. At the 0.05 level of significance, test whether there is a difference in the distribution of symptom improvement between the placebo group and the group that received the new drug.

Random Samples? ☐

Observed freq. for each category? ☐

$E \geq 5$ for each category? ☐

H_0:

H_a:

$\chi^2 =$

$r = \#rows =$ ___ $c = \#col's =$ ___ $df =$ _____ $=$ ___

P-value = _____

Because P-value **[< | >]** α, we **[REJECT | FAIL TO REJECT]** H_0.

There is **[ENOUGH | NOT ENOUGH]** evidence that there is a difference in proportion of symptom improvement between the placebo group and the group that received the new drug.

	Group		
Symptoms	Placebo	Non-Placebo	Total
Improved	18	37	55
Not Improved	30	15	45
Total	48	52	100

Recall

$$E = \frac{row\ total \cdot col\ total}{Grand\ Total}$$

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

$$df = (r - 1)(c - 1)$$

(Homogeneity Test)