**Chapter 19: Chi-Square**

Section Meeting Notes: 12/3/14

**(1) Why use Chi-square?**

🡪 It can be used with data that has been measured on a nominal/categorical scale.

🡪 It can also be used to see if there is a “difference” between two or more groups of participants.

🡪 Chi-square is that it is easier to compute than some statistics.

🡪 Chi-square makes no assumptions about the distribution of the population. Other statistics assume certain characteristics about the distribution of the population such as normality.

 **(2) Important Definitions**

Chi-square test: a statistical test often used for nominal/categorical data

Categorical variable: a variable that represents counts for the number of observations falling into each of several categories

Independent observations: observations in which the result for one measurement does not have any effect on the next measurement

Observed frequencies: the frequencies you observe in the data that is collected

Expected frequencies: the expected value for the number of observations in a cell if the null hypothesis (H0) is true

Contingency table: a two-dimensional table in which each observation is classified on the basis of two variables simultaneously

Marginal total: totals for the levels of one variable summed across the levels of the other variable

**In-Class Example**

(1) Data obtained from Levin & Isen (1975)



(2) Fill in the table with the **observed frequencies/values** for the Unstamped Letter Condition. Then, calculate the marginal totals for each column and each row.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mailed Letter | Left Letter | **Marginal Total** |
| Found Dime | 7 | 1 | 8 |
| Did Not Find Dime | 1 | 9 | 10 |
| **Marginal Total** | **8** | **10** |  |

(3) Calculate the **expected frequency/value** that a participant found the dime and left the letter.

A. Calculate the probability of the event based on the observed data

*P* [found dime, left letter] = *P* [found dime] \* *P* [left letter]

*P* [found dime, left letter] = *P* [] \* *P* []

*P* [found dime, left letter] = 2.469

B. Calculate the expected frequency for that cell

 *E* = *P* \* N

 *E* = (2.469) \* 18

 *E* = 4.44

(4) Fill in the **expected frequency/value** in the appropriate cell in the table below. Then, solve for the expected value for the remaining cells using the marginal totals.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mailed Letter | Left Letter | **Marginal Total** |
| Found Dime | 3.56 | 4.44 | 8 |
| Did Not Find Dime | 4.44 | 5.56 | 10 |
| **Marginal Total** | **8** | **10** |  |

(5) Calculate the chi-square statistic (

Cell 1: = 3.32

Cell 2: = 2.66

Cell 3: = 2.66

Cell 4: = 2.13

(6) Find the critical value. Chi-square Distribution Table can be found in textbook (pg. 585).

 A. Need alpha

α = .05

B. Need degrees of freedom

d.f. = (# of categories) - 1

 d.f. = (2) - 1

 d.f. = 1

critical value = 3.84

(7) Compare the (10.77) value to the critical value (3.84).

🡪 The calculated value is greater than the critical value. If is greater than the critical value, you reject the null hypothesis.

**Try on your own**

(1) Data obtained from Levin & Isen (1975)



(2) Fill in the table with the **observed frequencies/values** for the Stamped Letter Condition. Then, calculate the marginal totals for each column and each row.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mailed Letter | Left Letter | **Marginal Total** |
| Found Dime |  |  |  |
| Did Not Find Dime |  |  |  |
| **Marginal Total** |  |  |  |

(3) Calculate the **expected frequency/value** that a participant found the dime and left the letter.

A. Calculate the probability of the event based on the observed data

*P* [found dime, left letter] = *P* [found dime] \* *P* [left letter]

*P = \_\_\_\_\_\_\_\_\_*

B. Calculate the expected frequency for that cell

 *E* = *P* \* N

*E* = *­­­­­\_\_\_\_\_\_\_\_\_*

(4) Fill in the **expected frequency/value** in the appropriate cell in the table below for the Stamped Letter condition. Then, solve for the expected value for the remaining cells using the marginal totals.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mailed Letter | Left Letter | **Marginal Total** |
| Found Dime |  |  |  |
| Did Not Find Dime |  |  |  |
| **Marginal Total** |  |  |  |

(5) Calculate the chi-square statistic (

Cell 1:

Cell 2:

Cell 3:

Cell 4:

 \_\_\_\_\_\_\_

(6) Find the critical value. Chi-square Distribution Table can be found in textbook (pg. 585).

 A. Need alpha

α = .05

B. Need degrees of freedom

d.f. = (# of categories) - 1

d.f. = \_\_\_\_\_\_\_

critical value = \_\_\_\_\_\_

(7) Compare the value to the critical value, and conclude.