Test Bank

# Chapter 14: Goodness-of-Fit and Independence Chi-Square Statistics

## Multiple Choice

1. When determining if there is an association between two nominal variables you should use which of the following statistics?

A. Pearson’s correlation

B. Spearman’s correlation

C. goodness-of-fit χ2

D. independence χ2

Ans: D

Learning Objective: Choosing the correct chi square

2. When determining if the number of cases in specific categories of a single variable matches what was is expected you should use which of the following statistics?

A. Pearson’s correlation

B. Spearman’s correlation

C. goodness-of-fit χ2

D. independence χ2

Ans: C

Learning Objective: Choosing the correct chi square

3. A diner owner argues that his coffee is every bit as good as the more expensive coffee shops in town and wants to advertise his coffee as the “best in town.” To determine if his coffee is really the best, he conducts a blind taste test with his coffee against coffee from two expensive coffee shops in town. Each participant tasted all three coffees and reported which one they liked best. The data below are the number of people who liked each type of coffee the best. Were the choices equally split among the three different coffees? Compute the expected frequency for each cell.

|  |  |  |
| --- | --- | --- |
| Diner Coffee | Coffee Shop A | Coffee Shop B |
| 18 | 7 | 23 |

A. 16, 16, 16

B. 17, 10, 14

C. 18, 18, 18

D. 14, 10, 24

Ans: A

Learning Objective: Computing expected frequencies

4. A diner owner argues that his coffee is every bit as good as the more expensive coffee shops in town and wants to advertise his coffee as the “best in town.” To determine if his coffee is really the best, he conducts a blind taste test with his coffee against coffee from two expensive coffee shops in town. Each participant tasted all three coffees and reported which one they liked best. The data below are the number of people who liked each type of coffee the best. Were the choices equally split among the three different coffees? Based on the expected frequencies for each cell in this analysis can the study continue or does the χ2 statistic require that more data be collected?

|  |  |  |
| --- | --- | --- |
| Diner Coffee | Coffee Shop A | Coffee Shop B |
| 18 | 7 | 23 |

A. The χ2 requires that more data be collected before this data can be analyzed.

B. While more data are generally a good thing, these data do meet the minimum standard for χ2.

C. You really have to compute the χ2 statistic first, then you can determine if you need a better sample.

Ans: B

Learning Objective: Chi square expected frequency assumption

5. A diner owner argues that his coffee is every bit as good as the more expensive coffee shops in town and wants to advertise his coffee as the “best in town.” To determine if his coffee is really the best, he conducts a blind taste test with his coffee against coffee from two expensive coffee shops in town. Each participant tasted all three coffees and reported which one they liked best. The data below are the number of people who liked each type of coffee the best. Were the choices equally split among the three different coffees? What is the critical value for this study? Use α = .05.

|  |  |  |
| --- | --- | --- |
| Diner Coffee | Coffee Shop A | Coffee Shop B |
| 18 | 7 | 23 |

A. 3.841

B. 5.991

C. 6.35

D. 9.210

Ans: B

Learning Objective: Locating critical region

6. A diner owner argues that his coffee is every bit as good as the more expensive coffee shops in town and wants to advertise his coffee as the “best in town.” To determine if his coffee is really the best, he conducts a blind taste test with his coffee against coffee from two expensive coffee shops in town. Each participant tasted all three coffees and reported which one they liked best. The data below are the number of people who liked each type of coffee the best. Were the choices equally split among the three different coffees? Use α = .05.

Compute the obtained χ2 value for these data.

|  |  |  |
| --- | --- | --- |
| Diner Coffee | Coffee Shop A | Coffee Shop B |
| 18 | 7 | 23 |

A. 8.38

B. 12.23

C. 10.73

D. 9.87

Ans: A

Learning Objective: Computing goodness-of-fit chi square

7. Should you reject or fail to reject the null hypothesis that all three coffee shops have equally good coffee?

|  |  |  |
| --- | --- | --- |
| Diner Coffee | Coffee Shop A | Coffee Shop B |
| 18 | 7 | 23 |

A. reject

B. fail to reject

Ans: A

Learning Objective: Interpreting chi square obtained value

8. A diner owner argues that his coffee is every bit as good as the more expensive coffee shops in town and wants to advertise his coffee as the “best in town.” To determine if his coffee is really the best, he conducts a blind taste test with his coffee against coffee from two expensive coffee shops in town. Each participant tasted all three coffees and reported which one they liked best. The data below are the number of people who liked each type of coffee the best. Were the choices equally split among the three different coffees? Use α = .05. Which of the following summaries best describes the results of the *chi square analysis*?

|  |  |  |
| --- | --- | --- |
| Diner Coffee | Coffee Shop A | Coffee Shop B |
| 18 | 7 | 23 |

A. The coffee from the dinner and the two other coffee shopes were found to be equally good (i.e., not significantly different).

B. Coffee shop B had the best coffee.

C. The Diner and Coffee Shop B had a few more “best” votes than would be expected by chance. Coffee Shop A had a lot fewer best votes than was expected by chance.

D. Coffee shop B hd the best coffee, the diner had the second best coffee, and Coffee Shop A had the worst coffee.

Ans: C

Learning Objective: Interpreting chi square analysis

9. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. Which χ2 should be used to test this null hypothesis?

A. goodness-of-fit χ2

B. independence χ2

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

Ans: B

Learning Objective: Choosing correct chi-square test

10. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. What is the critical region for this χ2 test? Use α = .05.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

A. 3.841

B. 5.991

C. 6.635

D. 9.210

Ans: A

Learning Objective: Critical value for chi-square for independence

11. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. Are all of the expected frequencies sufficiently large to compute the χ2 test?

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

A. yes

B. no

Ans: A

Learning Objective: Assessing assumptions of chi-square for independence

12. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. Compute the obtained χ2 for these data.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

A. 0.02

B. 0.335

C. 1.67

D. 5.36

E. 4.05

F. 4.99

Ans: A

Learning Objective: Computing chi-square for independence

13. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. After you compute the obtained χ2 for these data, determine if there is sufficient evidence to reject the null hypothesis?

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

A. Yes, there is sufficient evidence to reject the null.

B. No, there is no sufficient evidence to reject the null.

Ans: A

Learning Objective: Rejecting null for chi-square for independence

14. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. After you compute the obtained chi square for these data, compute the effect size for these data.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

A. 0.02

B. 0.335

C. 1.67

D. 5.36

E. 4.05

F. 4.99

Ans: A

Learning Objective: Computing effect size for chi-square for independence

15. As a class project, a group of students performed an observation study. The students waited at a busy intersection and recorded the gender of each driver they saw and whether or not that driver was currently using a cell phone while they were driving. Some of the students thought that males were more likely to use cell phones than females while others in the group thought that the opposite was true. Use the data they collected below to test the null hypothesis that there is no association between gender and cell phone use while driving. Which of the following statements is the best summary of the chi square analysis?

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Gender | |
| Male | Female |
| Using cell while driving | Yes | 16 | 19 |
| No | 10 | 11 |

A. There was an association between gender and cell phone use. Females used cell phones more than was expected and males used cell phones less than was expected.

B. There was an association between gender and cell phone use. Males used cell phones more than was expected and females used cell phones less than was expected.

C. There was an association between gender and cell phone use.

D. There was NOT an association between gender and cell phone use.

Ans: D

Learning Objective: Summarizing results of chi-square for independence

16. As a class project, a student asked 25 people what type of cell phone they currently used most frequently. She wanted to know if one type of cell phone was more commonly used than any other. Use the data she collected to test the null hypothesis that all of the cell phone types are equally common. Which χ2 should be used to test this null hypothesis?

|  |  |  |
| --- | --- | --- |
| Cell phone types | | |
| Blueberry | U Phone | Trak Phone |
| 10 | 12 | 3 |

A. goodness-of-fit χ2

B. independence χ2

Ans: A

Learning Objective: Choosing correct chi-square

17. As a class project, a student asked 25 people what type of cell phone they currently used most frequently. She wanted to know if one type of cell phone was more commonly used than any other. Use the data she collected to test the null hypothesis that all of the cell phone types are equally common. What is the critical region for this χ2 test?

|  |  |  |
| --- | --- | --- |
| Cell phone types | | |
| Blueberry | U Phone | Trak Phone |
| 10 | 12 | 3 |

A. 3.841

B. 5.991

C. 6.635

D. 9.210

Ans: A

Learning Objective: Critical value for goodness-of-fit chi-square

18. As a class project, a student asked 25 people what type of cell phone they currently used most frequently. She wanted to know if one type of cell phone was more commonly used than any other. Use the data she collected to test the null hypothesis that all of the cell phone types are equally common. Are all of the expected frequencies sufficiently large to compute the chi square test?

|  |  |  |
| --- | --- | --- |
| Cell phone types | | |
| Blueberry | U Phone | Trak Phone |
| 10 | 12 | 3 |

A. Yes

B. No

Ans: A

Learning Objective: Assessing assumptions of goodness-of-fit chi-square

19. As a class project, a student asked 25 people what type of cell phone they currently used most frequently. She wanted to know if one type of cell phone was more commonly used than any other. Use the data she collected to test the null hypothesis that all of the cell phone types are equally common. Compute the obtained chi square for these data.

|  |  |  |
| --- | --- | --- |
| Cell phone types | | |
| Blueberry | U Phone | Trak Phone |
| 10 | 12 | 3 |

A. 0.02

B. 0.335

C. 1.67

D. 5.36

E. 4.05

F. 4.99

Ans: D

Learning Objective: Computing goodness-of-fit chi-square

20. As a class project, a student asked 25 people what type of cell phone they currently used most frequently. She wanted to know if one type of cell phone was more commonly used than any other. Use the data she collected to test the null hypothesis that all of the cell phone types are equally common. Is their sufficient evidence to reject the null hypothesis?

|  |  |  |
| --- | --- | --- |
| Cell phone types | | |
| Blueberry | U Phone | Trak Phone |
| 10 | 12 | 3 |

A. Yes

B. No

Ans: A

Learning Objective: Assessing assumptions of goodness-of-fit chi-square

21. As a class project, a student asked 25 people what type of cell phone they currently used most frequently. She wanted to know if one type of cell phone was more commonly used than any other. Use the data she collected to test the null hypothesis that all of the cell phone types are equally common. Which of the following is the best summary of the results of this study?

|  |  |  |
| --- | --- | --- |
| Cell phone types | | |
| Blueberry | U Phone | Trak Phone |
| 10 | 12 | 3 |

A. The three phones are equally common.

B. The Blueberry and U Phone were more common than expected by chance and the Trak Phone was less common than expected by chance.

C. All three phones were less common than expected by chance.

D. Only the U Phone was more common than would be expected by chance.

Ans: B

Learning Objective: Summarizing results of goodness-of-fit chi square

22. Scenario 14.1. A market researcher wants to know if the three local cable companies are equally liked by consumers. To test this, she creates three ads with exactly the same offer from companies A, B, and C. All three companies offered the same price and the same channels. Ninety-nine participants were asked to read all three ads and then indicate which company they would choose. Twenty-nine chose Company A, 31 chose company B, and 39 chose company C. All participants completed the surveys alone, without discussing it with others in the study. Which assumption does this address?

A. independence

B. homogeneity of variance

C. appropriate measurement of the variables

Ans: A

Learning Objective: Chi square assumptions

23. This question refers to Scenario 14.1. If you were to enter these data into SPSS, how many columns of data would you have?

A. 1

B. 2

C. 3

D. 4

Ans: A

Learning Objective: Chi square goodness-of-fit SPSS

24. This question refers to Scenario 14.1. Which χ2 test is appropriate for these data?

A. goodness of fit

B. independence

Ans: A

Learning Objective: Choose correct chi square statistic

25. This question refers to Scenario 14.1. What is the expected frequency in each cell if the null hypothesis is true and the local companies are equally liked?

A. 0

B. 25

C. 33.3

D. 27.3

Ans: C

Learning Objective: Chi square expected frequencies

26. This question refers to Scenario 14.1. What is the minimum expected frequency for each cell that is acceptable in order to meet the assumptions of the χ2 test?

A. 1

B. 5

C. 10

D. 30

Ans: B

Learning Objective: Chi square assumptions

27. This question refers to Scenario 14.1. Compute the degrees of freedom for this test.

A. 1  
B. 2

C. 3

Ans: B

Learning Objective: Chi square degrees of freedom

28. This question refers to Scenario 14.1. Find the critical value using an α of .05.

A. 3.841

B. 5.991

C. 7.815

D. 9.488

Ans: B

Learning Objective: Chi square critical value

29. This question refers to Scenario 14.1. Compute the goodness-of-fit χ2.

A. 1.52

B. 1.61

C. 1.70

D. 1.89

Ans: C

Learning Objective: Chi square goodness-of-fit computations

30. This question refers to Scenario 14.1. Should you reject or fail to reject the null hypothesis?

A. reject

B. fail to reject

Ans: B

Learning Objective: Chi square goodness-of-fit reject or fail to reject

31. This question refers to Scenario 14.1. Summarize the results of this study using APA style.

Ans: Varies

Learning Objective: Chi square goodness-of-fit summarize the results

32. Scenario 14.2. A market researcher wants to know if the extent to which people like the three local cable companies is related to their past experience with the companies. To test this, she creates three ads with exactly the same offer from companies A, B, and C. All three companies offered the same price and the same channels. Participants were recruited based on their past experience with the three companies, such that there were 50 people with experience with company A, 50 with company B, and 50 with company C. All participants were asked to read all three ads and then indicate which company they would choose. The data are in the table below. Which χ2 test is appropriate for these data?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Choice of Company | | |
|  |  | A | B | C |
| Previous Experience | A | 10 | 18 | 22 |
| B | 20 | 9 | 21 |
| C | 23 | 20 | 7 |

A. goodness of fit

B. independence

Ans: B

Learning Objective: Choose correct chi square statistic

33. This question refers to Scenario 14.2. If you were to enter these data into SPSS, how many columns of data would you have?

A. 1

B. 2

C. 3

D. 4

Ans: B

Learning Objective: Chi square test of independence SPSS

34. This question refers to Scenario 14.2. Compute the degrees of freedom for this test.

A. 1

B. 2

C. 3

Ans: B

Learning Objective: Chi square test of independence degrees of freedom

35. This question refers to Scenario 14.2. Find the critical value using an α of .05.

A. 3.841

B. 5.991

C. 7.815

D. 9.488

Ans: B

Learning Objective: Chi square test of independence critical value

36. This question refers to Scenario 14.2. Compute the χ2 test of independence.

A. 18.07

B. 21.62

C. 13.65

D. 12.84

Ans: A

Learning Objective: Chi square test of independence computations

37. This question refers to Scenario 14.2. Should you reject or fail to reject the null hypothesis?

A. reject

B. fail to reject

Ans: A

Learning Objective: Chi square test of independent reject or fail to reject

38. This question refers to Scenario 14.2. Which measure of effect size should be used for this test of independence?

A. Cramers φ

B. φ coefficient

Learning Objective: Chi square test of independence effect size

39. This question refers to Scenario 14.2. Compute the appropriate effect size for this study.

A. .05

B. .10

C. .20

D. .25

Ans: D

Learning Objective: Chi square test of independence effect size

40. This question refers to Scenario 14.2. How large is the effect size?

A. small

B. small–medium

C. medium

D. medium-large

E. large

Ans: C

Learning Objective: Chi square test of independence effect size

41. This question refers to Scenario 14.2. Summarize the results of this study using APA style.

Ans: Varies

Learning Objective: Chi square test of independent summarize the results