

Unit 5 Outline

Unit 5: Hypothesis Testing

One of the major goals in statistics is to use the information you collect from a sample to get a better idea of the entire population in which you are interested. In this unit, you will learn about hypothesis testing, which will enable you to achieve that goal.

A hypothesis test involves collecting and evaluating data from a sample to make a decision as to whether or not that data supports a claim made about a population. This unit will also teach you how to conduct hypothesis tests and to identify and differentiate between the errors associated with them.

Many times, you need answers to questions in order to make efficient decisions. For example, a restaurant owner might claim that his restaurant's food costs 30% less than other restaurants in the area, or a phone company might claim that its phones last at least one year more than phones from other companies. The process of hypothesis testing is a way making decisions about claims like these. In this unit, you will learn to establish your assumptions through null and alternative hypotheses. Then, you will learn to compare sample characteristics to assumptions to see whether there is enough data to accept or reject the null hypothesis. The null hypothesis is, at first, assumed to be true and the one you hope to nullify, while the alternative hypothesis is a research hypothesis that you claim to be true. This means that you need to conduct the correct tests to be able to accept or reject the null hypothesis. The unit concludes with an introduction to Chi-distributions and their applications.

Sections:

5.1 Hypothesis Testing: Single Mean and Single Proportion

5.2 Hypothesis Testing: Two Means, Paired Data, and Two Proportions

5.3 Chi-Square Distribution

5.1 Hypothesis Testing: Single Mean and Single Proportion

5.1.1 Null and Alternate Hypotheses

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 9: Hypothesis Testing: Single Mean and Single Proportion: "Section 1: Hypothesis Testing: Single Mean and Single Proportion" and "Section 2: Null and Alternate Hypotheses"

5.1.2 Type I and Type II Errors

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 9: Hypothesis Testing: Single Mean and Single Proportion: "Section 3: Outcomes and the Type I and Type II Errors"
- Lecture: Khan Academy's Statistics: "Type I Errors"

5.1.3 Distribution for Hypothesis Testing and More

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 9: Hypothesis Testing: Single Mean and Single Proportion: "Section 4: Distribution Needed"

for Hypothesis Testing,” “Section 5: Assumption,” “Section 6: Rare Events,” “Section 7: Using the Sample to Support One of the Hypotheses,” “Section 8: Decision and Conclusion,” and “Section 9: Additional Information”

- Lecture: Barbara Illowsky and Susan Dean’s Collaborative Statistics: “Video Lecture 9: Hypothesis Testing with a Single Mean”
- Assessment: Barbara Illowsky and Susan Dean’s Collaborative Statistics: Chapter 9: Hypothesis Testing: Single Mean and Single Proportion: “Practice 1: Single Mean, Known Population Standard Deviation,” “Practice 2: Single Mean, Unknown Population Standard Deviation,” and “Practice 3: Single Proportion”
- Lecture: Khan Academy’s Statistics: “Large Sample Proportion Hypothesis Testing”
- Lecture: Khan Academy’s Statistics: “Difference of Sample Means Distribution”
- Lecture: Khan Academy’s Statistics: “Confidence Interval of Difference of Means”

5.2 Hypothesis Testing: Two Means, Paired Data, Two Proportions

5.2.1 Comparing Two Independent Population Means with Unknown Population Standard Deviations

- Reading: Barbara Illowsky and Susan Dean’s Collaborative Statistics: Chapter 10: Hypothesis Testing: Two Means, Paired Data, Two Proportions: “Section 1: Hypothesis Testing: Two Population Means and Two Population Proportions” and “Section 2: Comparing Two Independent Population Means with Unknown Population Standard Deviations”

5.2.2 Comparing Two Independent Population Means with Known Population Standard Deviations

- Reading: Barbara Illowsky and Susan Dean’s Collaborative Statistics: Chapter 10: Hypothesis Testing: Two Means, Paired Data, Two Proportions: “Section 3: Comparing Two Independent Population Means with Known Population Standard Deviations”

5.2.3 Comparing Two Independent Population Proportions

- Reading: Barbara Illowsky and Susan Dean’s Collaborative Statistics: Chapter 10: Hypothesis Testing: Two Means, Paired Data, Two Proportions: “Section 4: Comparing Two Independent Population Proportions”
- Lecture: Khan Academy’s Statistics: “Comparing Population Proportions 1,” “Comparing Population Proportions 2,” and “Hypothesis Test Comparing Population Proportions”

5.2.4 Matched or Paired Samples

- Reading: Barbara Illowsky and Susan Dean’s Collaborative Statistics: Chapter 10: Hypothesis Testing: Two Means, Paired Data, Two Proportions: “Section 5: Matched or Paired Samples”
- Lecture: Barbara Illowsky and Susan Dean’s Collaborative Statistics: “Video Lecture 10: Hypothesis Testing with Two Means
- Lecture: Khan Academy’s Statistics: “Hypothesis Test for Difference of Means”
- Assessment: Barbara Illowsky and Susan Dean’s Collaborative Statistics: Chapter 10: Hypothesis Testing: Two Means, Paired Data, Two Proportions: “Practice 1: Hypothesis Testing for Two Proportions” and “Practice 2: Hypothesis Testing for Two Averages”

5.3 Chi-Square Distribution

5.3.1 Notation and Facts

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 11: The Chi-Square Distribution: "Section 1: The Chi-Square Distribution," "Section 2: Notation," and "Section 3: Facts About the Chi-Square Distribution"
- Lecture: Khan Academy's Statistics: "Chi-Square Distribution Introduction," "Pearson's Chi Square Test (Goodness of Fit)," and "Contingency Table Chi-Square Test"

5.3.2 Goodness-of-Fit Test

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 11: The Chi-Square Distribution: "Section 4: Goodness-of-Fit Test"

5.3.3 Test of Independence

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 11: The Chi-Square Distribution: "Section 5: Test of Independence"

5.3.4 Test of a Single Variance (Optional)

- Reading: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 11: The Chi-Square Distribution: "Section 6: Test of a Single Variance (Optional)"
- Lecture: Barbara Illowsky and Susan Dean's Collaborative Statistics: "Video Lecture 11: The Chi-Square Distribution"
- Assessment: Barbara Illowsky and Susan Dean's Collaborative Statistics: Chapter 11: The Chi-Square Distribution: "Practice 1: Goodness-of-Fit Test," "Practice 2: Contingency Tables," and "Practice 3: Test of a Single Variance"