

GLOBAL
EDITION



Statistics for the Life Sciences

FIFTH EDITION

Myra L. Samuels
Jeffrey A. Witmer
Andrew A. Schaffner



ALWAYS LEARNING

PEARSON

STATISTICS FOR THE LIFE SCIENCES

Fifth Edition
Global Edition

Myra L. Samuels

Purdue University

Jeffrey A. Witmer

Oberlin College

Andrew A. Schaffner

*California Polytechnic State University,
San Luis Obispo*

PEARSON

Boston Columbus Indianapolis New York San Francisco Hoboken
Amsterdam Cape Town Dubai London Madrid Milan Munich
Paris Montréal Toronto Delhi Mexico City São Paulo
Sydney Hong Kong Seoul Singapore Taipei Tokyo

Statistics for the Life Sciences, Global Edition

Table of Contents

Cover

Title Page

Copyright Page

Contents

Preface

Acknowledgments

Unit I Data and Distributions

1 Introduction

1.1 Statistics and the Life Sciences

1.2 Types of Evidence

1.3 Random Sampling

2 Description of Samples and Populations

2.1 Introduction

2.2 Frequency Distributions

2.3 Descriptive Statistics: Measures of Center

2.4 Boxplots

2.5 Relationships between Variables

2.6 Measures of Dispersion

2.7 Effect of Transformation of Variables*

2.8 Statistical Inference

2.9 Perspective

3 Probability and the Binomial Distribution

3.1 Probability and the Life Sciences

3.2 Introduction to Probability

3.3 Probability Rules*

3.4 Density Curves

3.5 Random Variables

Table of Contents

3.6 The Binomial Distribution

3.7 Fitting a Binomial Distribution to Data*

4 The Normal Distribution

4.1 Introduction

4.2 The Normal Curves

4.3 Areas under a Normal Curve

4.4 Assessing Normality

4.5 Perspective

5 Sampling Distributions

5.1 Basic Ideas

5.2 The Sample Mean

5.3 Illustration of the Central Limit Theorem*

5.4 The Normal Approximation to the Binomial Distribution*

5.5 Perspective

Unit I Highlights and Study

Unit II Inference for Means

6 Confidence Intervals

6.1 Statistical Estimation

6.2 Standard Error of the Mean

6.3 Confidence Interval for

6.4 Planning a Study to Estimate

6.5 Conditions for Validity of Estimation Methods

6.6 Comparing Two Means

6.7 Confidence Interval for $(1 - 2)$

6.8 Perspective and Summary

7 Comparison of Two Independent Samples

7.1 Hypothesis Testing: The Randomization Test

7.2 Hypothesis Testing: The t Test

7.3 Further Discussion of the t Test

7.4 Association and Causation

7.5 One-Tailed t Tests

7.6 More on Interpretation of Statistical Significance

Table of Contents

7.7 Planning for Adequate Power*

7.8 Students t: Conditions and Summary

7.9 More on Principles of Testing Hypotheses

7.10 The Wilcoxon-Mann-Whitney Test

8 Comparison of Paired Samples

8.1 Introduction

8.2 The Paired-Sample t Test and Confidence Interval

8.3 The Paired Design

8.4 The Sign Test

8.5 The Wilcoxon Signed-Rank Test

8.6 Perspective

Unit II Highlights and Study

Unit III Inference for Categorical Data

9 Categorical Data: One-Sample Distributions

9.1 Dichotomous Observations

9.2 Confidence Interval for a Population Proportion

9.3 Other Confidence Levels*

9.4 Inference for Proportions: The Chi-Square Goodness-of-Fit Test

9.5 Perspective and Summary

10 Categorical Data: Relationships

10.1 Introduction

10.2 The Chi-Square Test for the 2 X 2 Contingency Table

10.3 Independence and Association in the 2 X 2 Contingency Table

10.4 Fishers Exact Test*

10.5 The r X k Contingency Table

10.6 Applicability of Methods

10.7 Confidence Interval for Difference Between Probabilities

10.8 Paired Data and 2 X 2 Tables*

10.9 Relative Risk and the Odds Ratio*

10.10 Summary of Chi-Square Test

Unit III Highlights and Study

Unit IV Modeling Relationships

Table of Contents

11 Comparing the Means of Many Independent Samples

- 11.1 Introduction
- 11.2 The Basic One-Way Analysis of Variance
- 11.3 The Analysis of Variance Model
- 11.4 The Global F Test
- 11.5 Applicability of Methods
- 11.6 One-Way Randomized Blocks Design
- 11.7 Two-Way ANOVA
- 11.8 Linear Combinations of Means*
- 11.9 Multiple Comparisons*
- 11.10 Perspective

12 Linear Regression and Correlation

- 12.1 Introduction
- 12.2 The Correlation Coefficient
- 12.3 The Fitted Regression Line
- 12.4 Parametric Interpretation of Regression: The Linear Model
- 12.5 Statistical Inference Concerning 1
- 12.6 Guidelines for Interpreting Regression and Correlation
- 12.7 Precision in Prediction*
- 12.8 Perspective
- 12.9 Summary of Formulas

Unit IV Highlights and Study

13 A Summary of Inference Methods

- 13.1 Introduction
- 13.2 Data Analysis Examples

Chapter Appendices**

Chapter Notes**

Answers to Selected Exercises

Credits

Index

Index of Examples

Table of Contents

A
B
C
D
E
F
G
H
I
K
L
M
N
O
P
R
S
T
U
V
W
Y

Statistical Tables

Table 1 Random Digits

Table 2 Binomial Coefficients nC_j

Table 5 Sample Sizes Needed for Selected Power Levels for
Independent-Samples t Test

Table 6 Critical values and P-values of U_s for the Wilcoxon-Mann-Whitney test

Table 7 Critical Values and P-Values of B_s for the Sign Test

Table 8 Critical Values and P-Values of W_s for the Wilcoxon Signed-Rank

Table of Contents

Test

Table 10 Critical Values of the F Distribution

Table 11 Bonferroni Multipliers for 95% Condence Intervals