

Table of Contents

Preface	ix
1. Basic Concepts of Measurement	1
Measurement	2
Levels of Measurement	2
True and Error Scores	8
Reliability and Validity	10
Measurement Bias	14
Exercises	17
2. Probability	21
About Formulas	22
Basic Definitions	23
Defining Probability	30
Bayes' Theorem	34
Enough Exposition, Let's Do Some Statistics!	36
Exercises	38
3. Inferential Statistics	45
Probability Distributions	46
Independent and Dependent Variables	53
Populations and Samples	54
The Central Limit Theorem	59
Hypothesis Testing	64
Confidence Intervals	67
p-values	68
The Z-Statistic	70
Data Transformations	72

Exercises	75
4. Descriptive Statistics and Graphic Displays	83
Populations and Samples	83
Measures of Central Tendency	84
Measures of Dispersion	90
Outliers	96
Graphic Methods	97
Bar Charts	100
Bivariate Charts	111
Exercises	117
5. Categorical Data	121
The R×C Table	122
The Chi-Square Distribution	125
The Chi-Square Test	127
Fisher's Exact Test	132
McNemar's Test for Matched Pairs	134
Proportions: The Large Sample Case	136
Correlation Statistics for Categorical Data	138
The Likert and Semantic Differential Scales	145
Exercises	147
6. The t-Test	155
The t Distribution	155
The One-Sample t-Test	157
The Independent Samples t-Test	160
Repeated Measures t-Test	164
Unequal Variance t-Test	167
Exercises	168
7. The Pearson Correlation Coefficient	173
Association	174
Scatterplots	175
The Pearson Correlation Coefficient	182
The Coefficient of Determination	187
Exercises	188
8. Introduction to Regression and ANOVA	193
The General Linear Model	193
Linear Regression	195
Analysis of Variance (ANOVA)	206
Calculating Simple Regression by Hand	212
Exercises	214

9. Factorial ANOVA and ANCOVA	223
Factorial ANOVA	223
ANCOVA	233
Exercises	238
10. Multiple Linear Regression	243
Multiple Regression Models	243
Exercises	267
11. Logistic, Multinomial, and Polynomial Regression	273
Logistic Regression	273
Multinomial Logistic Regression	279
Polynomial Regression	282
Overfitting	285
Exercises	287
12. Factor Analysis, Cluster Analysis, and Discriminant Function Analysis ..	291
Factor Analysis	291
Cluster Analysis	299
Discriminant Function Analysis	302
Exercises	305
13. Nonparametric Statistics	307
Between-Subjects Designs	308
Within-Subjects Designs	317
Exercises	321
14. Business and Quality Improvement Statistics	325
Index Numbers	325
Time Series	331
Decision Analysis	334
Quality Improvement	339
Exercises	347
15. Medical and Epidemiological Statistics	351
Measures of Disease Frequency	351
Ratio, Proportion, and Rate	352
Prevalence and Incidence	354
Crude, Category-Specific, and Standardized Rates	357
The Risk Ratio	362
The Odds Ratio	367
Confounding, Stratified Analysis, and the Mantel-Haenszel Common	
Odds Ratio	370
Power Analysis	375

Sample Size Calculations	377
Exercises	380
16. Educational and Psychological Statistics	385
Percentiles	386
Standardized Scores	388
Test Construction	390
Classical Test Theory: The True Score Model	393
Reliability of a Composite Test	394
Measures of Internal Consistency	395
Item Analysis	400
Item Response Theory	403
Exercises	408
17. Data Management	411
An Approach, Not a Set of Recipes	412
The Chain of Command	413
Codebooks	413
The Rectangular Data File	415
Spreadsheets and Relational Databases	418
Inspecting a New Data File	418
String and Numeric Data	422
Missing Data	423
18. Research Design	425
Basic Vocabulary	426
Observational Studies	428
Quasi-Experimental Studies	431
Experimental Studies	436
Gathering Experimental Data	437
Example Experimental Design	447
19. Communicating with Statistics	449
General Notes	449
20. Critiquing Statistics Presented by Others	457
Evaluating the Whole Article	457
The Misuse of Statistics	458
Common Problems	459
Quick Checklist	461
Issues in Research Design	463
Descriptive Statistics	466
Inferential Statistics	470
A. Review of Basic Mathematics	473

B. Introduction to Statistical Packages 499

C. References 513

D. Probability Tables for Common Distributions 527

E. Online Resources 539

F. Glossary of Statistical Terms 543

Index 553

