

SECOND  
EDITION

# BASIC STATISTICS

---

## A Worktext



Elizabeth B. Parreño  
Ronel O. Jimenez

# **TABLE OF CONTENTS**

## **PART 1 DESCRIPTIVE STATISTICS**

### **Chapter 1**

BASIC CONCEPTS .....	1
1.1 Introduction .....	1
1.2 Definitions .....	1
1.2.1 Statistics .....	1
1.2.2 Descriptive Statistics .....	1
1.2.3 Inferential Statistics .....	2
1.2.4 Variable .....	2
1.2.5 Different Types of Variables .....	2
a. Categorical or qualitative variables .....	2
b. Numerical-valued or quantitative variables .....	3
1.2.6 Scales of Measurement .....	4
a. Nominal Scale .....	5
b. Ordinal Scale .....	6
c. Interval Scale .....	7
d. Ratio Scale .....	7
1.2.7 Population .....	8
1.2.8 Sample .....	8
1.2.9 Parameter .....	8
1.2.10 Statistic .....	8

### **Chapter 2**

COLLECTION OF DATA .....	19
2.1 Introduction .....	19
2.2 Methods of Collecting Data .....	19
2.2.1 Interview Method .....	19
a. Direct Method .....	19
b. Indirect Method .....	19
2.2.2 Questionnaire Method .....	20
a. Guided-Response Type .....	20
b. Recall Type .....	21
c. Recognition Type .....	21
d. Dichotomous Type .....	21
e. Multiple Choice Type .....	22
f. Multiple Response Type .....	22
g. Free-Response Type .....	22
h. Rating Scale Type .....	23

2.2.3	Empirical Observation Method.....	23
2.2.4	Test Method.....	24
2.2.5	Registration Method .....	24
2.2.6	Mechanical Devices .....	24
2.3	Sampling Techniques.....	24
2.3.1	Random Sampling .....	25
a.	Lottery Method.....	25
1.	Use of the Table of Random Numbers.....	26
2.3.2	Systematic Sampling .....	27
a.	Stratified Random Sampling .....	27
b.	Cluster Sampling .....	28
2.3.3	Purposive Sampling.....	29
2.3.4	Quota Sampling .....	29
2.3.5	Convenience Sampling.....	29

### **Chapter 3**

ORGANIZATION AND PRESENTATION OF DATA.....	37
3.1 Introduction .....	37
3.2 The Frequency Distribution.....	37
a. Class Mark.....	41
b. Class Boundary.....	41
3.3 Correlated Data .....	42
3.4 Time Series Data .....	43
3.5 Graphs.....	44
3.5.1 Bar Graph.....	44
3.5.2 Line Graph.....	46
3.5.3 Pie Chart .....	47
3.5.4 Frequency Histogram.....	48
3.5.5 Frequency Polygon.....	50
3.5.6 Cumulative Frequency Ogive .....	50
3.6 Relative Frequency.....	51

### **Chapter 4**

MEASURES OF CENTRAL TENDENCY.....	71
4.1 Introduction .....	71
4.2 Measures of Central Tendency of Ungrouped Data .....	71
4.2.1 Mean.....	71
4.2.2 Median.....	73
4.2.3 Mode .....	75
4.3 Measures of Central Tendency of Grouped Data .....	77
4.3.1 Mean.....	77
4.3.2 Median .....	78
4.3.3 Mode .....	79

**Chapter 5**

MEASURES OF POSITION .....	91
5.1 Introduction .....	91
5.2 Measures of Position for Ungrouped Data .....	91
5.2.1 Quartiles .....	91
5.2.2 Deciles.....	91
5.2.3 Percentiles .....	92
5.3 Fractiles of Grouped Data .....	94
5.3.1 Quartiles .....	94
5.3.2 Deciles.....	94
5.3.3 Percentiles .....	94

**Chapter 6**

MEASURES OF VARIATION .....	109
6.1 Introduction.....	109
6.2 Range.....	109
6.3 Mean Absolute Deviation.....	110
6.4 Variance.....	111
6.5 Standard Deviation.....	114
6.6 Coefficient of Variation.....	116
6.7 Quartile Deviation .....	117
6.8 Percentile Range.....	120
6.9 Using the Scientific Calculator .....	121

**Chapter 7**

NORMAL DISTRIBUTION.....	131
7.1 Introduction.....	131
7.2 The Standard of Normal Distribution .....	131
7.3 z-scores.....	131
7.4 Skewness .....	136
7.5 Kurtosis .....	138

**PART 2 INFERRENTIAL STATISTICS****Chapter 8**

HYPOTHESIS TESTING .....	159
8.1 Introduction.....	159
8.2 Hypothesis .....	159
8.3 The Null Hypothesis.....	159
8.4 Significance Level.....	160
8.5 One-Tailed and Two-Tailed Tests .....	160
8.6 Testing Hypothesis.....	161
8.7 Degree of Freedom.....	161
8.8 Tests Concerning Means .....	162

8.8.1	z-test on the Comparison between the Population Mean and Sample Mean.....	162
8.8.2	t-test on the Comparison between the Population Mean and Sample Mean.....	164
8.8.3	t-test Concerning Means of Independent Samples... ..	166
8.9	t-test on the Significance of the Difference Between Two Correlated Means .....	167
8.10	z-test on the Significance of Difference Between the Population and a Sample Proportion .....	169
8.11	z-test on the Significance of Difference Between Two Independent Proportions .....	171
8.12	Significance of the Difference Between Variances .....	173
8.12.1	Analysis of Variance .....	173
8.12.2	t-test for Samples With Correlated Variances.....	176

### **Part 3 ADDITIONAL TOPICS**

#### **Chapter 9**

CORRELATION ANALYSIS.....	189
9.1 Introduction.....	189
9.2 Pearson Product-Moment Correlation Coefficient.....	189
9.3 Regression Analysis .....	193
9.4 Spearman's Rank Correlation Coefficient .....	195

#### **Chapter 10**

CHI-SQUARE .....	203
10.1 Introduction.....	203
10.2 Contingency Table .....	203
10.3 Test of Independence .....	203
10.4 Goodness of Fit.....	206
10.5 Chi-Square in Testing the Significance of the Difference Between Proportions.....	208

#### **Chapter 11**

PROBABILITY.....	215
11.1 Introduction.....	215
11.2 Fundamental Counting Techniques .....	215
11.2.1 Multiplication Rule.....	215
11.3 Permutation.....	217
11.4 Combination .....	219
11.5 Probability Theory .....	220
11.5.1 Sample Space.....	220
11.5.2 Event .....	220

11.6 The Probability of the Occurrence of an Event .....	221
11.7 Probability Axioms.....	223
11.8 Probabilities in the Union and Intersection of Events .....	225
11.9 Probabilites in the Repeated Trials .....	227
<b>Chapter 12</b>	
<b>HEALTH CARE STATISTICS.....</b>	<b>241</b>
12.1 Introduction.....	241
12.2 Fundamental Counting Techniques .....	241
12.2.1 Morbidity and Mortality .....	241
12.2.2 Demographic Variables .....	241
12.2.3 Vital Statistics.....	242
12.2.4 Types of Health Statistics Data.....	242
12.2.5 Data Requestors.....	242
12.3 Rates.....	242
12.3.1 Death or Mortality Rate.....	243
12.3.2 Morbidity Rate.....	244
a. Prevalence Rate .....	244
b. Incidence Rate .....	245
c. Complications Rate .....	245
d. Fatality Rate .....	246
<b>APPENDICES</b>	
Appendix A .....	255
Appendix B .....	256
Appendix C .....	257
Appendix D .....	258
Appendix E .....	259
Appendix F .....	267
<b>REFERENCES.....</b>	<b>268</b>