

Contents

1 GENERAL INTRODUCTION TO BIOSTATISTICS, 1

- 1-1 THE BASES OF BIOSTATISTICS, 1
- 1-2 DEFINITION OF STATISTICS, 2
- 1-3 STUDY MATERIAL VERSUS STUDY OBSERVATIONS, 4
- 1-4 SOME POPULAR CONCEPTS AND MISUSES OF STATISTICS, 7

2 GRAPHS AND TABLES: GENERAL PRINCIPLES, 9

- 2-1 GENERAL PRINCIPLES CONCERNING THE CONSTRUCTION OF GRAPHS, 9
- 2-2 GENERAL PRINCIPLES CONCERNING THE CONSTRUCTION OF TABLES, 10
- 2-3 MISLEADING GRAPHS, 12

3 DESCRIPTIVE STATISTICS, 18

- 3-1 INTRODUCTION, 18
- 3-2 THE SUMMATION SIGN AND ITS PROPERTIES, 19
- 3-3 MEASURES OF CENTRAL TENDENCY, 24
- 3-4 MEASURE OF VARIABILITY, 29
- 3-5 THE EFFECT ON THE MEAN, VARIANCE, AND STANDARD DEVIATION OF UNIFORM CHANGES IN THE OBSERVATIONS, 34
- 3-6 DISCRETE AND CONTINUOUS VARIABLES, 37
- 3-7 GROUPED DATA, 38
- 3-8 PERCENTILES, QUANTILES, AND PERCENTILE RANKS, 53
- 3-9 GENERAL COMMENTS AND CONCLUSIONS CONCERNING DESCRIPTIVE STATISTICS, 54
- EXERCISES, 55

4 PROBABILITY, 59

- 4-1 DEFINITION OF PROBABILITY, 60
- 4-2 A PRIORI PROBABILITIES, 62
- 4-3 PERSONAL OR SUBJECTIVE PROBABILITY, 63
- 4-4 PRINCIPLES OF ENUMERATION, 64
- 4-5 THE FACTORIAL NOTATION AND SOME OF ITS PROPERTIES, 67
- 4-6 PERMUTATIONS—COUNTING ORDERED SEQUENCES, 68
- 4-7 COMBINATIONS—SETS OF OBJECTS WITHOUT REGARD TO ORDER, 70
- 4-8 NUMBER OF DISTINGUISHABLE PERMUTATIONS OF OBJECTS NOT ALL DIFFERENT, 73
- 4-9 PROBABILITY OF COMPOSITE EVENTS, 74
- 4-10 MARGINAL AND CONDITIONAL PROBABILITY, 78
- 4-11 BAYES'S RULE, 81
EXERCISES, 83

5 POPULATIONS, SAMPLES, AND INFERENCE, 87

- 5-1 DEFINITIONS AND BASIC IDEAS RELATED TO POPULATIONS AND SAMPLES, 87
- 5-2 RANDOM AND NONRANDOM SAMPLES, 92
- 5-3 RANDOM NUMBERS AND THEIR USES, 95
- 5-4 RANDOM VARIABLES, DISTRIBUTIONS, AND SAMPLING DISTRIBUTIONS, 98
- 5-5 SAMPLING FINITE POPULATIONS, 104
EXERCISES, 110

6 SOME IMPORTANT DISTRIBUTIONS, 112

- 6-1 THE BINOMIAL DISTRIBUTION, 112
- 6-2 THE POISSON DISTRIBUTION, 119
- 6-3 PROBABILITY DENSITY, 122
- 6-4 THE NORMAL DISTRIBUTION, 124

7 ESTIMATION, 148

- 7-1 POINT ESTIMATION, 148
- 7-2 INTERVAL ESTIMATION, 152
- 7-3 TOLERANCE LIMITS, 188
EXERCISES, 188

8 HYPOTHESIS TESTING, 192

- 8-1 BASIC CONCEPTS AND DEFINITIONS, 193
- 8-2 TESTS FOR THE PARAMETERS OF A NORMAL DISTRIBUTION, 200
- 8-3 TESTS FOR THE PARAMETERS OF TWO NORMAL DISTRIBUTIONS, 210
- 8-4 TESTS ON BINOMIAL DISTRIBUTIONS, 216
- 8-5 TESTS FOR NORMALITY OF THE UNDERLYING DISTRIBUTION, 218
- EXERCISES, 225

9 CHI-SQUARE TESTS FOR FREQUENCY DATA, 229

- 9-1 GENERAL BACKGROUND AND THE BASIC CHI-SQUARE STATISTIC, 229
- 9-2 THE CASE OF ALL EXPECTED FREQUENCIES SPECIFIED PRIOR TO SAMPLING, 232
- 9-3 THE GOODNESS OF FIT TEST FOR THE NORMAL DISTRIBUTION, 233
- 9-4 TESTS FOR ASSOCIATION IN CONTINGENCY TABLES, 235
- 9-5 SOME MISAPPLICATIONS OF CHI-SQUARE FREQUENCY TESTS, 244
- 9-6 THE VARIANCE TEST FOR GOODNESS OF FIT OF THE POISSON DISTRIBUTION, 246
- EXERCISES, 249

10 REGRESSION AND CORRELATION, 253

- 10-1 BASIC IDEAS, ORIGIN OF THE TERM "REGRESSION," AND REGRESSION TOWARD THE MEAN, 253
- 10-2 THE STRAIGHT LINE, 254
- 10-3 LINEAR REGRESSION: ASSUMPTIONS AND EXAMPLES, 257
- 10-4 ESTIMATION OF SLOPE AND INTERCEPT: LEAST SQUARES, 260
- 10-5 CONFIDENCE INTERVALS AND TESTS IN LINEAR REGRESSION, 265
- 10-6 THE LINEAR CORRELATION COEFFICIENT IN LINEAR REGRESSION, 273

- 10-7 CORRELATION AND THE BIVARIATE NORMAL DISTRIBUTION, 275
EXERCISES, 278

11 THE ANALYSIS OF VARIANCE, 282

- 11-1 THE GENERAL ONE-FACTOR ANALYSIS OF VARIANCE, 282
11-2 THE GENERAL TWO-FACTOR ANALYSIS OF VARIANCE, 288
11-3 THE LATIN SQUARE, 301
11-4 CONCLUDING REMARKS, 305
EXERCISES, 306

12 DISTRIBUTION - FREE AND NONPARAMETRIC METHODS, 310

- 12-1 THE WILCOXON RANK SUM TEST, 313
12-2 THE SIGN TEST, 316
12-3 THE WILCOXON SIGNED RANK TEST, 318
12-4 DISTRIBUTION-FREE CONFIDENCE INTERVAL FOR THE MEDIAN OF A CONTINUOUS DISTRIBUTION, 319
12-5 A TEST FOR RANDOMNESS: TOTAL NUMBER OF RUNS ABOVE AND BELOW THE MEDIAN, 320
12-6 DISTRIBUTION-FREE TOLERANCE LIMITS, 322
EXERCISES, 323

13 DEMOGRAPHY AND VITAL STATISTICS, 326

- 13-1 INTRODUCTION, 326
13-2 HISTORICAL REMARKS, 326
13-3 VITAL RATES, 327
13-4 LIFE TABLE, 340
EXERCISES, 349

REFERENCES, 352

APPENDIX TABLES, 357

INDEX, 413