

# Contents

Preface and acknowledgments	v
Glossary of symbols and formulae	xiii
<b>1 Introduction</b>	<b>1</b>
1.1 From descriptive statistics to statistical methods	1
1.2 Inference from sample results	2
1.3 Probability	4
Exercises	8
Further reading	9
<b>2 Basic distributions</b>	<b>10</b>
2.1 The binomial distribution	10
2.2 The normal distribution	16
2.3 The standard normal distribution	19
2.4 Use of the standard normal distribution	23
2.5 The standard normal distribution and the binomial distribution	28
2.6 The Poisson distribution	30
Exercises	32
Further reading	33
<b>3 The theoretical basis of sampling</b>	<b>34</b>
3.1 Sample and population	34
3.2 Experimental sampling distributions: means	36
3.3 Experimental sampling distributions: proportions	38
3.4 Theoretical sampling distributions	40
3.5 Sample statistic and population parameter	42
Further reading	45
<b>4 Estimation</b>	<b>46</b>
4.1 Introduction	46
4.2 The single sample: the mean	46
4.3 The standard error	49
4.4 Probability and confidence limits	50
4.5 Probable error	52

4.6	The mean of small samples	52
4.7	The single sample: the proportion	54
4.8	Error and sample size	55
4.9	Sampling from small populations	56
4.10	Summary and notes on calculations	57
	Exercises	61
	Further reading	63
<b>5</b>	<b>Significance tests</b>	<b>64</b>
5.1	Introduction	64
5.2	Population mean and sample mean	64
5.3	The null hypothesis	66
5.4	The non-rejection of the null hypothesis	70
5.5	Types of error and the alternative hypothesis	72
5.6	Differences between sample means (large samples)	78
5.7	Differences between sample means (small samples)	81
5.8	Population proportion and sample proportion	82
5.9	Differences between sample proportions	83
5.10	Two-tailed tests and one-tailed tests	86
5.11	The interpretation of significant differences	89
	Exercises	90
	Further reading	95
<b>6</b>	<b>The magnitude of statistically significant differences</b>	<b>96</b>
6.1	Population mean and sample mean	96
6.2	The difference between sample means	99
6.3	Population proportion and sample proportion	102
6.4	The difference between sample proportions	103
6.5	Note on methods	107
	Exercises	107
<b>7</b>	<b>Tests for goodness of fit and association</b>	<b>110</b>
7.1	Introduction	110
7.2	The $\chi^2$ statistic and the chi-square distribution	111
7.3	Degrees of freedom	113
7.4	The chi-square test	114
7.5	The chi-square test as a test for normality	116
7.6	The chi-square test and contingency tables	119
7.7	The contingency coefficient	128
	Exercises	129
	Further reading	133
Appendix	<i>Statistical tables</i>	134
Table 1	Normal curve areas	134
Table 2	Distribution of $t$	136
Table 3	Distribution of chi-square	138
	Answers to Exercises	140
	Index	143