

CONTENTS

CHAPTER 1

CONFUSION	1
1.1 The Weather	1
1.2 Discrimination?	3
1.3 The 1970 Draft Lottery	5
1.4 The Club Meeting	11
1.5 The "Treatment" Stack	11
1.6 The Aging Population	12
1.7 The Case of the Disappearing Children	14

CHAPTER 2

MORE CONFUSION?	16
2.1 Uterine Cancer	16
2.2 Sexual Activity	17
2.3 Retrospective Samples	18
2.4 Joggers	19
2.5 Television Ratings	21
2.6 Unemployment	21

CHAPTER 3

WHAT ARE YOU TALKING ABOUT?	27
3.1 Target Populations	27
3.2 A Taxpayer Population	30
3.3 Smooth Approximations to Target Populations	37

xi

CHAPTER 4

SAMPLES	44
4.1 Samples are Necessary	44
4.2 Samples are Cheaper and Faster	45
4.3 Samples are More Accurate	45
4.4 Statistical Samples and Judgement Samples	47
4.5 Sample Satisfaction	48

CHAPTER 5

HOW MISLEADING CAN AN HONEST SAMPLE REALLY BE?	50
5.1 An IRS Sampling Plan	51
5.2 All the Possible Samples	54
5.3 Unbiasedness	59
5.4 The Variance of the Sample Means	60
5.5 Of What Use Is a Single Sample?	63
5.6 The Terminology of Populations and Distributions	65

CHAPTER 6

DISTORTIONS OF AN HONEST SAMPLE	68
6.1 Bias	68
6.2 Crude (But Effective) Distortion	62
6.3 The Sampler's Approach	73

CHAPTER 7

HOW SURE ARE YOU?	76
7.1 Where Are the Most Misleading Samples?	76
7.2 What Confidence Can We Have in the Sample?	78
7.3 Objectives and Obstacles	83

CHAPTER 8

THE AMAZING NORMAL DISTRIBUTION	84
8.1 A Startling Theoretical Result	84
8.2 Properties of the Normal Distribution	88
8.3 Normal Confidence Limits	93

CHAPTER 9

THE ULTIMATE OBJECTIVE	99
9.1 Estimates that Are Close to the Target	99
9.2 Reducing Variance	101
9.3 Confidence Intervals Do Not Account for Bias!	101

CHAPTER 10

GATHERING UP THE SAMPLE	105
10.1 Sampling with Replacement	105
10.1.1 What Is It?	105
10.1.2 The Sampling Distribution	107
10.1.3 Relative Frequencies	109
10.1.4 In Practice	112
10.2 Sampling with Unequal Probability	115
10.2.1 A Simple Example	115
10.2.2 Sampling with Probabilities Proportional to Size	121
10.3 Stacking the Deck	127
10.3.1 Selection Biases	127
10.3.2 How Bad Can "Good" Data Be?	128
10.3.3 Coverage	129
10.4 Systematic Sampling	132

CHAPTER 11

THE CLEVER USE OF GROUPS	137
11.1 Objectives	137
11.2 Special Treatment for Special Cases	137

11.3	A Simple Illustration of Gains and Losses by Grouping	144
11.4	Multistage Sampling	148
11.4.1	Population Grouping	148
11.4.2	Two Stage Sampling of the Taxpayers	148
11.4.3	The Variance in Two Stage Sampling	153
11.5	Sampling Unequally Sized Groups	156
11.5.1	A Population with Zero Variance	157
11.5.2	Unequally Sized Groups of Taxpayers	160
11.6	Stratified Sampling	162
11.6.1	Stratification of the Taxpayers	162
11.6.2	Sample Allocation	165
11.6.3	The Terminology of Primaries and Strata	167
11.7	Variance Considerations	170
11.8	Self-Weighting Designs and Data Bases	173

CHAPTER 12

	AVERAGES AREN'T EVERYTHING	176
12.1	Some Possibilities	177
12.1.1	Robust Estimators	177
12.1.2	Auxiliary Information	183
12.2	Related Measurements	185
12.3	Ratio Estimation	190
12.4	Regression Estimation	199
12.5	Estimation by Post-Stratification	202
12.5.1	Post-Stratification	202
12.5.2	An Illustration	203
12.5.3	General Remarks	208
12.6	Technical Biases	209

CHAPTER 13

	THE VAGUE ANSWER TO THE PRECISE QUESTION OF SAMPLE SIZE	211
13.1	Diminishing Returns from Bigger Samples	211
13.2	A Mathematically Precise Sample Size	214
13.2.1	Trial and Error	214
13.2.2	A Formula for Sample Size	216

13.3 The Guesswork	223
13.4 Sample Size, the Last Question Not the First	225
CHAPTER 14	
WHAT WAS THAT AGAIN?	229
14.1 Sampling Distributions	229
14.2 Variance Reduction	230
14.3 Types of Bias	231
CHAPTER 15	
HOW TO	233
15.1 Design Your Survey	233
15.2 Criticize Another Survey	241
INDEX	246
NOTATION	Inside Back Cover