

Contents

1	Introduction	1
1.1	Purpose	1
1.2	What Is Demography?	1
1.3	The Demographic Perspective: A Brief History	2
1.4	Continuing Evolution of Demographic Analysis	4
References		5
2	Demographic Information	7
2.1	Purpose	7
2.2	Nature of Demographic Information	7
2.2.1	Components of Population Change	7
2.2.2	Concepts and Definitions	8
2.2.3	Demographic Change and Implications	11
2.3	Data Collection Methods	11
2.3.1	Census	11
2.3.2	Sample Surveys	13
2.3.3	Registration of Births, Deaths, Marriages and Divorces	15
2.3.4	Population Registers	16
2.3.5	Administrative Records	17
2.4	Availability of Demographic Data from International Agencies	18
References		19
3	Some Basic Statistical Measures	21
3.1	Purpose	21
3.2	Demographic Data and Analysis	21
3.3	Counts and Frequencies	24
3.4	Proportions and Percentages	24
3.5	Ratios, Rates and Probabilities	26

3.6	Measures of Central Tendency	29
3.6.1	Arithmetic Mean	29
3.6.2	Geometric and Harmonic Means	30
3.6.3	Median	32
3.6.4	Mode	33
3.6.5	Normal and Skewed Distributions	34
3.7	Measures of Dispersion	36
3.7.1	Variance and Standard Deviation	36
3.7.2	Quantiles	38
3.8	Measures of Relative Concentration and Inequality	42
3.8.1	Gini Coefficient	42
3.8.2	Quantile Concentration	46
3.8.3	Indexes of Dissimilarity and Relative Difference	46
3.9	Correlation and Regression	47
3.9.1	Association and Correlation	47
3.9.2	Linear Regression and Multiple Regression Models	53
	References	57
4	Elements of Demographic Analysis	59
4.1	Purpose	59
4.2	Balancing Equation	59
4.3	Population Growth Rates	61
4.3.1	Annual Growth Rate	61
4.3.2	Exponential Population Growth Rate	62
4.3.3	Interpolation and Extrapolation	63
4.3.4	Population Doubling Time	64
4.3.5	Growth and Fold rates	65
4.4	Population Dynamics and Analytical Approaches	65
4.4.1	Demographic Stocks and Flows	65
4.4.2	Cross-Sectional and Longitudinal Approaches in Demography	66
4.4.3	Synthetic Measures	66
4.5	Crude Rates	67
4.6	Characteristic-Specific Rates and Ratios	68
4.6.1	Characteristic-Specific Rates	68
4.6.2	Sex Ratios	68
4.6.3	Sex Ratio at Birth	69
4.6.4	Child-Woman Ratio	70
4.6.5	Dependency Ratio	71
4.6.6	Child to Old Ratios	72
4.7	Population Density and Distribution	73
4.7.1	Population Density	73
4.7.2	Index of Redistribution	74
4.7.3	Index of Concentration	74
4.8	Impact of Characteristics on Demographic Measures	75

4.9	Standardization	77
4.9.1	Direct Standardization	77
4.9.2	Indirect Standardization	78
4.9.3	Examples of Standardization	78
4.10	Graphical Presentation of Demographic Data	81
Appendix 4.1 Input Data for Standardization and Pyramids		85
Appendix 4.2 Population Pyramids		87
References		94
5	Fertility	97
5.1	Purpose	97
5.2	Perspectives on Fertility	97
5.3	Cross-Sectional Fertility Rates	98
5.3.1	Crude Birth Rates	98
5.3.2	Age-Specific and General Fertility Rates	98
5.4	Cross-Sectional and Longitudinal Fertility	100
5.5	Synthetic Measures of Fertility	103
5.5.1	Total Fertility Rate, Gross and Net Reproduction Rates	103
5.5.2	Mean Length of Generation	105
5.5.3	Synthetic Measures Using Grouped Data	107
5.5.4	Other Formulae for Synthetic Measures	109
5.6	Fertility Rates and Population Characteristics	110
5.7	Parity and Parity Progression Ratios	113
5.8	Standardized Fertility Ratios	115
5.9	International Comparisons of Fertility	117
5.10	Maximum Biological Fertility	118
References		121
6	Mortality	123
6.1	Purpose	123
6.2	Cross-Sectional Mortality Rates	123
6.2.1	Crude Death Rates	123
6.2.2	Age-Specific Mortality Rates	124
6.3	Longitudinal Mortality Rates	126
6.4	Causes of Death	128
6.5	Maternal Mortality	130
6.6	Foetal and Early Childhood Mortality	132
6.6.1	Perinatal, Neonatal and Infant Mortality	132
6.6.2	Abortion Rates and Ratios	135
6.7	Characteristic Specific Mortality Rates	138
6.7.1	Mortality and Place of Birth	138
6.7.2	Mortality and Marital Status	138
6.8	Potential Years of Life Lost	140
References		141

7	Life Tables	143
7.1	Purpose	143
7.2	Longevity and Life Tables	143
7.3	Assumptions Made in Constructing a Life Table	144
7.4	Data Requirements	145
7.5	Constructing a Complete Life Table	145
7.5.1	Age Specific Death Rates	146
7.5.2	Probability of Dying	146
7.5.3	Number of Deaths and Survivors	147
7.5.4	Person-Years Lived and Life Expectancy	148
7.5.5	Characteristics of Life Table Populations	149
7.5.6	Graphs of q_x , l_x , d_x and e_x	150
7.5.7	Smoothing of Data	153
7.5.8	Example of a Complete Life Table	153
7.6	Constructing an Abridged Life Table	155
7.6.1	Graphs of the Abridged Life Table Columns	156
7.6.2	Example of an Abridged Life Table	156
7.7	Other Methods of Constructing Abridged Life Tables	158
7.8	Uses of Life Tables	159
7.8.1	Population Projections	159
7.8.2	Other Types of Life Tables	159
7.8.3	Insurance	160
7.8.4	Epidemiological Research	160
7.8.5	Other Industrial and Commercial Uses	160
7.9	Availability of International Life Tables	161
7.10	International Comparisons	161
Appendix 7.1: Input Data for Life Tables		162
Appendix 7.2: Complete Life Tables by Sex: Australia, 2005–2007		165
Appendix 7.3: Abridged Life Tables by Sex: Australia, 2005–2007		170
References		171
8	Migration	173
8.1	Purpose	173
8.2	Basic Concepts	173
8.3	Migration Rates and Ratios	174
8.3.1	Crude Migration Rates	174
8.3.2	Characteristic-Specific Migration Rates	176
8.3.3	Migration Ratios	177
8.4	Direct Methods of Estimation	177
8.4.1	Place of Residence at Specific Times in the Past	178
8.4.2	Place of Birth	181
8.5	Indirect Methods of Estimation	181
8.5.1	Life Table Method	181
8.5.2	Census Survival Ratios	185
8.5.3	Other Administrative Records	186

8.6	Determinants of Migration	186
8.6.1	Push and Pull Factors	186
8.6.2	Gravity Model	186
8.7	Centre of Gravity of Population	189
	References	190
■	Some Demographic Events and Characteristics Analysis	193
9.1	Purpose	193
9.2	Marriages and Divorces	193
9.2.1	Marriage Rates	194
9.2.2	Divorce Rates	196
9.2.3	Marital Status	197
9.3	Families and Households	198
9.3.1	Concepts and Definitions	198
9.3.2	Household Size, Headship and Growth	198
9.4	Education and Training	201
9.4.1	Literacy	201
9.4.2	Gross Enrolment Ratio	202
9.4.3	Net Enrolment Rate	203
9.4.4	Retention Rate	204
9.4.5	Educational Attainment	204
9.5	Labour Force	205
9.5.1	Labour Force Participation Rate	205
9.5.2	Employment and Unemployment Rates	208
9.5.3	Job Creation Rate	209
9.5.4	Labour Force Flows and Growth	210
9.6	Occupation and Industry	211
9.6.1	Occupation	211
9.6.2	Industry	211
	References	213
■	Multiple Decrement Life Tables	215
10.1	Purpose	215
10.2	The Multiple Decrement Perspective	215
10.3	Multiple Decrement Life Tables	217
10.3.1	Example Using Cause of Death Data for the United States	217
10.4	Other Decremnts	221
10.4.1	Example of a Working Life Table for Japan	222
10.5	Multistate Models	224
10.5.1	Example of a Multistate Life Table for Japan	227
	References	229
■	Population Projections	231
11.1	Purpose	231
11.2	Concepts: Estimates, Projections and Forecasts	231

11.3	Projections of the Total Population	232
11.3.1	Constant Growth Rate	232
11.3.2	Mathematical Models	232
11.3.3	Fitting the Gompertz and Logistic Models	234
11.3.4	An Example of Fitting the Gompertz and Logistic Models	234
11.4	Projections by Age: Cohort-Component Method	236
11.4.1	Data Requirements and Steps	236
11.4.2	Assumptions	237
11.4.3	Illustrative Projections of the Population of Estonia	238
11.4.4	Some General Considerations	242
11.4.5	Availability of Population Projections	242
11.5	Projections by Age: Cohort-Change Method	243
11.5.1	Data Requirements and Methodology	243
11.5.2	Illustrative Projections of the Population of Ryde Local Government Area	245
11.5.3	Some General Considerations	246
11.6	Socio-Economic Projections	246
11.6.1	Concepts and Methods	246
11.6.2	Example of Projections of the Employed Persons Using the Participation Rate Method	247
11.6.3	Example of Projecting School Enrolments Using the Cohort-Progression Method	248
11.6.4	Other Socio-Economic Projections	250
11.7	Other Methods and Some Free United Nations Publications	250
Appendix 11.1:	Input Data for Population Projections of Estonia	251
References		253
12	Testing the Quality and Smoothing of Demographic Data	255
12.1	Purpose	255
12.2	Types of Error and Their Sources	255
12.3	Some General Principles	256
12.4	Quality of Age Data	257
12.4.1	Digital Preference in Age Data	257
12.4.2	Sex and Age Ratio Scores	261
12.5	Comparison with Other Data Sources	263
12.6	Smoothing of Demographic Data: Some General Considerations	265
12.6.1	Using Various Measures of Central Tendency	266
12.6.2	Moving Averages	266
12.6.3	Aggregation of Data	267
12.6.4	Smoothing Age Data	267
12.6.5	Smoothing Using Interpolation Multipliers	269
12.7	Other Methods	277
References		277

L3	The Stable Population Model	279
13.1	Purpose	279
13.2	The Model	279
13.3	Age Distribution of a Stable Population	280
13.4	Estimation of (r) in a Stable Population	282
13.5	Estimation of the Birth and Death Rates in a Stable Population	284
13.6	Fitting the Stable Population Model to Australia and Indonesia	284
13.7	Some Important Characteristics of the Stable Population Model	286
13.7.1	Relative Impact of Fertility and Mortality in Determining the Shape of a Stable Age Distribution	286
13.7.2	Age Distributions of Populations Subjected to Constant Fertility and Mortality Rates	286
13.8	Stable Population Models for Males	292
13.9	Model Life Tables and Stable Populations	293
13.9.1	A Hypothetical Example of the Use of Model Life Tables and Stable Populations	297
13.10	Some Further Comments on Model Life Tables and their Role in Indirect Methods of Estimation	299
	References	300
M4	Demographic Software	303
14.1	Purpose	303
14.2	Types of Software	303
14.2.1	Spreadsheets	304
14.2.2	Statistical Packages	304
14.2.3	Specialized Demographic Software	305
14.3	Conclusion	306
	Index	307