Department of International Economic and Social Affairs POPULATION STUDIES, No. 81

# Manual X

# INDIRECT TECHNIQUES FOR DEMOGRAPHIC ESTIMATION

A collaboration of the Population Division of the Department of International Economic and Social Affairs of the United Nations Secretariat with the Committee on Population and Demography of the National Research Council, United States National Academy of Sciences



UNITED NATIONS

New York, 1983

#### NOTE

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The designations "developed" and "developing" economies are intended for statistical convenience and do not necessarily express a judgement about the stage reached by a particular country or area in the development process.

The term "country" as used in the text of this publication also refers, as appropriate, to territories or areas.

The views expressed in this publication are those of the authors and do not imply the expression of any opinion on the part of the United Nations Secretariat.

This publication has been edited and consolidated in accordance with United Nations practice and requirements.

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such a symbol indicates a reference to a United Nations document.

The printing of this volume was made possible by a publication grant from the United Nations Fund for Population Activities

ST/ESA/SER.A/81

UNITED NATIONS PUBLICATION

Sales No. E.83.XIII.2

03200

The Population Division of the Department of International Economic and Social Affairs of the United Nations has been concerned with the measurement of demographic phenomena for over 30 years. The research programme of the Division has been designed to improve the collection, analysis and understanding of demographic trends and policies; and its analytical studies on mortality, fertility, urbanization and population structure have been widely used by both Governments and scholars.

A series of technical manuals has also been published by the Population Division, describing methods of demographic analysis and demographic estimates and projections needed for the purposes of economic and social policies. These manuals deal with methods of estimating total population for current dates, appraising the quality of basic data for population estimates, projecting population by sex and age, estimating basic demographic measures from incomplete data, projecting the economically active population, measuring internal migration, and projecting households and families. The most recent manuals are Manual VIII: Methods for Projections of Urban and Rural Population<sup>1</sup> and Manual IX: The Methodology of Measuring the Impact of Family Planning Programmes on Fertility.<sup>2</sup>

In the 1960s, many Governments became increasingly aware of the implications of the unprecedented population trends for economic and social development and began to consider policies designed to moderate population growth. However, adequate demographic data, especially in developing countries, were lacking. Recognizing that there was a serious gap between the quantitative information about populations and the amount and quality of data actually available, the Population Commission, at its twelfth session in 1963, recommended that a manual be prepared on methods of estimating fundamental demographic measures from incomplete data, since it was apparent that there was a need for a manual that would make it possible for a demographer/statistician to derive the maximum of reliable information from data in a census or demographic survey. At the request of the United Nations, Ansley J. Coale and Paul Demeny, with the assistance of R. D. Esten, Erna Härm and S. B. Mukherjee, prepared Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data,<sup>3</sup> which was published in 1967. Its importance and usefulness were quickly recognized by demographers and statisticians throughout the world. *Manual IV* was reprinted in 1969 and 1978 to accommodate the many requests.

Since the publication of *Manual IV*, a number of new techniques for estimating fertility and mortality levels and trends have been developed and many of the earlier methods have been refined. At its nineteenth session in 1977, the Population Commission recommended that *Manual IV* be revised to take into account the advances in methodology and the changes in the demographic situation in recent years.<sup>4</sup> Since such a revision was already under way through a project initiated by the Committee on Population and Demography of the Assembly of Behavioral and Social Sciences of the National Research Council, United States National Academy of Sciences, it was decided that the recommendations of the Population Commission would be best served by joint efforts to develop the present manual.

The Committee on Population and Demography was established in April 1977 under the Assembly of Behavioral and Social Sciences of the National Research Council. Funded by the United States Agency for International Development, the Committee has undertaken three major tasks: (a) to evaluate available evidence and prepare estimates of levels and trends of fertility and mortality in selected developing countries; (b) to improve the technologies for estimating fertility and mortality when only incomplete or inadequate data exist (including techniques of data collection); and (c) to evaluate the factors determining the changes in birth rates in developing countries.

The Committee approached the first task through careful assessment, by internal and external comparison; and through analysis, by application of the most reliable methods known, of all the data sources available. Each of the country studies undertaken therefore consisted of the application of a range of methods to a number of data sets. Best estimates of levels and recent trends were then developed on the grounds of their consistency and plausibility, and the robustness of the individual methods from which they were derived. Several country reports on levels and trends of fertility and mortality have been published.<sup>5</sup>

The Committee's second task, refinement of methodology, was seen as a by-product of achieving the first. The application of particular methods to many different data sets from different countries and referring to different time periods would inevitably provide valuable information about the practical functioning of the

<sup>&</sup>lt;sup>1</sup> United Nations publication, Sales No. E.74.XIII.3.

<sup>&</sup>lt;sup>2</sup> United Nations publication, Sales No. E.78.XIII.8.

<sup>&</sup>lt;sup>3</sup> United Nations publication, Sales No. E.67.XIII.2.

<sup>&</sup>lt;sup>4</sup> Official Records of the Economic and Social Council, Sixty-second Session, Supplement No. 4, para. 186.

<sup>&</sup>lt;sup>5</sup> Available from the National Academy Press, 2101 Constitution Avenue, N.W., Washington, D.C. 20418, United States of America.

methods themselves. Particular data sets might also require the development of new methodology or the refinement of existing techniques.

Manual X has its origins in the first task of the Committee on Population and Demography, but it has grown to include the presentation of the methodological developments resulting from the Committee's work on its second task. When the Committee was first considering the establishment of panels to prepare country studies, it recognized that much of the valuable methodological work carried out in the preceding decade was widely scattered through technical publications which were difficult to obtain. To facilitate the panel's estimation work, the Committee decided that it would be useful to have a manual of the most up-to-date analytical methods. As the work of the Committee progressed, several new methods were developed and a number of existing methods were refined. In view of the United Nations work in this area, it was decided that the manual, rather than being a mere tool in the preparation of country studies, should become an up-to-date comprehensive demographic estimation manual to be developed with the collaboration of the Population Division of the Department of International Economic and Social Affairs of the United Nations Secretariat.

The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine. The members of the Committee responsible for the report were chosen for their special competences and with regard for appropriate balance. The report has been reviewed by a group other than the authors, according to procedures approved by a committee consisting of members of the Academies and the Institute. The United Nations wishes to thank Kenneth Hill and Hania Zlotnik of the Committee staff and James Trussell of the Office of Population Research, Princeton University, who wrote *Manual X*. Hania Zlotnik has also prepared computer programs to apply some of the techniques described in this work. These are published in a separate volume entitled *Computer Programs for Demo*graphic Estimation: A User's Guide.<sup>6</sup>

The United Nations also wishes to thank the members of the Committee on Population and Demography for their contribution to this important study: Ansley J. Coale (Chairman), Office of Population Research, Princeton University; William Brass, Centre for Population Studies, London School of Hygiene and Tropical Medicine; Lee-Jay Cho, East-West Population Institute, East-West Center, Honolulu; Ronald Freedman, Population Studies Center, University of Michigan; Nathan Keyfitz, Department of Sociology, Harvard University; Leslie Kish, Institute for Social Research, University of Michigan; W. Parker Mauldin, Population Division, The Rockefeller Foundation; Jane Menken, Office of Population Research, Princeton University; Samuel Preston, Population Studies Center, University of Pennsylvania; William Seltzer, Statistical Office, United Nations; Conrad Taeuber, Kennedy Institute, Center for Population Research, Georgetown University; Etienne van de Walle, Population Studies Center, University of Pennsylvania; Robert J. Lapham, Study Director.

Acknowledgement is also due to the United Nations Fund for Population Activities, whose financial grant made possible the printing of this *Manual*.

<sup>6</sup> Report No. 11 of the Committee on Population and Demography; available from the National Academy Press.

				Page
Fo	orew	ord.		ij
Ex	pla	nato	ry notes	XX
In	trod	uctio	Dn	
 A	0	rigir	and scope of Manual X.	
R	ם	efini	tion of indirect techniques in demographic estimation	
C.	Ň	leed	for indirect estimation	
Ď.	E	volu	tion of indirect estimation and the contents of Manual X	
F	ับ	ise of	Manual X	
E. F.	D	efini	tions and conventions	
~				
Ch	apter T	De		1
	1.		MOGKAPHIC MODELS	1
		<b>A</b> .	General Background	1
		В.	Mortality models: model life tables	1
			1. United Nations model life tables	1
			2. Coale and Demeny regional model life tables	
			3. Ledermann's system of model life tables	1
			4. Brass logit life-table system	]
			5. United Nations model life tables for developing countries	1
		С.	Model stable populations	2
		D.	Nuptiality models	2
		E.	Fertility models	2
			1. Coale and Trussell model	2
			2. Brass relational Gompertz fertility model	2
	II.	EST	TIMATION OF FERTILITY BASED ON INFORMATION ABOUT CHILDREN EVER	2
			Reckaround of methods	2
		А.	Dackground of methods	5
			1. Nature of information on children ever born	1
			2. Typical errors in data on children ever born	4
		_	3. Organization of this chapter	4
		В.	Methods of the Brass type based on comparison of period fertility rates	
			with reported average parities	
			1. General description of methods of the Brass type	
			2. I ne <i>P</i> / <i>P</i> ratio method based on data about all children	
			(a) basis of method and its rationale	
			(b) Data required	2
			(c) Computational procedure	-
			(d) A detailed example	
			3. Comparison of current first-birth fertility with the reported proportion	
			of mothers	
			(a) Basis of method and its rationale	
			(b) Data required	-
			(c) Computational procedure	
			(d) A detailed example	
			4. Comparison of period fertility rates with average parities for a hypo-	
			thetical cohort	4
			(a) Basis of method and its rationale	4
			(b) Data required	4

# CONTENTS

Chapter	,
Chapter	

	D.	E	stimat	tion of intersurvey child mortality using data for a hypothetical	
		4.	Co	mments on the detailed example	85
		3.	Ad	letailed example	83
		2.	Co	mputational procedure	81
		1.	Dat	ta required	81
		ria	age		81
	С.	Es	timat	ion of child mortality using data classified by duration of mar-	
		4.	Cor	mments on the detailed example	80
		3.	A d	letailed example	78
		2.	Cor	mputational procedure	77
		1.	Dat	ta required	76
	<b>B</b> .	Es	timati	ion of child mortality rates using data classified by age	76
		2.	Org	ganization of this chapter	75
		1.	Use	e of data on child survivorship	73
	Α.	Ba	ckgro	ound of method	73
	BOI	RN A	ND C	HILDREN SURVIVING	73
III.	Est	<b>IM</b>	TION	OF CHILD MORTALITY FROM INFORMATION ON CHILDREN EVER	
			(.)	t	-
			(c)	A detailed example	70
			(b)	Computational procedure	69
			(a)	Data required	69
		Э.	nari	ities by duration group	69
		2	Cor	mnarison of period duration-specific fertility rates with average	
			(c)	A detailed example	67
			<b>(b)</b>	Computational procedure	66
			(a)	Data required	66
			tion	of marriage	66
		2.	Estin	mation of level of natural fertility from reported parity by dura-	
		1.	Basi	is of methods and their rationale	64
		by	durat	tion of marriage	64
	D.	Es	timati	ion of fertility from information on children ever born classified	
			(c)	Detailed examples	61
			<b>(b)</b>	Computational procedure	59
			(a)	Data required	59
			two	surveys	59
		2.	Fert	tility estimation from the increment of cohort parities between	
		1.	Basi	is of method and its rationale	58
		bet	ween	two surveys	58
	С.	Est	timati	ion of age-specific fertility from the increment of cohort parities	
			(d)	A detailed example	56
			(c)	Computational procedure	55
			<b>(b)</b>	Data required	55
			(a)	Basis of method and its rationale	55
			with	cohort parity increments	55
		6.	Con	nparison of the cohort fertility registered between two censuses	
			(d)	A detailed example	48
			(c)	Computational procedure	46
			<b>(b)</b>	Data required.	46
			(a)	Basis of method and its rationale	45
		5.	wom	nen with the reported average parity of the same cohort	45
		5	Com	aparison of mean number of births registered by a cohort of	
			(d)	A detailed example	42
			(c)	Computational procedure	- 41

Chapter		1. Data annulated
		I. Data required
		2. Computational procedure
		3. A detailed example
		4. Comments on the detailed example
	Ε.	Estimation of child mortality when the fertility experience of true cohorts
		is known
		1. Date required
		2. Data required
		3. Computational procedure
		4. Detailed examples
		(a)  Inaliand,  1970-1975
		( <i>b</i> ) Brazii, 1700-1970
ĪV.	Est	IMATION OF ADULT SURVIVORSHIP PROBABILITIES FROM INFORMATION
	ON	ORPHANHOOD AND WIDOWHOOD
	<b>A</b> .	Background of methods
		1. Nature and use of indirect information on adult mortality
		2. Organization of this chapter
	~	Projection of conditional adult sum in ambin
	В.	Esumation of conditional adult survivorsnip
		Contral Characteristics Section of adult suprimership based on proportions not archarad
		2. Estimation of adult survivorship based on proportions not orphaned.
		(a) Basis of method and its rationale
		(0) Brass method
		(1) Data required
		(ii) Computational procedure
		(iii) A detailed example
		(c) Method based on an equation fitted by using regression
		(1) Data required
		(11) Computational procedure
		(iii) A detailed example
		(d) Use of data from two surveys
		(1) Data required
		(ii) Computational procedure
		(iii) A detailed example
		5. Esumation of adult survivorsnip based on proportions widowed
		(a) Basis of method and its rationale
		(b) Widowhood data classified by age
		(i) Data required
		(11) Computational procedure
		(11) A detailed example
		(c) Widowhood data classified by duration of first marriage
		(1) Data required
		(II) Computational procedure
		(111) A detailed example
		(a) Use of widownood data from two surveys
	С.	Estimation of survivorship to adulthood from birth
		1. General characteristics of methods
		2. Estimation of female survivorship from birth to adult ages on the
		basis of proportions with surviving mother
		(a) Basis of method and its rationale
		(b) Data required
		(c) Computational procedure

#### Chapter

	3. Estimation of survivorship from birth to adult ages on the basis of
	proportions not widowed
	(a) Basis of method and its rationale
	(b) Widowhood data classified by age
	(i) Data required
	(ii) Computational procedure
	(ii) A detailed example
	(III) A detailed example
	(c) wildownood data classified by duration of marriage
	(1) Data required
	(ii) Computational procedure
	(iii) A detailed example
V. E	STIMATION OF ADULT MORTALITY FROM INFORMATION ON THE DISTRIBU-
TI	ON OF DEATHS BY AGE
Α	Background of method
	1. Use of information on deaths by age and sex
	2. Organization of this chapter
R	Preston and Coale method
D	1 Basis of method and its rationale
	7. Data required
	2. Computational procedure
	3. Computational procedure
	4. First detailed example
	5. Second detailed example
С	Brass growth balance method
	1. Basis of method and its rationale
	2. Data required
	3 Computational procedure
	A First detailed example
	4. I list detailed example
VI. DI AB A.	Background of methods
	hilitiae
	2 Operation of this chapter
~	2. Organization of this chapter
В.	Smoothing and interpolation of an incomplete set of survivorship proba-
	1 Basis of method and its rationale
	1. Date required
	2. Data required
	3. Computational procedure
	4. A detailed example
С.	Linkage of child survivorship probabilities with conditional adult sur-
	vivorship probabilities
	1. Basis of method and its rationale
	2. Linkage method using a logit life-table system
	(a) Data required
	(b) Computational procedure.
	(a) A detailed example
	(c) A usually chample
	(a) Comment on the detailed example
	3. Use of Coale-Demeny model life tables
/II. Fi	ERTILITY AND MORTALITY ESTIMATION USING MODEL STABLE AGE DISTRI-
BL	JTIONS

## Chapter

	Α.	Background of methods	156
		1. General principles underlying the use of model stable populations	
		for estimation purposes	156
		2. Organization of this chapter	157
	B.	Evaluation of age distributions	158
	2.	1. Basis of method and its rationale	158
		2 Data required	160
		2. Data required inconduce	160
		A detailed example	161
		4. A uctailed chample	162
	C	Estimation of fertility from the proportion of the population under age	102
	C.	Estimation of refutity from the proportion of the population under age	166
		1 Basis of method and its rationale	166
		1. Basis of method and its faulthate	168
		2. Data required	169
		3. Computational procedure	160
		4. A detailed example	107
	-	5. Comments on the detailed example	1/1
	D.	Estimation of the expectation of life at age 5 and of the death rate over	
		age 5 from the proportion under age 15 and the rate of increase	172
		1. Basis of method and its rationale	172
		2. Data required	173
		3. Computational procedure	173
		4. A detailed example	174
		5. Comments on the detailed example	177
VIII	FST	IMATION OF FERTILITY BY REVERSESURVIVAL METHODS	178
v III.		Background of methods	178
	л.	1 Meaning of reverse survival	178
		2. Organization of this shorter	178
	D	2. Organization of this chapter	1/0
	D.	Estimation of onut fates by reverse survivar of the population under age	170
		IV	170
k.		1. Basis of method and its rationale	190
		2. Data required	100
		3. Computational procedure	100
	~	4. A detailed example	101
	C.	The own-children method of fertility estimation	182
		I. Basis of method and its rationale	182
		2. Data required	183
		3. Computational procedure	184
		4. A detailed example	187
IX.	Est	TIMATION OF ADULT MORTALITY USING SUCCESSIVE CENSUS AGE DISTRI-	
	BUT	TIONS	196
	Α.	Background of methods	196
		1. Use of a sequence of population age distributions	196
		2. Organization of this chapter	196
	R	Estimation of mortality from intercensal survivorship probabilities	197
	<u> </u>	1. Basis of methods and their rationale	197
		2 Intercensal survivorship ratios for five-year age cohorts smoothed	•
		using the Coale-Demeny life tables	197
		(a) Data required	197
		(b) Computational procedure	198
		(a) First detailed example: Papama 1960-1970	199
		(d) Second detailed example: Colombia 1051-1064	201
		(a) Second detaned example. Colombia, 1751-1704	-01

#### Chapter

.

#### Page

	3.	Intercensal survivorship ratios for five-year age cohorts smoothed by	204
		use of the logit system	207
		(a) Data required	204
		(b) Computational procedure	204
		(c) First detailed example: Panama, 1960-1970	205
		(d) Second detailed example: Colombia, 1951-1964	207
	4.	Intercensal mortality estimated by using projection and cumulation	208
		(a) General characteristics of method	208
		(b) Data required	209
		(c) Computational procedure	209
		(d) A detailed example: Panama, 1960-1970	210
С	Int	ercensal survival with additional information on the age pattern of	
<b>U</b> .	ma	ortality	212
	1.	Basis of method and its rationale	212
	2	Data required	213
	2	Computational procedure	213
	J.	A detailed example	214
n	ч. Ес	A usualized example	~
D.	ES	amation of a post-childhood me table nom an age distribution and	218
	1110	Desis of mothed and its rationale	210
	1.	Basis of method and its rationale	210
	2.	Data required	219
	3.	Computational procedure	219
	4.	A detailed example: Panama, 1960-1970	220

# ANNEXES

I.	The singulate mean age at marriage	225
II.	The El-Badry correction for data on children ever born	230
III.	The mean age of childbearing	230
IV.	Linear interpolation	239
<b>V</b> .	Smoothing of an age distribution	24
VI.	Adult survivorship ratios from Coale-Demeny model life tables for use with adult mortality estimates from orphanhood	25
VII.	Adult survivorship ratios from Coale-Demeny model life tables for use with adult mortality estimates from widowhood	25
VIII.	Values of probability of surviving from birth, from Coale-Demeny model life tables for females, males and both sexes combined	26
IX.	Values of probability of surviving for both sexes combined, for ages up to 15, from Coale-Demeny model life tables using different sex ratios at birth	27:
<b>X</b> .	Five-year and ten-year survivorship probabilities from Coale-Demeny model life tables	28
XI.	Logit values by single year of age for Coale-Demeny female level 16 model life tables.	30
XII.	Glossary	30

### LIST OF TABLES

		Page
1.	Schematic guide to Manual X	6
2.	Logit values for the Brass general standard life table	19
3.	Standard pattern of natural fertility and of deviations from natural fertility, by age group, for the Coale and Trussell fertility model	24
4.	Values of the $\eta$ transformation of a standard fertility schedule, $\eta(F(x))$	26
5.	Schematic guide to contents of chapter II	30
6.	Correspondence between indices and age groups	33
7.	Coefficients for interpolation between cumulated fertility rates to estimate par- ity equivalents	34
8.	Coefficients for calculation of weighting factors to estimate age-specific fertili- ty rates for conventional age groups from age groups shifted by six months	34
9.	Children ever born and births in the past year, by age group of mother, Ban- gladesh, 1974	35
10.	Average parities, period fertility rates and cumulated fertility, by age group of mother, Bangladesh, 1974	35
11.	Average parities, estimated parity equivalents and $P/F$ ratios, Bangladesh, 1974	36
12.	Reported period fertility rates, fertility rates for conventional age groups, ad- justed fertility rates and estimated number of births, Bangladesh, 1974	36
13.	Number of women, number of women with at least one child and number of first births during the 12 months preceding the survey, by age group, Bangladesh, 1974	39
14.	Proportion of women with at least one child, period first-birth fertility rates and cumulated first-birth fertility schedule, by age group, Bangladesh, 1974	39
15.	Reported and equivalent proportions of mothers, by age group, and $P_1/F_1$ ratios, Bangladesh, 1974	40
16.	Female population, children ever born and registered births, by age group of women, Thailand, 1960 and 1970	43
17.	Reported average parities, 1960 and 1970, and parities for the hypothetical in- tercensal cohort, by age group, Thailand	43
18.	Age-specific fertility rates, 1960 and 1970, and average fertility rates for the in- tercensal period, Thailand	44
19.	Cumulated fertility schedule, parity equivalents, hypothetical-cohort parities, $P/F$ ratios and adjusted intercensal fertility rates, Thailand, 1960-1970	44
<b>20</b> .	Separation factors for splitting annual age-specific fertility rates by cohort	48
21.	Registered births, by five-year age group of mother, Thailand, 1950-1969	49
22.	Total population and female population aged 15-34, by age group, for the census years 1947, 1960 and 1970; children ever born in 1970 and adjusted population in 1970, Thailand	49
23.	Age-specific growth rates for the female population, 1947-1960 and 1960-1970, after adjustment, Thailand	50

- 7

		Page
24.	Estimated mid-year female population, by age group, Thailand, 1950-1969	50
25.	Age-specific fertility rates calculated from registered births and interpolated mid-year female population, Thailand, 1950-1969	51
26.	Calculation of parity equivalents for different female birth cohorts, Thailand, 1950-1969	52
27.	Contributions to cohort fertility by age group and five-year period, Thailand, 1950-1969	54
28.	Estimates of completeness of birth registration, Thailand, 1969	54
29.	Reported average parities, 1960 and 1970; and cohort parity increments dur- ing the intercensal period, Thailand	56
30.	Contributions of period fertility to intersurvey cohort fertility by five-year period and estimated intersurvey increments in cohort fertility, Thailand, 1960-1969	57
31.	Estimates of completeness of birth registration, Thailand, 1960-1969	57
32.	Female population and children ever born, by age group, Thailand, 1960, 1970 and 1975	61
33.	Average parities for 1960 and 1970, cohort parity increments and average par- ities for the intersurvey hypothetical cohort, Thailand	61
34.	Average parities for the hypothetical cohort, estimated schedule of cumulated fertility-and age-specific fertility rates, Thailand, 1960-1970	62
35.	Average parities for 1970 and 1975, cohort parity increments and hypothetical cohort average parities, Thailand	63
36.	Hypothetical-cohort average parities, estimated schedule of cumulated fertility and age-specific fertility rates, Thailand, 1970-1975	63
37.	Expected average parities for selected values of the youngest age at which a significant number of women marry and of the female singulate mean age at marriage when marital fertility is experienced at the level indicated in table 38.	67
38.	Age-specific marital fertility rates when natural fertility is experienced at the standard level	67
<b>39</b> .	Children ever born and ever-married women, by time elapsed since first mar- riage, Egypt, 1976	67
40.	Never-married women and total number of women, by age group, Egypt, 1976	68
41.	Reported and expected average parities, by duration of marriage, Egypt, 1976	68
42.	Calculation of expected average parities by duration group, Egypt, 1976	68
43.	Adjusted marital fertility and estimated age-specific fertility rates and number of births, Egypt, 1976	69
44.	Ever-married women, children ever born and births in the year preceding the survey, by time elapsed since first marriage, 1976	71
45.	Cumulated fertility schedule, parity equivalents and ratios of average parities to parity equivalents, by time elapsed since first marriage, 1976	71
46.	Schematic guide to contents of chapter III	76

		Page
47.	Coefficients for estimation of child mortality multipliers, Trussell variant, when data are classified by age of mother	77
48.	Coefficients for estimation of the reference period, $t(x)$ , to which the values of $q(x)$ estimated from data classified by age refer	78
<b>49</b> .	Children ever born and children surviving, by sex and age of mother, Panama, 1976	78
50.	Average parity per woman, by sex of child and age of mother, Panama, 1976	<b>79</b>
51.	Proportions of children dead, by sex of children and age of mother, Panama, 1976	79
52.	Trussell's multipliers for child mortality estimation, West model; Panama, 1976	79
53.	Estimates of probabilities of dying and of surviving, by sex, derived from child survival data classified by age of mother, West model; Panama, 1976	80
54.	Estimates of the reference period to which the estimated probabilities of dying refer, West model; Panama, 1976	80
55.	Mortality levels in the West model life tables consistent with the childhood mortality estimates, $q(x)$ , Panama, 1976	81
56.	Coefficients for estimation of child mortality multipliers, Trussell variant, when data are classified by duration of marriage	82
57.	Coefficients for estimation of the reference period, $t(x)$ , to which the values of $q(x)$ estimated from data classified by duration of marriage refer	83
58.	Children ever born and children surviving, by sex of child and marriage dura- tion of mother, Panama, 1976	84
59.	Average parities, by sex of children and marriage duration of mother, Pana- ma, 1976	84
<b>6</b> 0.	Proportions of children dead, by sex of child and marriage duration of mother, Panama, 1976	84
61.	Multipliers for the proportions of children dead tabulated by duration of mar- riage, assuming a West mortality pattern, Panama, 1976	84
62.	Estimates of probabilities of dying and of surviving, by sex, derived from child survival data classified by duration of marriage, West model; Panama, 1976	85
63.	Estimates of the reference period, $t(x)$ , to which the estimated probabilities of dying refer, West model, Panama, 1976	85
64.	Mortality levels in the West model life tables consistent with the duration- based estimates of child mortality, Panama, 1976	85
65.	Number of women, children ever born and children dead, by age group, Thai- land, 1970 and 1975	87
66.	Average number of children ever born and children dead per woman, by age group of mother, Thailand, 1970 and 1975	88
67.	Average number of children ever born and children dead per woman of a hypothetical intersurvey cohort, by age of mother, Thailand, 1970-1975	88
68.	Child mortality estimates, Thailand, period 1970-1975	89

		Pa
69.	Child mortality estimates, Thailand, 1975	1
70.	Coefficients for estimation of the multipliers, $k(i)$ , from the experience of true cohorts when data are classified by age of mother and the intersurvey interval is five years	1
71.	Coefficients for estimation of the multipliers, $k(i)$ , from the experience of true cohorts when data are classified by age of mother and the intersurvey interval is 10 years	1
72.	Coefficients for estimation of the multipliers, $k(i)$ , from the experience of true cohorts when data are classified by duration of marriage and the intersurvey interval is five years.	9
73.	Coefficients for estimation of the multipliers, $k(i)$ , from the experience of true cohorts when data are classified by duration of marriage and the intersurvey interval is 10 years.	
74.	Coefficients needed to estimate the reference period, $t(x)$ , from the experience of true cohorts when data are classified by age and the intersurvey interval is five years	
75.	Coefficients needed to estimate the reference period, $t(x)$ , from the experience of true cohorts when data are classified by age and the intersurvey interval is 10 years	
, 76.	Coefficients needed to estimate the reference period, $t(x)$ , from the experience of true cohorts when data are classified by marriage duration and the intersurvey interval is five years.	
77.	Coefficients needed to estimate the reference period, $t(x)$ , from the experience of true cohorts when data are classified by marriage duration and the intersurvey interval is 10 years	
78.	Estimation of child mortality from 1975 data taking into account the fertility experience of cohorts, Thailand	
<b>79</b> .	Data on children ever born and surviving, Brazil, 1960 and 1970	
80.	Child mortality estimation using multipliers based on the West mortality pat- tern, Brazil, 1960	
81.	Child mortality estimation using multipliers based on the West mortality pat- tern, Brazil, 1970	
82.	Child mortality estimation for the intercensal period 1960-1970, with 1960 data on children ever born corrected for inclusion of stillbirths, Brazil	
83.	Intercensal estimates of child mortality, Brazil, 1960-1970	
84.	Child mortality estimation taking into account the experience of true cohorts, Brazil, 1970	
85.	Schematic guide to contents of chapter IV	
86.	Weighting factors, $W(n)$ , for conversion of proportions of respondents with mother alive into survivorship probabilities for females	1
87.	Weighting factors, $W(n)$ , for conversion of proportions of respondents with father alive into survivorship probabilities for males	1
88.	Values of the standard function for calculation of the time reference for in- direct estimates of adult survivorship	1

.

#### Page

<b>89</b> .	Data on maternal orphanhood status and proportions of respondents with mother alive, Bolivia, 1975
<b>90</b> .	Children born during the 12 months preceding the survey, by age of mother at time of the survey, Bolivia, 1975
91.	Estimation of female adult survivorship from proportions of respondents with surviving mother, using the Brass method, Bolivia, 1975
<b>92</b> .	Estimation of time reference periods for survivorship estimates derived from maternal orphanhood data, Bolivia, 1975
<b>93</b> .	Coefficients for estimation of female survivorship probabilities from age 25 from proportions with surviving mother
<b>94</b> .	Calculation of female survivorship probabilities from age 25 using proportions with surviving mothers and the regression method, Bolivia, 1975
<b>95</b> .	Estimation of time reference periods for survivorship probabilities derived from maternal orphanhood data using the regression method, Bolivia, 1975
<b>96</b> .	Calculation of proportions not orphaned for a hypothetical intersurvey cohort, constructed example
<b>9</b> 7.	Coefficients for estimation of conditional male survivorship probabilities from data on the widowhood status of female respondents
<b>98</b> .	Coefficients for estimation of conditional female survivorship probabilities from data on the widowhood status of male respondents
<b>99</b> .	Ever-married female population and number of women whose first husband was dead at time of interview, by age group, Bolivia, 1975
1 <b>0</b> 0.	Estimation of male survivorship probabilities from information on survival of first husband, Bolivia, 1975
101.	Estimation of time reference periods for male survivorship probabilities derived from information on survival of first husband, Bolivia, 1975
102.	Coefficients for estimation of conditional male survivorship probabilities from the widowhood status of female respondents, classified by duration of mar- riage
103.	Coefficients for estimation of conditional female survivorship probabilities from the widowhood status of male respondents, classified by duration of mar- riage
104.	Data on survivorship status of first wife, male respondents, Panama, 1976
105.	Estimation of adult female survivorship probabilities from male data on sur- vival of first spouse, by duration of marriage, Panama, 1976
106.	Estimation of time reference periods for female survivorship probabilities derived from male widowhood data, Panama, 1976
107.	Coefficients for estimation of female survivorship probabilities from birth on the basis of proportions of respondents with mother alive
108.	Standard ratio values to be used in estimation of survivorship probabilities from birth on the basis of data on maternal orphanhood, Coale-Demeny models

Page

,

109.	Female children ever born and surviving according to the National Demo- graphic Survey, Bolivia, 1975	120
110.	Estimation of child mortality for females, Bolivia, 1975	120
111.	Estimation of female survivorship probabilities from birth using information on orphanhood by age of respondent, Bolivia, 1975	120
112.	Coefficients for estimation of male survivorship from birth from proportions of women with surviving first husband, classified by age	123
113.	Coefficients for estimation of female survivorship from birth from proportions of men with surviving first wife, classified by age	123
114.	Values of the standard ratio, RSW, indicating the relationship between child and adult mortality in estimation of survivorship probabilities from birth on the basis of widowhood data, Coale-Demeny models	123
115.	Data on widowhood status of males obtained in National Demographic Survey, Bolivia, 1975	124
116.	Estimation of time reference periods for conditional survivorship probabilities for females, Bolivia, 1975	125
117.	Estimation of female survivorship from birth using data on male widowhood status, Bolivia, 1975	125
118.	Coefficients for estimation of male survivorship from birth from proportions of women with surviving first husband, classified by duration of first marriage	126
119.	Coefficients for estimation of female survivorship from birth from proportions of men with surviving first wife, classified by duration of first marriage	126
120.	Estimation of female survivorship probabilities from birth using data on widowhood status of male respondents, classified by duration of marriage, Panama, 1976	128
121.	West mortality levels implied by the estimates of child mortality obtained from data classified by duration of marriage, Panama, 1976	128
122.	Schematic guide to contents of chapter V	130
123.	Coefficients for estimation of the age factor for the open interval, $z(A)$ , from the ratio of deaths over age 45 to deaths over age 10 and the population growth rate.	134
124.	Female population and deaths by age, El Salvador, 1961	135
125.	Intercensal growth rates for females, El Salvador, 1950-1971	135
1 <b>26</b> .	Values of reported deaths, estimated population for different ages and ratios of estimated to reported population, females, El Salvador, 1961	136
127.	Age distribution of male population, central death rates and derived numbers of deaths, by age group, Andra Pradesh State, India, 1970 and 1971	138
128.	Values of reported deaths, estimated population for different ages and ratios of estimated to reported population, males, Andra Pradesh State, India, 1970-1971	138
1 <b>29</b> .	Elements needed to estimate completeness of death registration among adult females, El Salvador, 1961	143

130.	Partial death and birth rates for females, El Salvador, 1961	143
131.	Fitting of a straight line by group means, females, El Salvador, 1961	144
132.	Estimation of an adjustment factor, K, by use of trimmed means, females, El Salvador, 1961	145
133.	Values of population at different ages, reported deaths and partial birth and death rates for males, Andra Pradesh State, India, 1970-1971	145
134.	Schematic guide to contents of chapter VI	147
135.	Childhood survivorship probabilities for females, estimated using Trussell coefficients with data classified by age and by marriage duration of mother, Panama, 1976	149
136.	Female survivorship probabilities estimated from data on the widowhood status of male respondents classified by duration of marriage, Panama, 1976	149
137.	Logit transformation of the estimated and standard survivorship probabilities, Panama, 1976	149
138.	Estimated smoothed life-table survivorship probabilities for females obtained by use of different smoothing and linkage methods, Panama, 1976	151
139.	Estimated conditional female survivorship probabilities, $l(x)/l(20)$ , and corresponding mortality levels in the West family of model life tables, Panama, 1976	152
140.	Iteration process to estimate the $\alpha$ and $\beta$ parameters defining a life table for females in the logit system generated by the general standard, Panama, 1976	153
141.	Estimation of average birth rate over the 15-year period preceding enumera- tion from the proportion of the population under age 15, $C(15)$ , the probabili- ty of surviving to age 5, $l(5)$ , and the constant rate of natural increase, $r$ , for selected non-stable populations	157
142.	Schematic guide to contents of chapter VII	158
143.	Age distribution and fitted birth-rate estimates for males, Brazil, 1960	161
144.	Population under exact age x, $N(x-1)$ , by sex, Brazil, 1960	169
145.	Identification of the stable population determined by the reported proportion under age 15 at level 13.16, Brazil, 1960	170
146.	Estimation of the gross reproduction rate by interpolation between the female, South model stable populations, Brazil, 1960	172
147.	Death rate over age 5 and expectation of life at age 5 in selected model stable populations with a proportion under age 15, $C(15)$ , of 0.4195 and a rate of increase, $r$ , of 0.025	173
148.	Total population of Colombia according to its censuses	174
149.	Population by age group and sex, Colombia, 1951	174
150.	Cumulated proportion under age $x$ for males and females, and corresponding birth rates in fitted stable populations, West model, females, level 13; Colombia, 1951	175

#### Page

151.	Identification of the female stable population, West model, consistent with a proportion under age 15, $C(15)$ , of 0.4256 and a growth rate, $r$ , of 0.0219, Colombia, 1951	176
152.	Number of baptisms, by sex and year of occurrence, Colombia, 1950-1952	176
153.	Schematic guide to contents of chapter VIII	178
154.	Values of person-years lived from exact age $x$ to $x + 5$ by a stationary population, South model life tables	181
155.	Estimation of number of births by reverse survival, Brazil, 1960	181
156.	Total population at census dates and intercensal growth rates by sex, Brazil	181
157.	Birth rates by sex, estimated by reverse survival, Brazil, 1960	182
158.	Birth rates for both sexes combined, estimated by reverse survival, Brazil, 1960	182
159.	Values of parameters $\alpha$ and $\beta$ determining the Coale-Demeny model life tables for childhood in the logit system generated by female level 16 in the corresponding family	185
160.	Values of parameters $\alpha$ and $\beta$ determining the Coale-Demeny model life tables for adult females in the logit system generated by female level 16 in the corresponding family	186
161.	Own-children data, with children classified by single year of age and single year of age of mother, Colombia, 1978	187
162.	Values of the expansion factors, $K_x$ , used in adjustment of own-children data for the existence of children without mother, Colombia, 1978	188
163.	Estimates of probabilities of surviving, $l(x)$ and ${}_{1}L_{x}$ , for children, North model, Colombia, 1978	189
1 <b>64</b> .	Coefficients for estimation of separation factors for age group 0-1, Coale- Demeny model life tables	189
165.	Estimates of probabilities of surviving, $l(x)$ and ${}_{1}L_{x}$ , for adult females, West model, Colombia, 1978	190
1 <b>66</b> .	Estimated number of births in single-year periods, by single year of age of mother, Colombia, 1963/64-1977/78	191
167.	Estimated number of women in single-year periods, by single-year age of woman, Colombia, 1963/64-1977/78	192
168.	Estimated single-year fertility rates, by single-year age of woman, Colombia, 1963/64-1977/78	194
169.	Estimated single-year fertility rates, by five-year age group, Colombia, 1963/64-1977/78	195
170.	Estimated three-year fertility rates, by five-year age group, Colombia 1964- 1978	195
171.	Schematic guide to contents of chapter IX	197
172.	Coefficients for estimation of stationary-population age distribution, ${}_{5}L_{x}$ , for unconventional age groups	199

173.	Enumerated and adjusted female population in 1960, enumerated population in 1970 and cohort survivorship ratios, Panama	200
174.	Determination of the mortality level implied by each cohort survivorship ra- tio, Panama, 1960-1970	201
175.	Completion of an intercensal life table using the Coale-Demeny model life tables, Panama, 1960-1970	201
176.	Female population by age group, 1951 and 1964; adjusted female population, 1964; and cohort survivorship ratios, Colombia	202
177.	Steps in estimation of the mortality level to which each cohort survivorship ra- tio corresponds in the West model, Colombia, 1951-1964	203
178.	Application of smoothing procedure based on the logit system to the cohort survivorship ratios for the period 1960-1970, Panama	206
179.	Smoothing of female cohort survivorship ratios by use of the logit life-table system, Colombia, 1951-1964	208
180.	Projection of the initial female population over 10 years using different mor- tality levels, Panama, 1960-1970	211
181.	Weighting factors for approximation of cohort deaths for intervals that are not multiples of five	214
182.	Female population, 1960 and 1970; and registered deaths of females, 1960, 1965 and 1970; by age group, Panama	215
183.	Estimated cohort deaths, female population, Panama, 1960-1970	215
184.	Cohort population ratios, $N1/N2$ , and ratios of cohort deaths over population, $D/N2$ , for different types of cohorts, Panama, 1960-1970	217
185.	Coefficients for estimation of the equivalent growth rate over age $A,\rho(A)$ , from the growth rate over age 10 and the ratio of the population over age 45 to the population over age 10	219
186.	Estimation of intercensal mortality for females, using intercensal growth rates, Panama, 1960-1970	221
187.	Population by age group, sex and marital status, Panama, 1976	225
188.	Proportions single ignoring those of unknown marital status, Panama, 1976	226
189.	Proportions single assuming that those of unknown marital status are ever married, Panama, 1976	226
190.	Female proportions single, 1955 and 1960; and estimated proportions single in a hypothetical intersurvey cohort, Japan	227
191.	Female proportions single, 1966 and 1976; and estimated proportions single in a hypothetical intersurvey cohort, Tunisia	228
192.	Female population according to different responses concerning children ever born, Peru, 1972	231
193.	Fitting of a straight line by using group means, Peru, 1972	232
1 <b>94</b> .	Estimated proportions childless and estimated total female population with known parity, Peru, 1972	233

195.	Female population according to different responses concerning children ever born, Thailand, 1970	234
1 <b>96</b> .	Reported proportions childless and of parity not stated among ever-married women, Thailand, 1970	234
<b>197</b> .	Adjusted data using proportions among ever-married women, Thailand, 1970	234
198.	Adjusted data using proportions among all women, based on an incorrect as- sumption, Thailand, 1970	235
199.	Standard natural fertility schedule for married women	236
200.	Proportions of women by marital status, number of women and children born in 1961	237
201.	Calculation of mean age of childbearing by the direct method	237
202.	Estimation of mean age of childbearing, $\mu$ , by using method 2	238
203.	Male population, by single year of age, Sri Lanka, 1975	242
204.	Adjustment for heaping of the male age distribution, Sri Lanka, 1975	243
205.	Estimation of an adjusted male age distribution by using Y-transformations and the West model stable population as standard, Sri Lanka, 1975	245
206.	Adjustment of two consecutive enumerations of the female population using cohort survival, Turkey, 1955 and 1960.	248
207.	Female adult survivorship probabilities from age 25, $l(N)/l(25)$ , for maternal orphanhood analysis, North model	250
208.	Female adult survivorship probabilities from age 25, $l(N)/l(25)$ , for maternal orphanhood analysis, South model	250
209.	Female adult survivorship probabilities from age 25, $l(N)/l(25)$ , for maternal orphanhood analysis, East model	251
210.	Female adult survivorship probabilities from age 25, $l(N)/l(25)$ , for maternal orphanhood analysis, West model	251
211.	Male adult survivorship probabilities from age 32.5, $l(N)/l(32.5)$ , for paternal orphanhood analysis, North model	252
212.	Male adult survivorship probabilities from age 32.5, $l(N)/l(32.5)$ , for paternal orphanhood analysis, South model	252
213.	Male adult survivorship probabilities from age 32.5, $l(N)/l(32.5)$ , for paternal orphanhood analysis, East model	253
214.	Male adult survivorship probabilities from age 32.5, $l(N)/l(32.5)$ , for paternal orphanhood analysis, West model	253
215.	Male adult survivorship probabilities from age 37.5, $l(N)/l(37.5)$ , for paternal orphanhood analysis, North model	254
216.	Male adult survivorship probabilities from age 37.5, $l(N)/l(37.5)$ , for paternal orphanhood analysis, South model	254
217.	Male adult survivorship probabilities from age 37.5, $l(N)/l(37.5)$ , for paternal orphanhood analysis, East model	255

		Page
218.	Male adult survivorship probabilities from age 37.5, $I(N)/I(37.5)$ , for paternal orphanhood analysis, West model	255
219.	Female adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first wife, North model	256
220.	Female adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first wife, South model	256
221.	Female adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first wife, East model	257
222.	Female adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first wife, West model	257
223.	Male adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first husband, North model	258
224.	Male adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first husband, South model	258
225.	Male adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first husband, East model	259
226.	Male adult survivorship probabilities from age 20, $l(N)/l(20)$ , for analysis based on survival of first husband, West model	259
227.	Female probability of surviving from birth, $l(x)$ , North model	260
228.	Male probability of surviving from birth, $l(x)$ , North model	261
<b>229</b> .	Probability of surviving from birth, $l(x)$ , for both sexes combined, North model	262
230.	Female probability of surviving from birth, $l(x)$ , South model	263
231.	Male probability of surviving from birth, $l(x)$ , South model	264
232.	Probability of surviving from birth, $l(x)$ , for both sexes combined, South model	265
233.	Female probability of surviving from birth, $l(x)$ , East model	266
234.	Male probability of surviving from birth, $l(x)$ , East model	267
235.	Probability of surviving from birth, $l(x)$ , for both sexes combined, East model	268
236.	Female probability of surviving from birth, $l(x)$ , West model	269
237.	Male probability of surviving from birth, $l(x)$ , West model	270
238.	Probability of surviving from birth, $l(x)$ , for both sexes combined, West model	271
239.	North model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.02	272
240.	North model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.03	272
241.	North model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.04	273

Page

242.	North model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.05	273
243.	North model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.06	274
244.	North model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.07	274
245.	South model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.02	275
246.	South model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.03	275
247.	South model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.04	276
248.	South model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.05	276
249.	South model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.06	277
250.	South model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.07	277
251.	East model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.02	278
252.	East model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.03	278
253.	East model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.04	279
254.	East model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.05	27 <del>9</del>
255.	East model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.06	280
256.	East model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.07	280
257.	West model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.02	281
258.	West model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.03	281
259.	West model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.04	282
<b>260</b> .	West model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.05	282
261.	West model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.06	283
262.	West model values for probability of surviving from birth, $l(x)$ , for ages up to 15, both sexes combined: sex ratio at birth of 1.07	283

xxii

÷

		Page
<b>263</b> .	Female five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , North model	284
264.	Female five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , South model	285
265.	Female five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , East model	286
<b>266</b> .	Female five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , West model	287
<b>267</b> .	Male five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , North model	288
268.	Male five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , South model	289
<b>269</b> .	Male five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , East model	290
270.	Male five-year survivorship probabilities, ${}_{5}S_{x,x+4}$ , West model	<b>29</b> 1
271.	Female 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , North model	292
272.	Female 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , South model	<b>29</b> 3
273.	Female 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , East model	<b>294</b>
274.	Female 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , West model	<b>295</b>
275.	Male 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , North model	296
276.	Male 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , South model	<b>29</b> 7
277.	Male 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , East model	<b>29</b> 8
278.	Male 10-year survivorship probabilities, ${}_{10}S_{x, x+4}$ , West model	<b>299</b>
279.	Logit transformation of the complement of the probability of surviving, $1-i(x)$ , North model	300
280.	Logit transformation of the complement of the probability of surviving, $1-i(x)$ , South model	300
281.	Logit transformation of the complement of the probability of surviving, $1-i(x)$ , East model	301
<b>282</b> .	Logit transformation of the complement of the probability of surviving, $1-I(x)$ , West model	301

#### LIST OF FIGURES

Page

1.	Relative deviations of North model values for the probability of dying, $_n q_x$ , from those of the West model for females, level 9	14
2.	Relative deviations of South model values for the probability of dying, $_n q_x$ , from those of the West model for females, level 9	14
3.	Relative deviations of East model values for the probability of dying, $_n q_x$ , from those of the West model for females, level 9	15
4.	Relative deviations of the North, South and East values for the probability of dying, $_n q_x$ , with respect to those of the West model for females, level 9	15
5.	Life tables derived through the logit system, letting $\beta = 1.0$ and using the Brass general standard	18
6.	Life tables derived through the logit system, letting $\alpha = 0.0$ and using the Brass general standard	18
7.	Comparison of the mortality patterns in the United Nations model life tables for developing countries with the West family of the Coale and Demeny set	20
8.	Coale and Trussell fertility schedules: combinations of early marriage and various degrees of fertility control; and late marriage with the same degrees of fertility control.	24
9.	Fertility schedules generated through the Gompertz relational model with $\beta = 1.0$	25
10.	Fertility schedules generated through the Gompertz relational model with $\alpha = 0.0$	26
11.	Illustration of the effects of deviations from the assumptions on the plot of estimated to reported population ratios, $N/N$ , for model cases	131
12.	Plot of ratios of estimated to reported female population, El Salvador, 1961	137
13.	Plot of ratios of estimated to reported male population, Andra Pradesh State, India, 1970-1971	139
14.	Plot of partial birth rates, $N(x)/N(x+)$ , against partial death rates, $D(x+)/N(x+)$ , for females, El Salvador, 1961	144
15.	Plot of partial birth rates, $N(x)/N(x+)$ , against partial death rates, $D(x+)/N(x+)$ , for males, Andra Pradesh State, India, 1970-1971	146
16.	Plot of the logit transformation of the estimated female survivorship probabili- ties, $l(x)$ , against those of the general standard, Panama, 1976	150
17.	Comparison of age distributions of different stable populations, West model	160
18.	Plot of the estimated birth-rate, $b(x)$ , sequence based on the model stable male populations, West family, level 13; Brazil, 1960	162
19.	Birth-rate estimates, $b(x)$ , obtained from the proportions under age $x$ , $C(x)$ , in different populations	163
20.	Sequences of birth-rate estimates, $b(x)$ , derived from female, West model stable populations of level 13; Colombia, 1951	175
м.	Plot of the logit transformation of the estimated survivorship function, $l(x)$ , against that of the standard, West model for females, level 18; Panama	206

		1 424
22.	Plot of the logit transformation of the estimated survivorship function, $l(x)$ , against that of the standard, West model for females, level 15; Colombia	209
23.	Plots of cohort population ratios, $N1/N2$ , against ratios of cohort deaths over population, $D/N2$ , for various types of cohorts	216
24.	Estimation of the true level of non-response on the subject of children ever born, Peru, 1972	232
25.	Estimation of the true level of non-response on the subject of children ever born, Thailand, 1970	234
26.	Plot of the Y-transformation of the proportions under age $x$ in the reported population against the $Y =$ transformation of the equivalent proportions in the standard, Sri Lanka, 1975	245
27.	A comparison of the results of different adjustment procedures for male age distribution, Sri Lanka, 1975	246

#### **Explanatory notes**

The following symbols have been used in the tables throughout the report:

Three dots (...) indicate that data are not available or are not separately reported.

A hyphen (-) indicates that the item is not applicable.

A dash (-) indicates that the amount is nil or negligible.

A minus sign (-) indicates a deficit or decrease, except as indicated.

A full stop (.) is used to indicate decimals.

A slash (/) indicates a crop year or financial year, e.g., 1970/71.

Use of a hyphen (-) between dates representing years, e.g., 1971-1973, signifies the full period involved, including the beginning and end years.

Details and percentages in tables do not necessarily add to totals, because of rounding.

Reference to "dollars" (\$) indicates United States dollars, unless otherwise stated.

Reference to "billion" indicates a thousand million.