In 1983 estimates of the levels and trends of infant mortality for all the countries of the world were first published by the Population Division of the Department of International Economic and Social Affairs of the United Nations Secretariat, with the support and encouragement of the United Nations Children's Fund (UNICEF) and the assistance of the World Health Organization (WHO) and the United Nations regional commissions (United Nations, 1983a). Since then, those estimates and projections have been updated twice by the United Nations (United Nations, 1986 and 1988). Recently, an additional indicator of child mortalitynamely, mortality of children under the age of 5-was added (United Nations, 1988). Because of the lack of reliable vital-registration statistics in most developing countries, the available estimates are often obtained by the use of indirect estimation methods.

Aware of the possible problems in the interpretation and use of such methods, UNICEF, which has played an important role in disseminating information about levels and trends of mortality in childhood, requested the Population Division of the United Nations Secretariat to prepare the present guide to the estimation of child mortality in order to familiarize a wide audience with the estimation methods most commonly used and their strengths and limitations.

From a demographic perspective, the *Guide* is closely related to the series of Population Division manuals

aimed at promoting widespread understanding and use of the estimation methods developed in the various population fields. Though the *Guide* is simpler and less comprehensive than other manuals covering similar topics, it does not sacrifice substance to simplification and thus provides a solid basis for understanding all the intricacies of the methods available. It is thus useful both for the demographer wishing to master those methods and for the non-demographer whose aim is to become familiar with their main traits.

To accompany the *Guide*, a program for microcomputers, named QFIVE, was prepared by the Population Division expressly to apply the Brass method as described here.* Special thanks are due to Kenneth Hill of Johns Hopkins University, who wrote a preliminary version of the *Guide*. It was later expanded by the Population Division, in order to make its contents more accessible to those who are not familiar with recent demographic techniques.

Acknowledgement is also due to UNICEF for providing part of the financial support that made the *Guide* possible.

^{*}Inquiries concerning the QFIVE program should be directed to the Director, Population Division, United Nations, New York, New York 10017.

CONTENTS

		Page
PREF/	ACE	111
INTRO	DUCTION	1
Chapte	er	
I.	INDICATORS OF MORTALITY IN CHILDHOOD	3
	Life tables	3
	Measurement of mortality in childhood	5
	Cohort versus period measures of mortality in childhood	6
	Model life tables	7
	Observed patterns of mortality in childhood and the model life tables	10
II.	DATA REQUIRED FOR THE BRASS METHOD	13
	Nature of the data required	13
	Children ever born and children dead	13
	Total female population of reproductive age	14
	Compilation of the data required	14
	The case of Bangladesh	14
III.	RATIONALE OF THE BRASS METHOD	22
	Allowing for the age pattern of child-bearing	22
	Derivation of the method	23
	Estimating time trends of mortality	23
	Limitations of the Brass method associated with its simplifying assumptions	23
IV.	TRUSSELL VERSION OF THE BRASS METHOD	25
	Computational procedure	25
	A detailed example	27
	Compilation of the data required	27
	Computational procedure	29
	Estimates of mortality in childhood by sex	32
V.	PALLONI-HELIGMAN VERSION OF THE BRASS METHOD	34
	Data required	34
	Computational procedure	34
	A detailed example	38
	Compilation of the data required	38
	Computational procedure	38
	Estimations of mortality in childhood by sex	45
VI.	INTERPRETATION AND USE OF THE ESTIMATES YIELDED BY THE BRASS METHOD	46
	Which version of the Brass method should one use?	46
	Use of information on the pattern of mortality in childhood to test the adequacy of	
	mortality models	46
	What are the consequences of using the "wrong" model?	48
	Analysis of data from successive censuses or surveys	50
	Overall observations on the use of the Brass method	53
vп	Brass Magnar METHOD	56
v II.	DRASS-MACKAE METHOD	56
	Derivation of the method and its rationale	57
	Limitations of the Bross Macroe method	57
	Application of the Brass-Macrae method	51
	Data required	51
	Computational procedure	51 50
	A datailed exemple	20 20
	A utilitie example	J0 50
	Comments on the results of the method	27

ANNEXES

I. Coale-Demeny model life table values for probabilities of dying between birth and exact age x , $q(x)$	61
II. United Nations model life table values for probabilities of dying between birth and exact age x , $q(x)$	68
III. Relationship between infant mortality, $q(1)$, and child mortality, $_4q_1$, in the Coale- Demeny mortality models	79
IV. Relationship between infant mortality, $q(1)$, and child mortality, $_4q_1$, in the United Nations mortality models	80
Notes Glossary References	81 82 83

TABLES

1.	Example of a life table
2.	Estimates of the probabilities of dying by ages 1 and 5, $q(1)$ and $q(5)$, by major
	region, 1950-1955, 1965-1970 and 1980-1985
3.	Correspondence between observed proportions of children dead by age group of
	mother and estimated probabilities of dying 23
4.	Coefficients for the estimation of child mortality multipliers, $k(i)$, Trussell version of
	the Brass method, using the Coale-Demeny mortality models
5.	Coefficients for the estimation of the time reference, $t(i)$, for values of $q(x)$, Trussell
	version of the Brass method, using the Coale-Demeny mortality models 27
6.	Calculation of the sex ratio at birth from data on children ever born, classified by sex,
	from the 1974 Bangladesh Retrospective Survey
7.	Application of the Trussell version of the Brass method to data on both sexes from the
	1974 Bangladesh Retrospective Survey
8.	Application of the Trussell version of the Brass method to data on males from the
	1974 Bangladesh Retrospective Survey
9.	Application of the Trussell version of the Brass method to data on females from the
	1974 Bangladesh Retrospective Survey
10.	Coefficients for the estimation of child-mortality multiplers, $k(i)$, Palloni-Heligman
	version of the Brass method, using the United Nations mortality models
11.	Coefficients for the estimation of the time reference, $t(i)$, for values of $q(x)$, Palloni-
	Heligman version of the Brass method, using the United Nations mortality models 3/
12.	Application of the Palloni-Heligman version of the Brass method to data on males
10	from the 19/4 Bangladesh Retrospective Survey
13.	Application of the Palloni-Heligman version of the Brass method to data on females
	from the 19/4 Bangladesh Retrospective Survey
14.	Application of the Palloni-Heligman version of the Brass method to data on both sexes
1.5	from the 1974 Bangladesh Retrospective Survey
15.	Comparison of estimated infant and under-five mortality in Bangladesn with the avail-
16	able mortality models
10.	Estimates of infant and under-five mortality in Bangladesn, obtained using the Coale-
17	Estimates of infant and under five mortality in Bangladesh, obtained using the United
17.	Nations mortality models 40
18	Estimation of under-five mortality in Tunisia from data from successive censuses
10.	using model West and the Trussell version of the Brass method 51
10	Estimation of under-five mortality in Ecuador from data from several sources using
19.	model West and the Trussell version of the Brass method
20	Estimation of the probability of dving, $q(x)$, for Bamako, Mali, using the Brass-
20.	Macrae method 58
21	Estimation of the probability of dving by age 2, $q(2)$, for Solomon Islands, using the
	Brass-Macrae method

FIGURES

1.	Typical shapes of the $1(x)$ and $1q_x$ functions of a life table	4
2.	Relation between cohort and period measures shown by a Lexis diagram	7

Page

3.	Relationship between infant mortality, $q(1)$, and child mortality, $_4q_1$, in the Coale-
	Demeny mortality models
4.	Relationship between infant mortality, $q(1)$, and child mortality, $_4q_1$, in the United
	Nations mortality models
5.	Comparison of country-specific estimates of infant and child mortality with the Coale-
	Demeny mortality models
6.	Comparison of country-specific estimates of infant and child mortality with the United
	Nations mortality models
7	Under-five mortality, $a(5)$, for both sexes in Bangladesh, estimated using model South
	and the Trussell version of the Brass method
8	Under-five mortality $a(5)$ for males and females in Bangladesh, estimated using
0.	model South and the Trussell version of the Brass method
9	Under-five mortality $a(5)$ for males in Bangladesh, estimated using the South Asian
	model and the Palloni-Heligman version of the Brass method
10	Under-five mortality $a(5)$ for males and females in Bangladesh, estimated using the
10.	South Asian model and the Palloni-Heligman version of the Brass method.
11	Comparison of the estimates of under-five mortality in Bangladesh, obtained using
	models South and South Asian
12	Infant and under-five mortality for both seves in Bangladesh estimated using the four
12.	Coale-Demeny mortality models
13	Infant and under-five mortality for both seves in Bangladesh estimated using the five
1.5.	United Nations mortality models
11	Bange of variation of the possible estimates of infant and under-five mortality for both
17.	saves in Bangladesh
15	Under five mortality for both seves in Tunisia, estimated using model West and the
1.).	Truscall version of the Brass method
16	Under five mortality for both saves in Ecuador, estimated using model West and the
10.	Truscall version of the Bross method

DISPLAYS

1.	Possible combinations for the compilation of the data on children ever born and chil-	
	dren dead by age of mother required by the Brass method	15
2.	Possible combinations for the compilation of the data on the total number of women	
	of reproductive age required by the Brass method	16
3.	Tabulation of data on children ever born and children surviving as appearing in the	
	report on the 1974 Bangladesh Retrospective Survey of Fertility and Mortality	17
4.	Tabulation of the female population by age group and marital status as appearing in	
	the report on the 1974 Bangladesh Retrospective Survey of Fertility and Mortality	18
5.	First step in the compilation of data on children ever born and children dead for	
	Bangladesh	19
6.	Second step in the compilation of data on children ever born and children dead for	
	Bangladesh	20
7.	Compilation of data on the total number of women by age group for Bangladesh	21
8.	Alternative compilation of data on the total number of women by age group for Bang-	
	ladesh (data rejected in the application of the Brass method)	21
9.	Worksheet for the compilation of data on births in a year by age group of mother for	
	the Palloni-Heligman version of the Brass method	35
10.	Tabulation of data on births in a year as appearing in the report on the 1974 Bang-	
	ladesh Retrospective Survey of Fertility and Mortality	41
11.	Compilation of data on births in a year by age group of mother for Bangladesh	42