CONTENTS

																				Page
INTRODUCTION .										•	•			•		•			•	vii

Chapter

I.	Тне	CONCEPT OF A STABLE POPULATION	
	Α.	Malthusian populations	1
	B.	Malthusian populations with known mortality (stable Malthusian populations).	2
	C.	Concept of a stable population considered as a limit	3
	D.	Study of the limit population on the basis of actual cases	3
	E.	A generalization of the concept of a limit stable population	8
	F.	Priority of the concept of a stable population	9
	G.	Malthusian populations with known age distributions	10
II.	Mai	THUSIAN POPULATIONS WITH KNOWN MORTALITY FUNCTIONS (SUB-SETS $H(r)$)	
	А.	Fundamental formulae:	
		Notation used	11
		Definitional relations among various functions	12
		Some confusions to be avoided	13
		Fundamental formulae for the female population	13
		Formulae for the male population	14
	В.	Determination of a population in a sub-set $H_0(r)$ (a Malthusian population whose	
		mortality function is known and which satisfies a given condition)	17
		First example: the rate of natural variation is known	17
		Second example: the female fertility function is known (stable population)	18
		Third example: the crude birth rate b_0 is known	30
		Fourth example: the crude death rate d_0 is known	31
		Fifth example: the age distribution $c(a_0)$ at a given age a_0 is known	33
		Sixth example: the age distribution of deaths $d(a_0)$ at a given age a_0 is known .	34
		Compatibility of a given age distribution of the population with a given mortality	35
		Compatibility of a given age distribution of deaths with a given mortality	38 39
		Effects of census and registration errors	39 39
		Reconsideration of the special case of stable populations	39 43
III.		LTHUSIAN POPULATIONS WITH KNOWN MORTALITY FUNCTIONS, CONSIDERED AS THE IT IN A DEMOGRAPHIC EVOLUTION	

•

А.	Introduction	٠	•	•	•	•	•	•	٠	٠	•	•	•	•	•	•	•	•	٠	•	٠	•	•	•	٠	4	45
	Various problems involved	•	•		• .	•			•	•	•		•	•	•	•	•	•	•		•	•	•	•	•	4	45
	Conditions of possibility .	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		46

Chapter

Page

	В.	Limit stable population	47 48 49
	C.	A limit Malthusian population with constant mortality and a constant and given crude birth rate	49
	D.	A limit Malthusian population with constant mortality and constant rate of natural variation	50
	E.	A limit Malthusian population with constant mortality and constant crude death rate	51
IV.	Ма	lthusian populations with known age distribution: sub-sets $F(r)$	
	Α.	Fundamental formulae	53
	В.	Populations of a sub-set $F(r)$ satisfying certain conditions	53
		First example: Malthusian population with age distribution $C_0(a)$ and given rate of variation r_0	53
		Second example: Malthusian population with given age distribution $C_0(a)$ and known survival ratio at a given age a_0	60
		Third example: Malthusian population with given age distribution $C_0(a)$ and known crude death rate d_0 .	61
		Fourth example: Malthusian population with given age distribution $C_0(a)$ and known age distribution of deaths at a given age $a_0 \ldots \ldots \ldots \ldots \ldots$	61
		Fifth example: Malthusian population with given age distribution $C_0(a)$ and known probability of dying at a given age $q(a_0)$	63
		Sixth example: Malthusian population with given age distribution $C_0(a)$ and known average death rate per five-year age group between the ages of 5 and 34	63
		Introduction of statistical variables	63
V.		DCESSES OF DEMOGRAPHIC EVOLUTION WHERE THE AGE DISTRIBUTION IS INVARIABLE: I-MALTHUSIAN POPULATIONS	
	А.	Introduction	67
		Sub-sets $H(r)$	67
		Sub-sets $F(r)$	67
	В.	Processes where the age structure is invariable	
		Definition of semi-Malthusian populations.	67
		Another definition of semi-Malthusian populations	68
		Relationship between semi-Malthusian populations and quasi-stable populations .	68
	_	Fertility in semi-Malthusian populations	68
	C.	Semi-Malthusian populations satisfying a given condition	68
	_	Examples using actual age structure	69
	D.	Reconsideration of the definition of Malthusian populations	70
VI.	SET	LTHUSIAN POPULATIONS WITH KNOWN AGE DISTRIBUTION OF DEATHS: THE SUB- S $G(r)$ and processes of demographic evolution with constant age distribution deaths	
	A.	Population of a sub-set $G_0(r)$ satisfying certain conditions	71
		First example: the rate of natural variation r is given	71
		rnst chample, the rate of hatural variation r is given	71
		Second example: the crude birth rate b_0 is given	
		Second example: the crude birth rate b_0 is given	73
		Second example: the crude birth rate b_0 is given	73 73
		Second example: the crude birth rate b_0 is given	73 73
	B.	Second example: the crude birth rate b_0 is given	71 73 73 74 74

Chapter

VII.	Тне	NETWORK OF INTERMEDIATE MODEL STABLE POPULATIONS	
	A.	Introduction	
	B.	The network of intermediate model stable populations	
	C.	Relationships among gross reproduction rate, expectation of life at birth, crude birth rate and crude death rate	
		Practical applications	
		A guideline	
		Age distribution of the population	
	D.	Age distribution and levels of mortality and fertility	
	E.	Correction of the age structure	I
	F.	Age structure and rate of natural variation	ł
	G.	Age structure of deaths	
	H.	Direct estimate of mortality by comparison of two censuses	í
	I.	Conclusion	1
VIII.	DE	VIATING NETWORKS OF MODEL STABLE POPULATIONS	
	Α.	Definition of deviating networks)
	В.	Summary comparison of the three networks)
	C.	Relations among gross reproduction rate, expectation of life at birth, stable birth rate and stable death rate	;
	D.	Age structure and levels of mortality and fertility	5
	E.	Correction of the age structure	3
	F.	Age structure and rate of natural variation	3
	G.	Age structure of deaths)
	H.	Estimated mortality by comparison of two census results	

H. Estimated mortality by comparison of two census results		
--	--	--

ANNEXES

I.	CALC	CULATION	OF THE TO	TAL	NU	MBER OF	THE POPULAT	ION,	ANNU	JAL BIR	THS	, A	INUAL G	ROWTH	
			DEATHS	IN	A	STABLE	POPULATION	ON	THE	BASIS	OF	A	GIVEN	INITIAL	
	POPU	JLATION													

Α.	Introduction	17
В.	Total number of the population	17
		17
	Annual births, deaths and growth	18
	The male population	18
	The reduced initial population	18
	Study of the functions $g(a)$ and $G(a)$ in the case of the human species \ldots 1	19
C.	Families of populations with constant mortality	21
		.22
		22
		23
		26
	Effects of the initial age structure on the envelope	26
	Growth potential of an age structure	28
D.	Families of populations with constant fertility	29
	Effects of changes in the age structure on the bundles of populations with constant	
	fertility	30
		30
	The case of fevels of more the expectation of me at onthe is ever of years	31
	Reconsideration of the gross stationary population.	32

v

Page

	Е.	Families of births	132
	F.	Families of growth.	132
	г. G.	Families of deaths	133
			134
	Н. -		101
	I.	Note on the values used in the various formulae in annex I for infinitely great values of the intrinsic rate of natural increase r	135
		The function $G(a)$	135
		The reduced initial net population	136
			136
		The mean age γ of the reduced initial net population	
		The envelope of families with constant mortality	136
II.	Mo	DEL LIFE TABLES	
	Α.	Introduction	139
	B.	The principle of model life tables	139
	C.	Deviations of actual mortality from the model life table	139
	D.	Components of mortality	142
	E.	Measuring the components of mortality.	142
	<u></u> . F.	Practical limits of variations in the components of mortality.	143
	G.	Model life tables for extreme mortality levels	152
	0.		
III.	Sta	BLE POPULATIONS (INTERMEDIATE SERIES)	
	C	le A.III.1. Distribution by sex and age groups of thirty-six stable populations alculated by associating six levels of intermediate model life table with six fertility evels.	170
	C	le A.III.2 Distribution by sex and age groups of forty-eight stable populations alculated by associating six levels of intermediate model life table with eight levels f the intrinsic rate of natural variation.	182
	р	le A.III.3. Distribution of deaths by sex and age groups in thirty-six stable opulations calculated by associating six levels of intermediate model life table with x fertility levels.	198
	Tab	le A.III.4. Distribution of deaths by sex and age groups in forty-eight stable	
	р	opulations calculated by associating six levels of intermediate model life table with ght levels of the intrinsic rate of natural variation	204
IV.	LEVE	BLE POPULATIONS CALCULATED BY ASSOCIATING THREE FERTILITY LEVELS WITH SIX SLS OF UPWARD-DEVIATING MODEL LIFE TABLE AND SIX LEVELS OF DOWNWARD- IATING MODEL LIFE TABLE	
	Ca	le A.IV.1. Distribution by sex and age groups of eighteen stable populations alculated by associating six levels of upward-deviating model life table with three stillity levels	214
	p	le A.IV.2. Distribution of deaths by sex and age groups in eighteen stable opulations calculated by associating six levels of upward-deviating model life table ith three fertility levels	220
	Са	le A.IV.3. Distribution by sex and age groups of eighteen stable populations alculated by associating six levels of downward-deviating model life table with three ertility levels	226
	p	le A.IV.4. Distribution of deaths by sex and age groups in eighteen stable opulations calculated by associating six levels of "downward-deviating" model life able with three fertility levels	232