

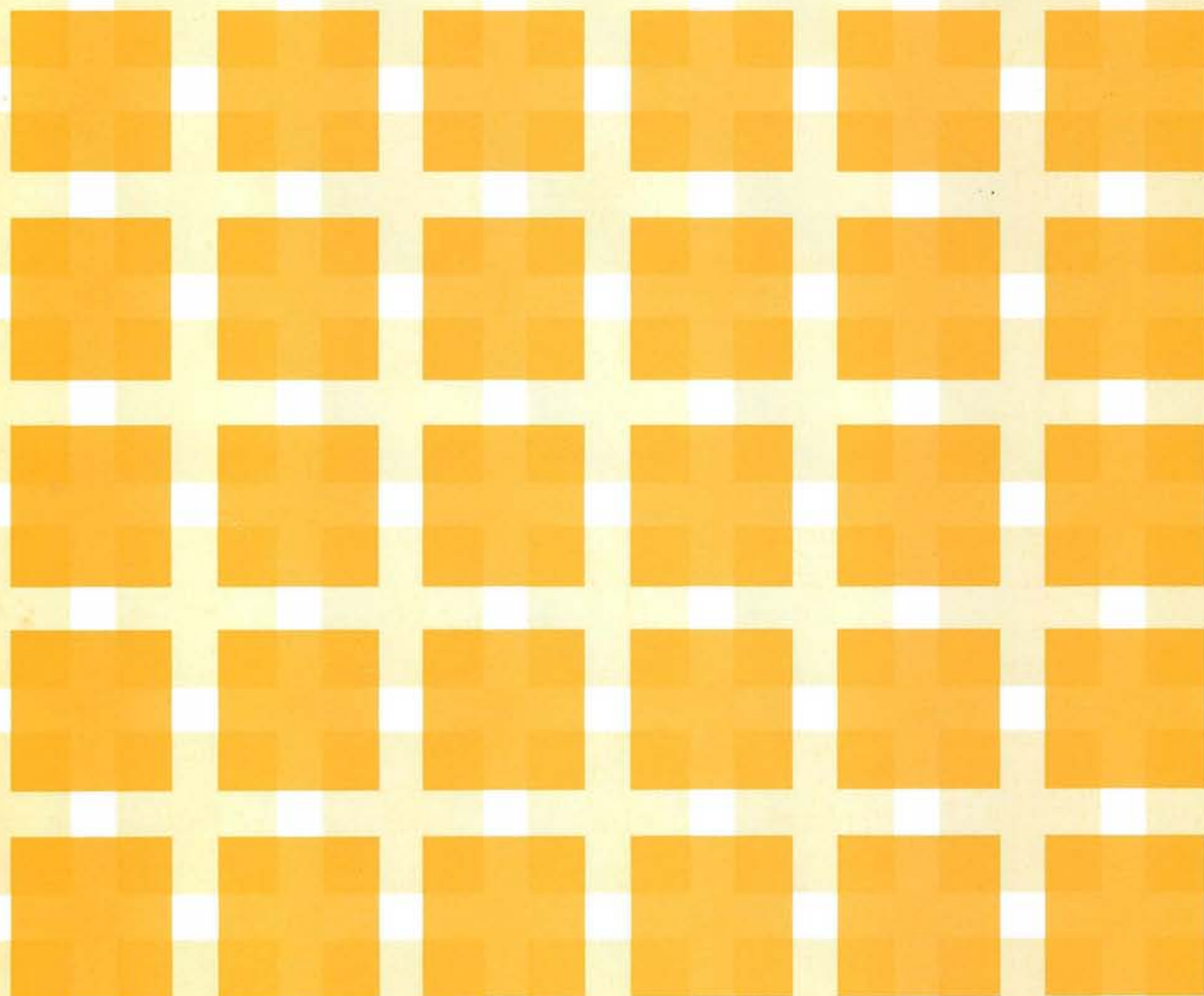
Hong Kong Population

A 20-Year Projection



Census and Statistics Department, Hong Kong

November 1982



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Foreword

Projections of the population of Hong Kong by sex and age were first produced in 1961. Since then, new projections have been made every five years after each population census.

This report contains the projections by sex and age for the period 1982–2001, following the 20-year spread of the previous set. Although the new projections have the advantage of being based on more up-to-date birth and death statistics and migration statistics, the future uncertainty remains. This is particularly so for the assumptions concerning migration, but it is also so in the case of fertility which has become so low that there are difficulties in forecasting its future.

The report is divided into two parts. Part I gives a summary of the method and also the detailed results. Part II describes fertility, mortality and migration trends in the 1970's and the detailed assumptions formulated against this historical background. A section on the methods of computation is also given.

C. C. Greenfield
Commissioner for Census & Statistics

November 1982

Part I

General Account of Population Projections

1. The purpose of the projection

The main purpose of the population projection is to provide an estimate of the total future population of Hong Kong and its composition by sex and age as a common framework for use in planning. Population projections made since 1961 have been heavily used by the Government in planning for the future requirements of housing, education, transportation, medical and social services. They are increasingly being used by public utilities and private companies in planning future development and expansion of business.

The population projections previously available were prepared in 1978. Since then, many significant changes in fertility, mortality and migration have occurred. With more up-to-date information on these demographic variables better assumptions concerning their future trends can be made. New population projections for the period 1982–2001, therefore, have been prepared based on revised assumptions and a new population age and sex distribution derived from the 1981 Census.

The present projections have been based on a single set of assumptions on fertility, mortality and migration. The assumptions have been formulated in the light of historical experience and new information that has become available. The strategy of drawing up a central but not variant projections (by high, medium and low assumptions) has been favoured on the grounds that it provides a consistent basis for all population—related planning. This, however, should not be read as implying that the future trends of fertility, mortality and migration are in principle determinable. A population projection is not an exercise in prophecy. Users of the projected data should constantly bear in mind the inherent uncertainty of the assumptions on which the projection is based.

2. The method of the projection

The standard method of population projection is by components. This method involves the specification of the population elements by sex and age and the separate projection of each component of population change viz. fertility, mortality and migration.

The first step in projecting is to select a base population year. These projections use the year 1981, since the 1981 Census has provided the latest information on the size and the sex-age distribution of the population. The Census population (on the reference date of 9 March 1981) has first been adjusted for misstatements of age, and then brought forward to mid-year 1981.

The projections of the population and its sex-age composition from the base year are then worked out year by year, based on the projections of fertility and mortality and assumptions as regards migration.

First, projected survival ratios* by sex and age are applied to the population at the beginning of a projection year to derive the surviving population at the end of that year. Then the fertility factor is introduced; projected age-specific fertility rates† are applied to the average number of women at each of the childbearing age, 15–49, to obtain the number of births in the year. These births are first divided into male and female births by an average sex ratio at birth and then subject to specific survival ratios. Finally, the migration element is brought in; the assumed net immigration is added to the surviving population by sex and age at the end of the year. This three-fold process is repeated for each year of the projection period, giving for each year the projected population by sex and age.

3. Summary of fertility, mortality and migration assumptions

The projection method described above requires assumptions concerning the future trends of fertility, mortality and migration. Implicit in these assumptions is the principle of continuity: that is to say that any changes in the future can be seen as an extension of what has been happening in the past. Thus a historical analysis is required to determine past trends, which will form the starting point for formulating the assumptions. The assumptions are further modified by subjective judgement on the basis of present experience and, where appropriate, experience from some developed countries.

The assumptions on fertility, mortality and migration are summarized below. The historical background of these components and a fuller description of the assumptions are found in Part II of this report.

* The proportion of survivors in a cohort at any particular age, derived from the specific life table based on the assumed schedule of death rates.

† The ratio of the total number of live births occurring to mothers in each childbearing age group during a calendar year to the total female population in that age group at the middle of that year.

Fertility assumptions

Assumptions concerning future fertility were formulated by projecting the age-specific fertility rates by birth order for the period 1971–1981. Different types of curves were fitted to the rates until a best fit, using the method of least squares, was found. For ages 15 to 19 and 40 to 49 most attention was focused on the all-order age-specific fertility rates, since fertility in these ages contributed very little to total fertility. Having thus obtained the projected fertility rates, several cross checks were made to ensure their appropriateness and consistency.

Overall, the future age-specific fertility rates are assumed to fall at each childbearing age over the projection period, though the rate of decrease will become slower. During the first half of the period, the major contribution to the projected decline in total fertility will come from further significant falls in fertility among women aged 20 to 29. In the second half of the period, only slight further falls in fertility have been assumed. The projection gave a total fertility rate of 1.72 in 2001, declining from 1.97 in 1981.

Mortality assumptions

Assumptions concerning future mortality were formulated by projecting the age-sex-specific death rates for ages 1 to 44 and the age-sex-specific death rates by major causes for ages 0 and 45 and over for the period 1971–1980. Having thus obtained the projected death rates, several cross checks were made to ensure their appropriateness and consistency, by examining the gap between the projected male and female death rates and expectations of life.

The age-specific death rates when projected on the basis stated above showed slight declines for ages 0 to 4, little or no change for ages 5 to 34, and thereafter slight falls for the remaining ages, and especially the older ages. Overall, the projection gave an expectation of life at birth for males in 2001 as 72.4 and for females 78.2.

Migration assumptions

An annual net immigration of 44 500 has been assumed in the light of the historical background. The sex-age distribution of the future net immigration is assumed to follow the average distribution in the past.

4. Results of the projections

The projections at one year intervals by sex and quinquennial age group for the period 1982–2001 are given in Appendix A. The population pyramids for the years 1981, 1986, 1991, 1996 and 2001 are given in Appendix B.

Population growth

The total population is projected to grow gradually from 5.13 million in 1981 to 6.24 million in 1991 and 7.11 million in 2001. The trend of population growth from 1971 to 2001 is illustrated by Chart 4.1 (a).

The size of the annual growth in the first half of the projection period is around 110 000, but after 1991 it starts decreasing and the projected annual growth in 1996 is about 90 000 and in 2001 about 70 000. The projected growth is the outcome of two factors: natural increase (i.e. an excess of births over deaths) and net immigration. Natural increase contributes some 60 per cent to the annual population growth for the period 1981–1990. Beginning with 1991 net immigration gradually takes over and plays a more significant role, increasing from about a 40 per cent share to a 50 per cent in 1996 and a 61 per cent in 2001. The pattern of population growth for the period 1981–2001 is given in Table 4.1.

Age structure

The trends in the age structure show that the Hong Kong population is aging. The projections show further changes in the age structure over the period 1981–2001 (Table 4.2). The aging of the population is accelerating. As projected, the population under 15 years of age will fall from 25 per cent in 1981 to 21 per cent in 2001. In contrast, the proportion aged 65 and over will increase from 7 per cent to 10 per cent. These figures leave the proportion in the working age group, 15–64, unchanged at approximately 68 per cent. The changes in the proportions of the population in the three broad age groups from 1971 to 2001 are illustrated in Charts 4.1 (b), 4.1 (c) and 4.1 (d).

Table 4.1 Projected total population, components of population growth and growth rate, 1981–2001

<i>Period (mid-mid)</i>	<i>Total births</i>	<i>Total deaths</i>	<i>Natural increase</i>	<i>Net immigration</i>	<i>Population growth</i>	<i>Total population at end of period</i>	<i>Population growth rate</i>
1981*/1982	91 500	28 000	63 500	44 500	108 000	5 241 800	2.10
1982/1983	94 800	29 100	65 700	44 500	110 200	5 352 000	2.10
1983/1984	97 000	30 300	66 700	44 500	111 200	5 463 200	2.08
1984/1985	99 100	31 500	67 600	44 500	112 100	5 575 300	2.05
1985/1986	100 600	32 800	67 800	44 500	112 300	5 687 600	2.01
1986/1987	101 900	34 100	67 800	44 500	112 300	5 799 900	1.97
1987/1988	102 500	35 500	67 000	44 500	111 500	5 911 400	1.92
1988/1989	102 400	36 800	65 600	44 500	110 100	6 021 500	1.86
1989/1990	101 700	38 200	63 500	44 500	108 000	6 129 500	1.79
1990/1991	100 800	39 600	61 200	44 500	105 700	6 235 200	1.72
1991/1992	99 000	41 100	57 900	44 500	102 400	6 337 600	1.64
1992/1993	96 900	42 500	54 400	44 500	98 900	6 436 500	1.56
1993/1994	95 300	43 900	51 400	44 500	95 900	6 532 400	1.49
1994/1995	92 500	45 400	47 100	44 500	91 600	6 624 000	1.40
1995/1996	90 700	46 800	43 900	44 500	88 400	6 712 400	1.33
1996/1997	88 600	48 300	40 300	44 500	84 800	6 797 200	1.26
1997/1998	87 000	49 700	37 300	44 500	81 800	6 879 000	1.20
1998/1999	85 100	51 200	33 900	44 500	78 400	6 957 400	1.14
1999/2000	84 000	52 700	31 300	44 500	75 800	7 033 200	1.09
2000/2001	83 100	54 100	29 000	44 500	73 500	7 106 700	1.05

* The total population at mid-1981 is estimated to be 5 133 800.

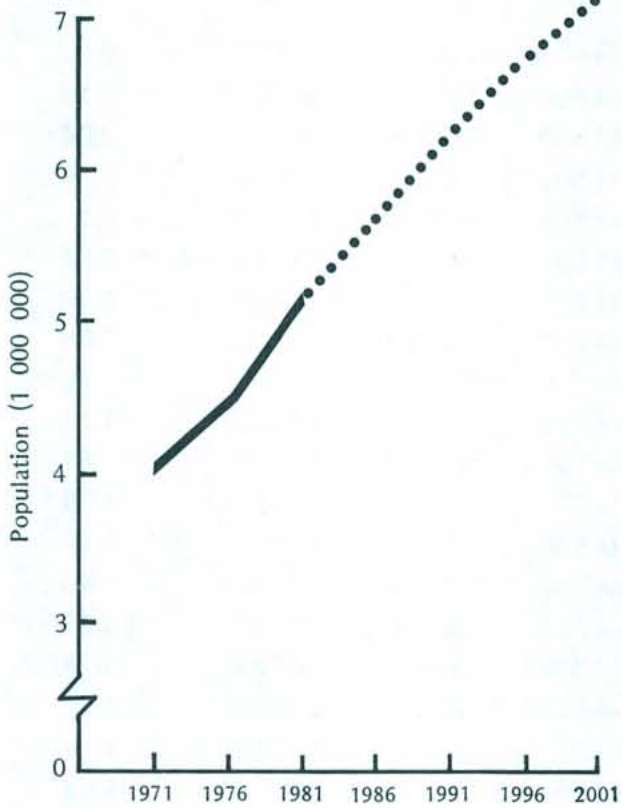
Table 4.2 Results of the projection, Hong Kong

<i>Age Group</i>	<i>1981 (base)</i>		<i>1986</i>		<i>1991</i>		<i>1996</i>		<i>2001</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
<i>(a) Numbers (in thousands) and percentage distribution</i>										
0–14	1 266	24.7	1 343	23.6	1 455	23.3	1 516	22.6	1 462	20.6
15–64	3 526	68.7	3 903	68.6	4 240	68.0	4 553	67.8	4 923	69.3
65+	342	6.6	442	7.8	540	8.7	643	9.6	722	10.1
All ages	5 134	100.0	5 688	100.0	6 235	100.0	6 712	100.0	7 107	100.0
Dependency Ratio* (per 1 000 population)	456		457		471		474		444	
<i>(b) Index Number (1981=100)</i>										
0–14	100		106		115		120		115	
15–64	100		111		120		129		140	
65+	100		129		158		188		211	
All ages	100		111		121		131		138	
Dependency Ratio*	100		100		103		104		97	

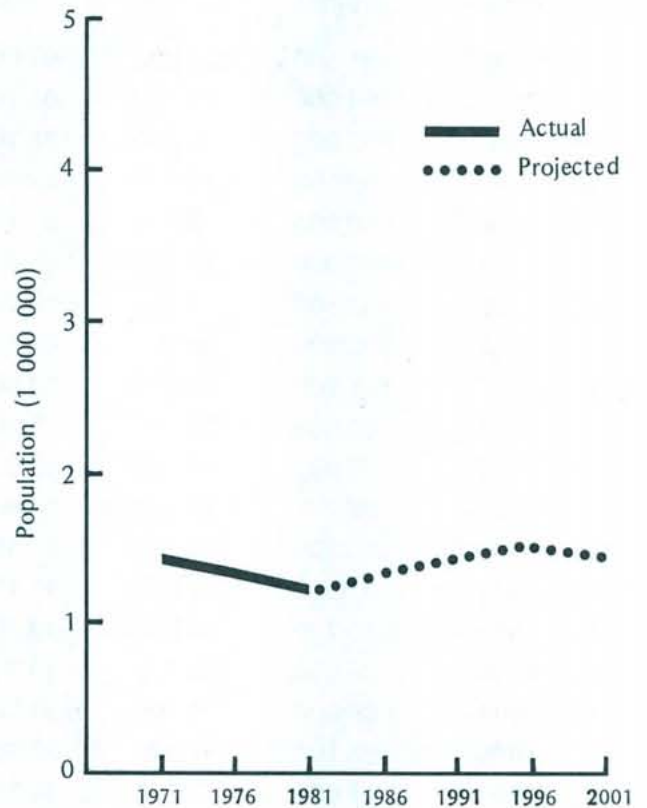
* Dependency ratio is the ratio of the number of persons below age 15 and persons aged 65 and over to those in the 15–64 age group.

Chart 4.1 Actual and Projected Population by Age Group : 1971-2001

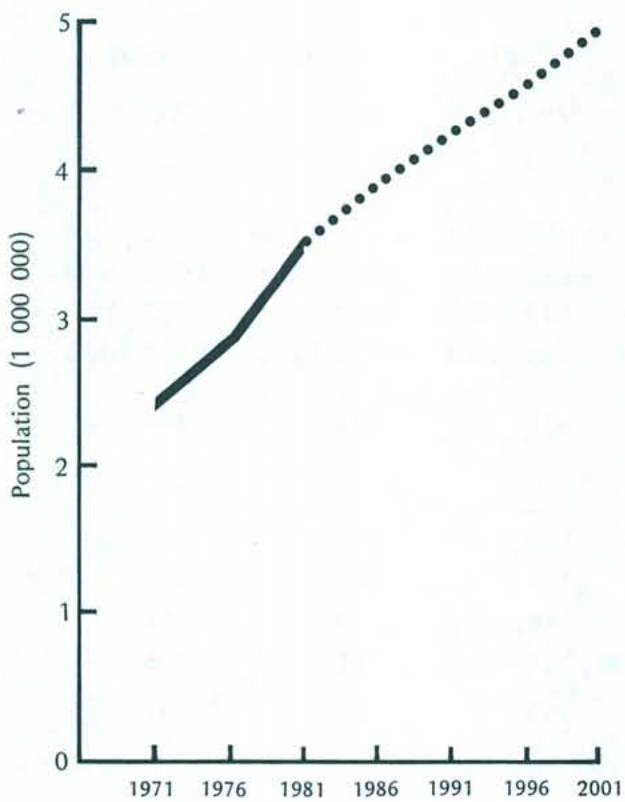
(a) All ages



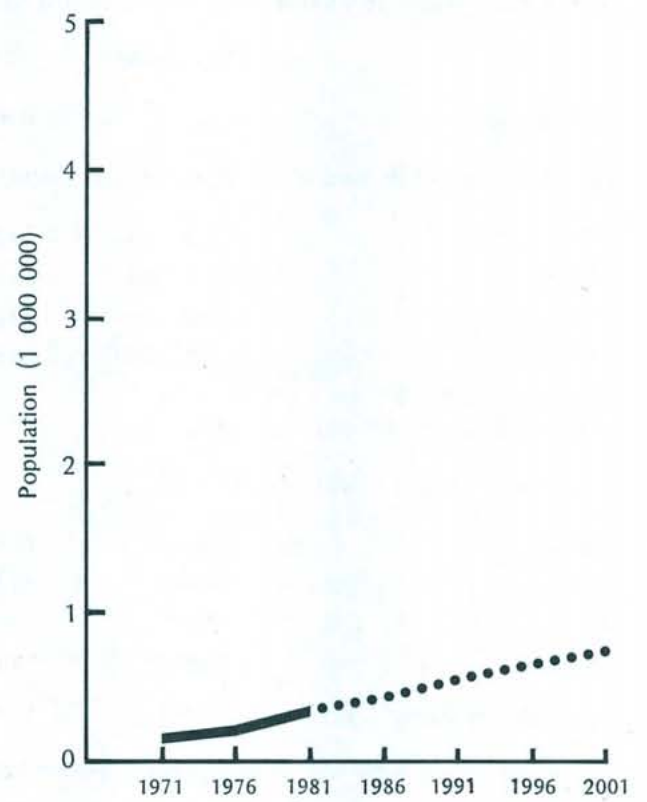
(b) Ages 0 - 14



(c) Ages 15 - 64



(d) Ages 65 and over



Appendix A

TABLE 1:

HONG KONG POPULATION ESTIMATE

<i>Age group</i>	MID-1981		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	212 600	198 700	411 300
5- 9	214 000	198 000	412 000
10-14	228 900	214 000	442 900
15-19	293 900	272 700	566 600
20-24	315 400	283 100	598 500
25-29	268 200	232 100	500 300
30-34	229 600	188 100	417 700
35-39	141 400	107 100	248 500
40-44	145 000	111 700	256 700
45-49	146 300	122 000	268 300
50-54	140 600	123 100	263 700
55-59	113 600	106 200	219 800
60-64	93 500	92 300	185 800
65-69	68 000	75 400	143 400
70-74	39 800	56 400	96 200
75+	31 100	71 000	102 100
Total	2 681 900	2 451 900	5 133 800

TABLE 2:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1982		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	217 800	204 300	422 100
5- 9	215 000	198 100	413 100
10-14	224 800	209 700	434 500
15-19	280 300	261 200	541 500
20-24	319 800	288 900	608 700
25-29	282 100	246 400	528 500
30-34	243 000	202 000	445 000
35-39	157 900	122 000	279 900
40-44	142 800	108 800	251 600
45-49	148 000	121 400	269 400
50-54	143 000	124 400	267 400
55-59	118 300	109 800	228 100
60-64	95 900	94 800	190 700
65-69	71 500	78 400	149 900
70-74	43 300	59 200	102 500
75+	33 900	75 000	108 900
Total	2 737 400	2 504 400	5 241 800

TABLE 3:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1983		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	225 500	210 900	436 400
5- 9	214 700	198 700	413 400
10-14	224 100	208 100	432 200
15-19	265 500	248 100	513 600
20-24	319 700	291 000	610 700
25-29	297 300	261 500	558 800
30-34	253 200	213 200	466 400
35-39	179 200	141 500	320 700
40-44	140 200	105 900	246 100
45-49	149 700	120 900	270 600
50-54	144 700	124 800	269 500
55-59	123 500	113 700	237 200
60-64	98 100	96 900	195 000
65-69	74 900	81 300	156 200
70-74	46 900	62 100	109 000
75+	37 000	79 200	116 200
Total	2 794 200	2 557 800	5 352 000

TABLE 4:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1984		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	232 400	217 600	450 000
5- 9	216 200	200 200	416 400
10-14	225 400	208 300	433 700
15-19	251 200	235 100	486 300
20-24	315 300	289 300	604 600
25-29	312 200	276 200	588 400
30-34	261 800	223 300	485 100
35-39	202 400	162 900	365 300
40-44	139 600	105 100	244 700
45-49	151 300	120 100	271 400
50-54	145 700	124 600	270 300
55-59	128 600	117 300	245 900
60-64	100 300	99 200	199 500
65-69	78 000	84 200	162 200
70-74	50 500	64 800	115 300
75+	40 400	83 700	124 100
Total	2 851 300	2 611 900	5 463 200

TABLE 5:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1985		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	240 100	225 100	465 200
5- 9	218 100	202 100	420 200
10-14	226 800	208 800	435 600
15-19	239 600	224 100	463 700
20-24	307 200	283 900	591 100
25-29	324 600	288 800	613 400
30-34	271 300	234 100	505 400
35-39	223 900	183 300	407 200
40-44	143 400	108 400	251 800
45-49	152 000	118 900	270 900
50-54	146 400	124 100	270 500
55-59	133 200	120 300	253 500
60-64	103 200	101 800	205 000
65-69	80 900	86 900	167 800
70-74	53 800	67 600	121 400
75+	44 100	88 500	132 600
Total	2 908 600	2 666 700	5 575 300

TABLE 6:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1986		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	248 100	232 100	480 200
5- 9	222 800	207 000	429 800
10-14	225 600	207 400	433 000
15-19	231 700	216 200	447 900
20-24	296 100	275 300	571 400
25-29	333 200	298 200	631 400
30-34	283 000	246 600	529 600
35-39	241 500	200 600	442 100
40-44	153 200	117 400	270 600
45-49	151 500	116 800	268 300
50-54	147 500	123 600	271 100
55-59	136 600	122 400	259 000
60-64	106 700	104 800	211 500
65-69	83 500	89 400	172 900
70-74	57 000	70 300	127 300
75+	48 100	93 400	141 500
Total	2 966 100	2 721 500	5 687 600

TABLE 7:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1987		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	253 400	237 100	490 500
5- 9	227 900	212 600	440 500
10-14	226 600	207 600	434 200
15-19	227 700	211 900	439 600
20-24	282 600	263 900	546 500
25-29	337 600	304 000	641 600
30-34	296 800	260 800	557 600
35-39	254 900	214 400	469 300
40-44	169 500	132 200	301 700
45-49	149 400	113 900	263 300
50-54	149 200	122 900	272 100
55-59	138 900	123 700	262 600
60-64	111 100	108 300	219 400
65-69	85 600	91 700	177 300
70-74	59 900	73 000	132 900
75+	52 400	98 400	150 800
Total	3 023 500	2 776 400	5 799 900

TABLE 8:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1988		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	257 500	240 900	498 400
5- 9	235 600	219 200	454 800
10-14	226 300	208 100	434 400
15-19	226 900	210 300	437 200
20-24	267 900	250 800	518 700
25-29	337 400	306 000	643 400
30-34	311 900	275 900	587 800
35-39	264 900	225 600	490 500
40-44	190 600	151 600	342 200
45-49	146 900	111 000	257 900
50-54	150 900	122 500	273 400
55-59	140 500	124 200	264 700
60-64	115 900	112 000	227 900
65-69	87 600	93 700	181 300
70-74	62 600	75 700	138 300
75+	56 900	103 600	160 500
Total	3 080 300	2 831 100	5 911 400

TABLE 9:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1989		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0-4	260 200	243 400	503 600
5-9	242 500	225 900	468 400
10-14	227 700	209 600	437 300
15-19	228 200	210 500	438 700
20-24	253 500	237 800	491 300
25-29	333 100	304 300	637 400
30-34	326 700	290 500	617 200
35-39	273 500	235 700	509 200
40-44	213 500	172 900	386 400
45-49	146 300	110 300	256 600
50-54	152 500	121 700	274 200
55-59	141 500	124 000	265 500
60-64	120 700	115 500	236 200
65-69	89 700	95 900	185 600
70-74	65 300	78 300	143 600
75+	61 500	108 800	170 300
Total	3 136 400	2 885 100	6 021 500

TABLE 10:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1990		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0-4	261 600	244 700	506 300
5-9	250 200	233 400	483 600
10-14	229 700	211 500	441 200
15-19	229 600	211 000	440 600
20-24	242 000	226 800	468 800
25-29	325 000	299 000	624 000
30-34	339 000	303 100	642 100
35-39	282 900	246 400	529 300
40-44	234 800	193 100	427 900
45-49	150 100	113 600	263 700
50-54	153 200	120 500	273 700
55-59	142 200	123 500	265 700
60-64	125 000	118 400	243 400
65-69	92 300	98 300	190 600
70-74	67 600	80 700	148 300
75+	66 100	114 200	180 300
Total	3 191 300	2 938 200	6 129 500

TABLE 11:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1991		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	261 500	244 700	506 200
5- 9	258 200	240 300	498 500
10-14	234 300	216 500	450 800
15-19	228 500	209 600	438 100
20-24	234 100	219 000	453 100
25-29	314 000	290 400	604 400
30-34	347 600	312 500	660 100
35-39	294 500	258 900	553 400
40-44	252 300	210 300	462 600
45-49	159 800	122 500	282 300
50-54	152 700	118 500	271 200
55-59	143 200	123 000	266 200
60-64	128 300	120 500	248 800
65-69	95 400	101 100	196 500
70-74	69 800	83 000	152 800
75+	70 700	119 500	190 200
Total	3 244 900	2 990 300	6 235 200

TABLE 12:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1992		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	260 000	243 300	503 300
5- 9	263 500	245 300	508 800
10-14	239 500	222 100	461 600
15-19	229 400	209 800	439 200
20-24	230 100	214 700	444 800
25-29	300 500	279 000	579 500
30-34	351 900	318 300	670 200
35-39	308 200	273 100	581 300
40-44	265 500	224 100	489 600
45-49	175 800	137 200	313 000
50-54	150 700	115 600	266 300
55-59	144 800	122 400	267 200
60-64	130 400	121 700	252 100
65-69	99 400	104 400	203 800
70-74	71 600	85 100	156 700
75+	75 300	124 900	200 200
Total	3 296 600	3 041 000	6 337 600

TABLE 13:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1993		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	257 300	240 700	498 000
5- 9	267 500	249 100	516 600
10-14	247 200	228 600	475 800
15-19	229 100	210 300	439 400
20-24	229 400	213 000	442 400
25-29	285 900	265 900	551 800
30-34	351 800	320 300	672 100
35-39	323 200	288 100	611 300
40-44	275 400	235 200	510 600
45-49	196 500	156 400	352 900
50-54	148 300	112 800	261 100
55-59	146 500	121 900	268 400
60-64	131 900	122 200	254 100
65-69	103 700	107 900	211 600
70-74	73 200	86 900	160 100
75+	79 900	130 400	210 300
Total	3 346 800	3 089 700	6 436 500

TABLE 14:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1994		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	253 500	237 200	490 700
5- 9	270 300	251 700	522 000
10-14	254 000	235 300	489 300
15-19	230 600	211 900	442 500
20-24	230 700	213 300	444 000
25-29	271 600	253 000	524 600
30-34	347 500	318 600	666 100
35-39	337 900	302 700	640 600
40-44	283 900	245 200	529 100
45-49	219 000	177 400	396 400
50-54	147 700	112 100	259 800
55-59	148 000	121 200	269 200
60-64	132 800	122 000	254 800
65-69	108 000	111 200	219 200
70-74	74 900	89 000	163 900
75+	84 400	135 800	220 200
Total	3 394 800	3 137 600	6 532 400

TABLE 15:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1995		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	249 000	232 900	481 900
5- 9	271 700	253 000	524 700
10-14	261 700	242 800	504 500
15-19	232 500	213 700	446 200
20-24	232 100	213 700	445 800
25-29	260 100	242 100	502 200
30-34	339 400	313 300	652 700
35-39	350 200	315 200	665 400
40-44	293 200	255 900	549 100
45-49	239 900	197 500	437 400
50-54	151 400	115 300	266 700
55-59	148 700	120 100	268 800
60-64	133 500	121 500	255 000
65-69	111 800	113 900	225 700
70-74	77 100	91 100	168 200
75+	88 600	141 100	229 700
Total	3 440 900	3 183 100	6 624 000

TABLE 16:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1996		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	244 000	228 200	472 200
5- 9	271 600	252 900	524 500
10-14	269 700	249 800	519 500
15-19	237 100	218 700	455 800
20-24	230 900	212 400	443 300
25-29	252 300	234 200	486 500
30-34	328 400	304 700	633 100
35-39	358 600	324 600	683 200
40-44	304 700	268 300	573 000
45-49	257 000	214 500	471 500
50-54	160 900	124 100	285 000
55-59	148 300	118 100	266 400
60-64	134 500	121 000	255 500
65-69	114 700	115 800	230 500
70-74	79 700	93 700	173 400
75+	92 700	146 300	239 000
Total	3 485 100	3 227 300	6 712 400

TABLE 17:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1997		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	238 600	223 200	461 800
5- 9	270 100	251 500	521 600
10-14	275 000	254 800	529 800
15-19	242 300	224 300	466 600
20-24	231 900	212 600	444 500
25-29	248 300	229 900	478 200
30-34	315 100	293 300	608 400
35-39	362 900	330 300	693 200
40-44	318 300	282 400	600 700
45-49	269 900	228 100	498 000
50-54	176 500	138 600	315 100
55-59	146 300	115 300	261 600
60-64	136 100	120 500	256 600
65-69	116 600	117 000	233 600
70-74	83 100	96 700	179 800
75+	96 400	151 300	247 700
Total	3 527 400	3 269 800	6 797 200

TABLE 18:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1998		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	233 300	218 200	451 500
5- 9	267 400	249 000	516 400
10-14	279 000	258 600	537 600
15-19	249 900	230 800	480 700
20-24	231 500	213 100	444 600
25-29	247 600	228 300	475 900
30-34	300 500	280 300	580 800
35-39	362 800	332 400	695 200
40-44	333 100	297 400	630 500
45-49	279 700	239 200	518 900
50-54	196 700	157 600	354 300
55-59	144 000	112 600	256 600
60-64	137 700	120 100	257 800
65-69	118 000	117 400	235 400
70-74	86 700	99 900	186 600
75+	100 100	156 100	256 200
Total	3 568 000	3 311 000	6 879 000

TABLE 19:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-1999		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	228 300	213 500	441 800
5- 9	263 600	245 500	509 100
10-14	281 800	261 100	542 900
15-19	256 800	237 500	494 300
20-24	233 000	214 600	447 600
25-29	248 900	228 500	477 400
30-34	286 300	267 400	553 700
35-39	358 500	330 700	689 200
40-44	347 600	311 800	659 400
45-49	288 100	249 100	537 200
50-54	218 500	178 300	396 800
55-59	143 600	111 900	255 500
60-64	139 100	119 400	258 500
65-69	118 900	117 300	236 200
70-74	90 200	102 900	193 100
75+	103 700	161 000	264 700
Total	3 606 900	3 350 500	6 957 400

TABLE 20:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-2000		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	223 800	209 300	433 100
5- 9	259 100	241 200	500 300
10-14	283 200	262 400	545 600
15-19	264 400	245 000	509 400
20-24	234 900	216 500	451 400
25-29	250 300	229 000	479 300
30-34	274 900	256 500	531 400
35-39	350 500	325 400	675 900
40-44	359 700	324 300	684 000
45-49	297 200	259 600	556 800
50-54	238 800	198 100	436 900
55-59	147 200	115 100	262 300
60-64	139 800	118 300	258 100
65-69	119 600	116 800	236 400
70-74	93 400	105 400	198 800
75+	107 500	166 000	273 500
Total	3 644 300	3 388 900	7 033 200

TABLE 21:

HONG KONG POPULATION PROJECTION

<i>Age group</i>	MID-2001		
	<i>Male</i>	<i>Female</i>	<i>Total</i>
0- 4	219 900	205 700	425 600
5- 9	254 100	236 500	490 600
10-14	283 100	262 400	545 500
15-19	272 400	252 000	524 400
20-24	239 600	221 400	461 000
25-29	249 100	227 600	476 700
30-34	267 100	248 700	515 800
35-39	339 600	316 900	656 500
40-44	368 100	333 700	701 800
45-49	308 500	272 000	580 500
50-54	255 300	214 800	470 100
55-59	156 300	123 700	280 000
60-64	139 400	116 400	255 800
65-69	120 500	116 400	236 900
70-74	95 800	107 100	202 900
75+	111 500	171 100	282 600
Total	3 680 300	3 426 400	7 106 700

Appendix B

Chart 1

Hong Kong Population Pyramid, mid-1981

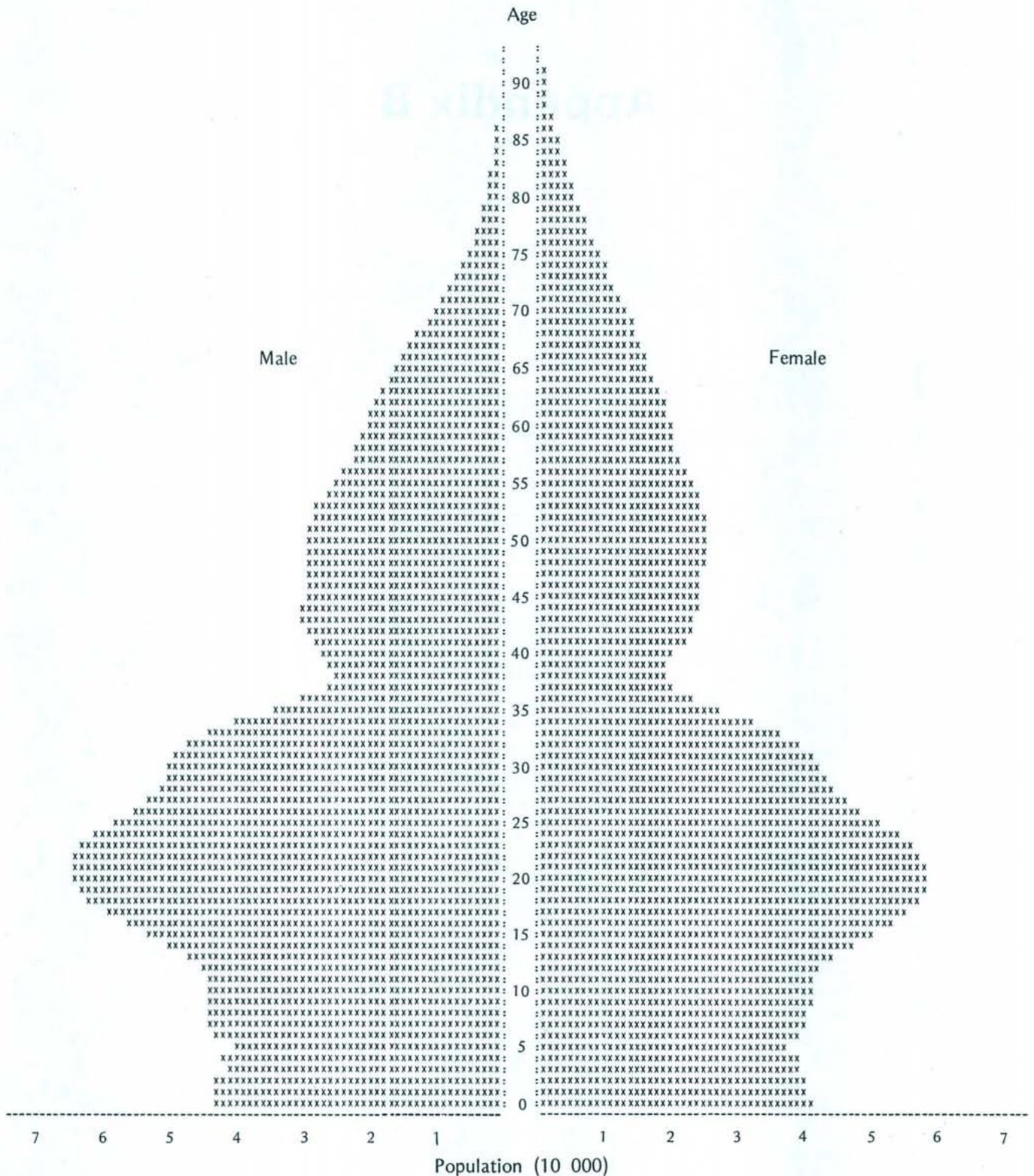


Chart 2

Hong Kong Population Pyramid, mid-1986

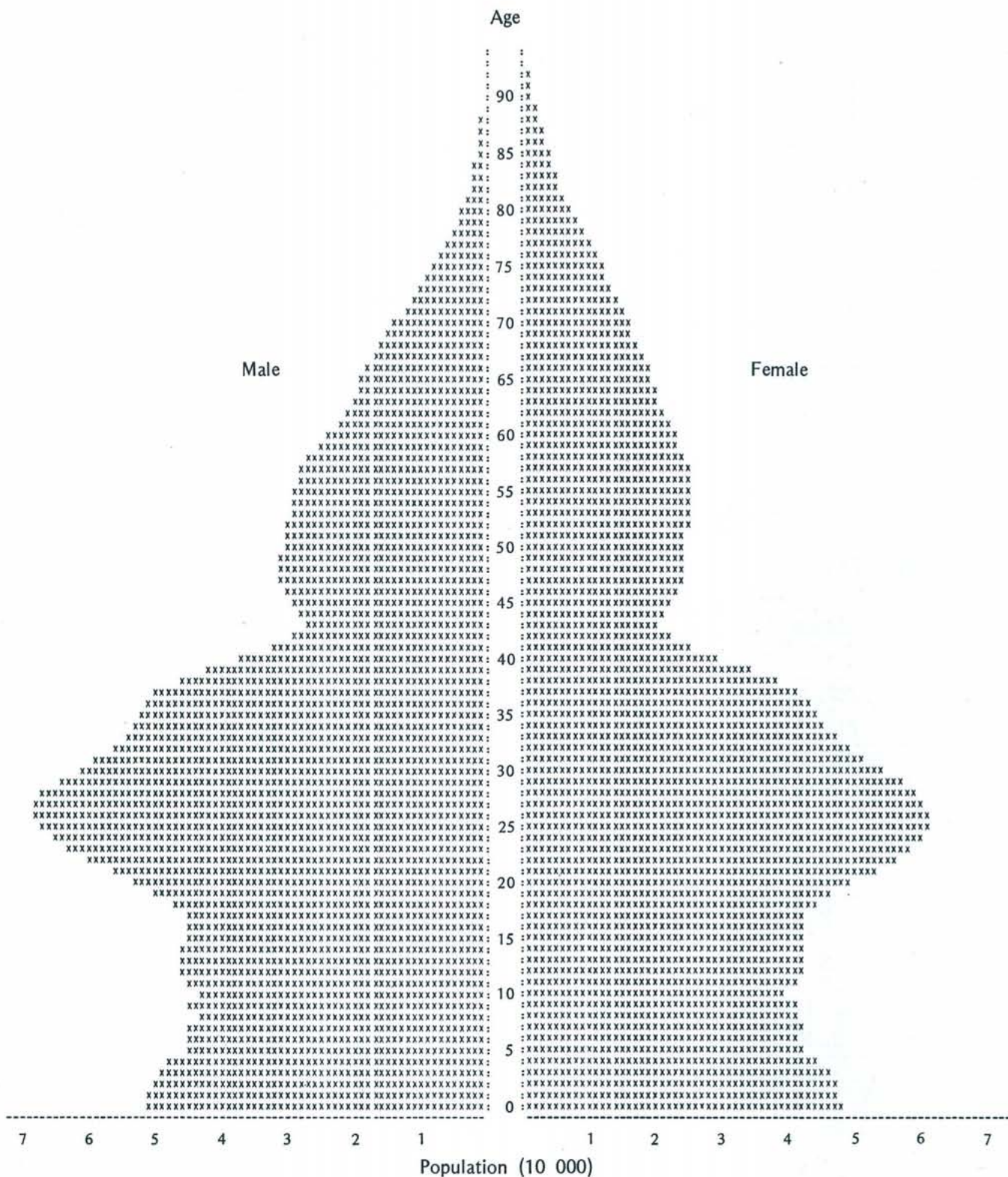


Chart 3

Hong Kong Population Pyramid, mid-1991

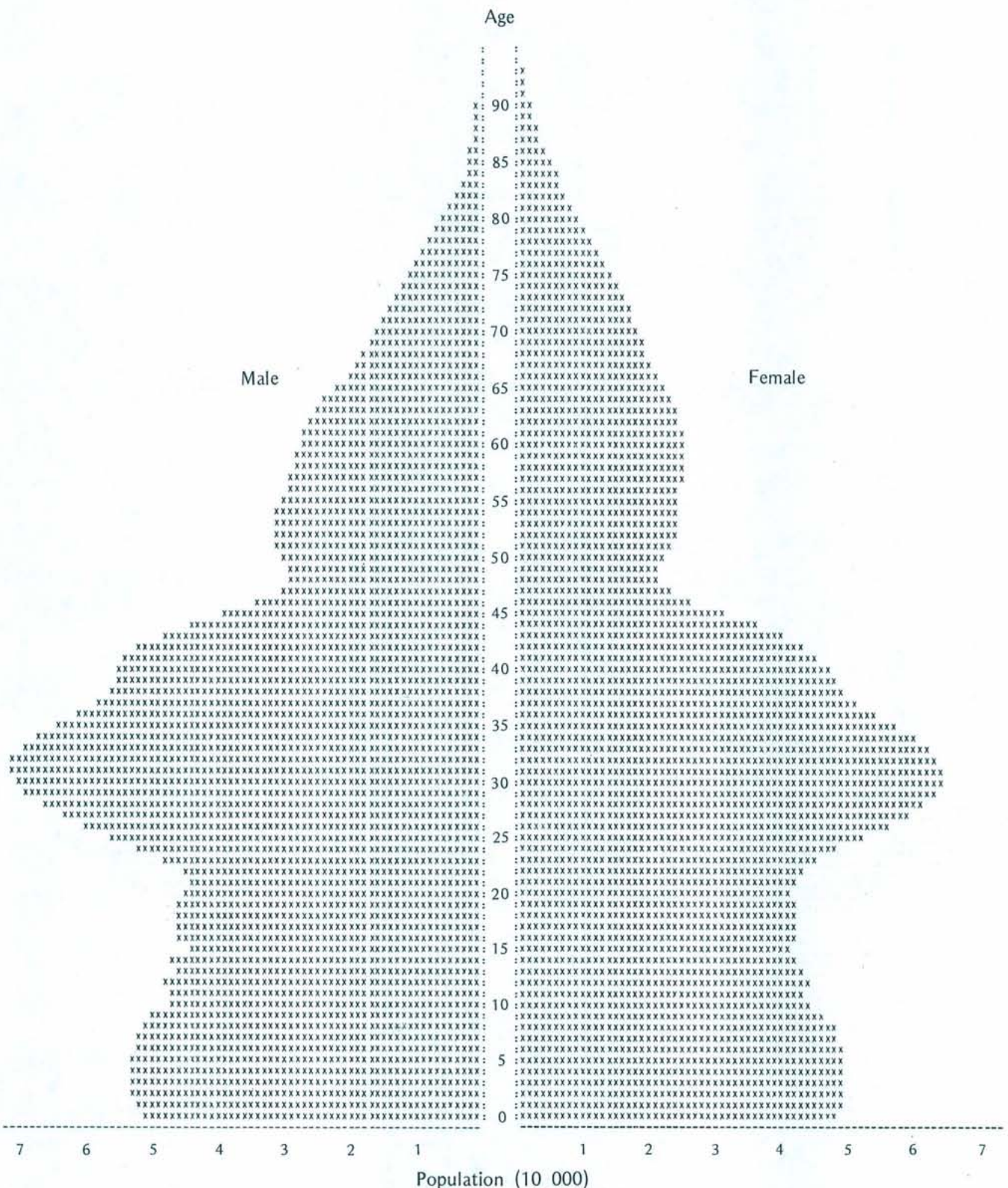


Chart 4

Hong Kong Population Pyramid, mid-1996

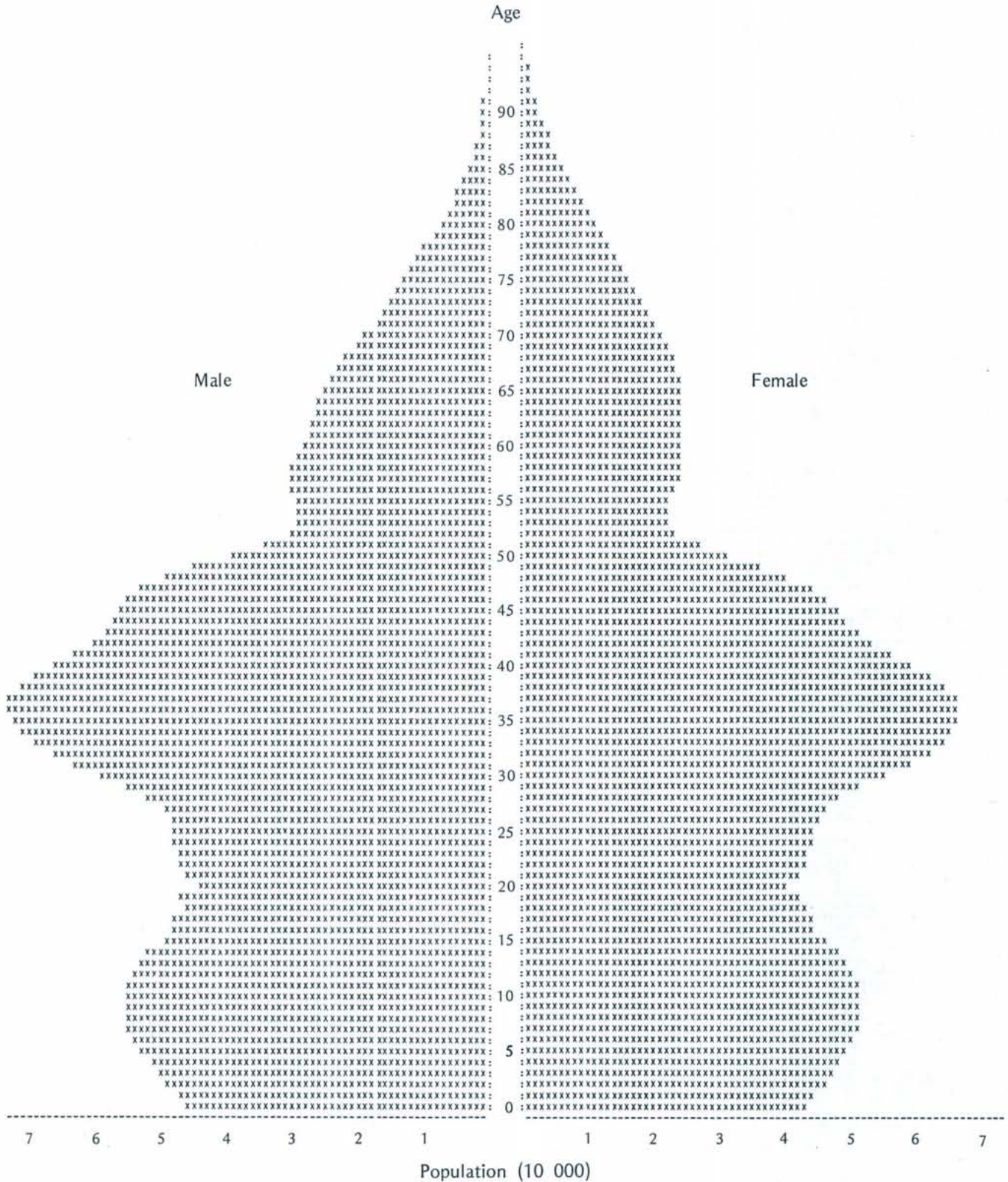
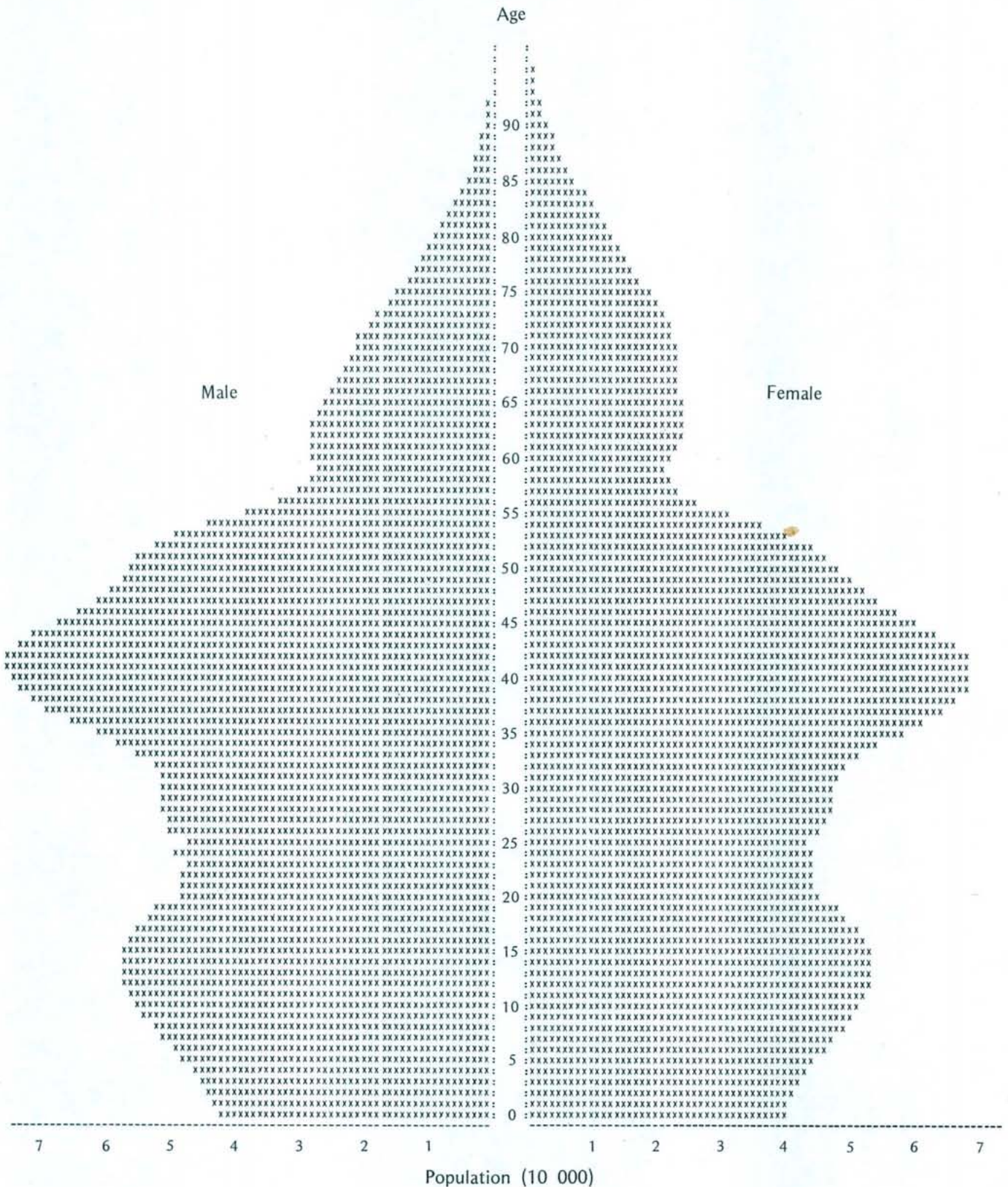


Chart 5
 Hong Kong Population Pyramid, mid-2001



Part II

Analysis of Components and Methods of Computation

1. Fertility

Fertility—past trends

After 1963 the annual number of live births in Hong Kong started to fall. The steep downward trend in births came to a halt in the early 1970's. The annual number of live births fluctuated steadily around 80 000 throughout the 1970's, rising to 87 000 in 1981. During this period the crude birth rate, which relates the number of live births occurring during a calendar year to the estimated mid-year total population*, fell continuously from 34 live births per 1 000 population in 1963 to a corresponding figure of 20 in 1971 and 17 in 1981 (Table 1.1). However, the crude birth rate is not a good indicator of the level of fertility as it takes no account of the changing age and sex structure of the population. In fact between 1971 and 1981 there was a considerable increase, amounting to some 43 per cent, in the number of women at risk of childbearing, that is those aged 15–49.

It is preferable therefore to relate the annual number of live births to the number of women aged 15 to 49, as in the general fertility rates which are also shown in Table 1.1. The figures show that there was a significant drop in the general fertility rate throughout the 10-year period, and by 1981 the general fertility rate at 66 live births per 1 000 women aged 15 to 49 was about 24 per cent below the corresponding figure in 1971.

Age-specific fertility rates

A greater insight into the decline in fertility can be gained by examining the trend in the age-specific fertility rate (Table 1.2), which relates the number of live births occurring to mothers in a given age group during a calendar year to the total female population in that age group at the middle of that year. The figures in Table 1.2 bring out several interesting features. Over the past ten years, age-specific fertility rates have declined sharply at every age, particularly so at ages 35 and over. In the youngest age group, 15 to 19, which in 1971 already had a relatively low level of fertility as compared with most countries, there was a drop of about one third between 1971 and 1981. In the next youngest age group there was an even greater reduction amounting to some 40 per cent over the same period. The relatively low fertility rates in these two age groups and the declines over time are undoubtedly associated with the late age of marriage of women in Hong Kong. Indeed evidence from the 1981 Population Census shows that there were significant increases in age at marriage during the period 1971–1981 (Table 1.3). In 1971, 32 per cent of women aged 20 to 24 and 80 per cent of those aged 25 to 29 had married, compared with the corresponding figures of 29 per cent and 70 per cent in 1981.

The falls between 1971 and 1981 in the age-specific fertility rates for women aged 35 and over have been particularly substantial, amounting to 60 per cent for women aged 35 to 39, 75 per cent for those aged 40 to 44, and 80 per cent for those aged 45 to 49. The figures in Table 1.2 thus show that childbearing among women aged 35 and over is becoming increasingly uncommon. The main factor behind these trends is that there is a tendency towards smaller families. Looked at in another way, an increasing proportion of births in any given calendar year are first births (Table 1.4). In 1971 one quarter of all births were first births, as compared with more than two fifths in 1981. In contrast, fourth and higher order births which accounted for one third of all births in 1971 accounted for less than one in ten births in 1981. The more widespread availability of contraception and its greater use effectiveness have undoubtedly contributed to these trends.

Unfortunately, estimates of the population by marital condition are not available; therefore separate examination of trends in marital fertility rates cannot be made. Nor is it possible to directly assess the pattern of birth intervals, since information is not available from the vital registration system on dates of previous births. However, as indicated above, classification according to birth order is possible and some illustrative trends in age-specific fertility rates by birth order for selected years are shown in Charts 1.1(b), 1.1(c), 1.1(d), 1.1(e). The additive components of these 4 figures giving the age-specific fertility rates are shown in Chart 1.1(a). It can be seen from the figures that changes in the age-specific fertility rates are the results of a genuine decline in fertility during the period 1971–1981 and a change in age-specific patterns of fertility over the same period. When disaggregated, the fertility decline is represented by the decreasing area under the curves of the various birth orders for the selected years. Comparatively speaking, the decrease was very pronounced for the third and fourth and higher order births, which implies their large contribution to the overall fertility decline. The changing pattern of fertility is indicated by the feature that the curves showing all-order fertility rates have become less dispersed over the period. Consequently, the mean age of mothers at childbearing decreased from 28.5 in 1971 to 27.4 in 1981.

Replacement fertility

The impact of fertility on a population can be better illustrated by some reproductivity measures of the extent to which a population is replacing itself by births. This can be achieved by considering the number of

* Mid-year population is employed to approximate the number of person-years in the calculation of the crude birth rate. This approximation is used in the calculation of other fertility measures described in this paper.

daughters available to replace their mothers. But before introducing a reproductivity formula, it is of interest to look at the period total fertility rate (TFR), which is closely connected with the reproductivity formula. TFR, defined as the sum of the age-specific fertility rates for those aged 15 to 49 in a given year, represents the number of children that a woman would bear (ignoring mortality) if she were subject throughout her reproductive age to the fertility rates prevailing in that year. TFR of a given year represents a hypothetical completed family size for the prevailing fertility level and pattern of that year. As shown in Table 1.5, TFR decreased rapidly from 3.41 in 1971 to 1.97 in 1981. In fact, a TFR of about 2.1, that is the rate for 1980, will result in a generation of women which cannot replace itself after taking into consideration childhood mortality and the differential in the sex ratio at birth which favours males. This kind of replacement situation will be clearly reflected by the net reproduction rate (NRR).

NRR, defined as the sum from ages 15 to 49 of the products of the age-specific fertility rates for female births and the female survival rates for a given year, represents the number of daughters who, according to the fertility rates prevailing in that year, would be born to a woman (allowing mortality) throughout the whole of her reproductive life. If the NRR is exactly one, then women are exactly reproducing themselves, if it is less than one they are failing to reproduce themselves. As shown by NRR in Table 1.5, the fertility fell sharply from a level considerably above replacement level of 1.63 in 1971 to one which is slightly below replacement level of 0.93 in 1981.

Period and cohort fertility

The discussion above has been entirely in terms of period fertility rates, that is births occurring in a given calendar year to groups of women born and married in different calendar years. However, fertility in any given year is to some extent dependent on fertility in previous years, since the number of women at risk of having a birth of a given order will depend on their past fertility. Moreover, period fertility indicators fluctuate much more markedly than do cohort indicators, since they are sensitive to changes in the timing of childbearing. Cohort fertility can be considered in terms of the level and pattern of childbearing of either women born or married in the same year. Information is not currently available to study the fertility of marriage cohorts, but for the current projection of fertility an attempt was made to rearrange the calendar year birth statistics (available from the vital registration system since 1970) on a birth cohort basis, and to supplement this short series with the 1976 By-Census data on the fertility performance of some birth cohorts. These cohort fertility data facilitate an assessment of the implications of the projected period fertility rates for selected birth cohorts in terms of the projected median age at first birth, the projected proportion of women remaining childless and the projected completed family size.

Method of projecting fertility

The method employed in formulating the fertility assumptions relied heavily on the use of period fertility rates. Since the Hong Kong projections are made only for a period of twenty years into the future, they thus cover only a segment of the total childbearing period for any given cohort. However, in the course of making assumptions about future fertility a detailed examination was made of the implications of the projected period fertility rates for selected birth cohorts, particularly in terms of the proportion of women having a first birth (or the proportion of women remaining childless).

Specifically, after careful scrutiny of past trends in a range of period indicators, it was decided to examine trends, between 1971 and 1981, in the age-specific fertility rates by birth order and to see how these could be most appropriately carried forward. Three separate curves were fitted to each of the time series of the age-specific fertility rates by birth order, namely a linear regression curve, the reciprocal of the linear regression curve and a generalized exponential curve. Most emphasis was placed on the trend in first and second order births in the age band 20 to 34 and in third order births at ages 25 to 39. For the youngest and two oldest age groups most attention was given to examining trends in the all-order age-specific rates, since fertility at these ages contributes very little to total fertility.

In an analysis using the 1981 Census fertility data for female immigrants coming from mainland China during the period 1976-1980, it was found that their fertility was considerably above that of indigenous women. It will be desirable in the preparation of the projections to formulate two sets of fertility assumptions, one for indigenous women and another for female immigrants. However, data on the fertility of immigrants can only be distinguished and extracted from the vital registration system since 1980, and in the absence of any thorough understanding of the changes and assimilation of fertility behaviour of immigrant women, the preparation of a separate set of immigrant fertility assumptions was not attempted. Only the composite fertility of indigenous and immigrant women was studied (by the method stated above) and then carried forward (using the techniques outlined below). In the formulation of the composite fertility assumptions, the speed of fertility decline was decelerated against the supposed trendal slope so as to accommodate the effect of immigrants on fertility.

In general, the linear regression curve fitted least well and the speed of change of the extrapolated values was found to be unrealistic. In most cases, the reciprocal curve, which had a similar initial slope to the exponential curve, tended to tail less rapidly to the horizontal and provided the best fit in terms of the

minimum value for the sum of the squares of the deviations of the actual values from the trendal values. The curve of best fit was then carried forward for n years into the future: n being determined on the basis of subjective judgement but with particular reference to the actual values for the last few years and the effect of immigrants.

Having thus obtained the projected fertility rates, several cross checks were made to ensure their appropriateness and consistency. Firstly, in the light of the fertility data from the vital registration system, which were rearranged on a birth cohort basis, together with the 1976 By-Census data on the fertility performance of some birth cohorts, an assessment was made of the implications of the projected fertility rates for selected birth cohorts in terms of the projected median age at first birth, the projected proportion of women remaining childless and the projected completed family size. Secondly, the projected all-order age-specific fertility rates were examined in relation to past trends. Finally, the derived total fertility rates were then compared with recent trends in other low fertility countries. On the basis of each of these three checks, the initially projected fertility rates were modified to make them consistent with what was considered to be the most likely future path of fertility in Hong Kong.

Projected first births

Table 1.6 shows the projected first-order birth rates and compares them with recent trends from 1979 to 1981. In general, the pattern of the projected rates indicates a presumed but gradual continuation of the trend towards a later mean age of mothers at first birth. The increased rates in the age groups 25–29 and 30–34 reflect some catching-up of first births that were postponed at younger ages during earlier periods. Table 1.7 shows the effect of past and projected trends in first-order birth rates on selected birth cohorts and brings out two features. Firstly, a movement towards a later age of mothers at first birth; thus some 58 per cent of women born in 1931 had had a first child by age 25 compared with a projected figure of only 30 per cent for those born in 1966 or later. This can be further illustrated by Table 1.8 where the actual median age at first birth increases from 24.0 for those women born in 1931 to a projected value of 27.7 for those born in 1966. Secondly, a probable increase in the proportion of women remaining childless throughout their lifetime is implied. This is based on a belief that the effect on this proportion from women remaining childless due to the increasing popularity of a no-child family and spinsterhood will outweigh the effect arising from advances in medical technology giving reproductive ability to some infecund women and some sterile husbands. But the proportion could not be expected to increase continuously into the future or to reach an unreasonably high level. A proportion of 15 per cent, based on the experience of some developed countries, of women remaining childless throughout their lifetime could be regarded as the ultimate limit, which is deemed sufficient to cover the effect of spinsterhood, no-child norm, infecundity and sterility. The change in this proportion as a result of the projected period fertility rates can be seen in the last column of Table 1.7.

Projected second births

Table 1.9 shows the projected second-order birth rates and compares them with recent trends from 1979 to 1981. The presumed continuation of the trend towards a later mean age of mothers at first birth, as noted in the preceding Section, would mean that there would be a smaller number of women at risk of having a second birth in the age groups 20–24 and 25–29. Thus the projected second-order birth rates in these age groups would be lower than the recent trend. The increased rate in the age group 30–34 reflects some catching-up of second births which were postponed at younger ages during earlier periods.

Projected age-specific fertility rates

Table 1.10 shows how the projected age-specific fertility rates are expected to continue their downward trend at every age. In the short term, that is for the next ten years, the major contribution to the projected decline in the total fertility rate is expected to come from further significant falls among women aged 20 to 29. In the second half of the projection period only slight further falls in fertility have been assumed. The overall effect of these changes in the age-specific fertility rates is that the total fertility rate would continue below the replacement level throughout the whole of the projection period, with the steepest falls occurring in the early 1980's (Table 1.11).

The implications of the projected age-specific fertility rates for selected birth cohorts is illustrated by Table 1.12 which gives the actual and projected number of children ever born by women born in selected years. The marked reduction in completed family size can be explained partly by industrialization during the 1960's and 1970's which had various consequences: firstly, a rise in the labour force participation rate of females due to rapid economic development and improved education; secondly, increasing urban growth which favours the formation of small families; and thirdly, a change in the people's aspirations as regards pecuniary reward and standard of living which together with the cost of raising children makes a large family too expensive. Another important reason for the decline in fertility is the success of the organized and persistent effort of the Government and private agencies in promoting family planning during these two decades. It is expected that those women born in 1956 (who were 25 years of age in 1981) will act positively to limit their families and will be the first generation to experience below replacement level fertility.

International trends

As mentioned above, one of the assessments made before reaching the finalized fertility assumptions was to examine recent trends in other low fertility countries. Table 1.13 shows that all the other countries considered had experienced a considerable decline in fertility during the 1970's, albeit from different levels and at varying rates of decrease. Since no uniform pace of decline was observed, most attention was placed on the experience of Singapore because of its ethnic and socioeconomic similarities with Hong Kong. It can be seen that the rate of decrease in fertility in Singapore was somewhat quicker than that in Hong Kong. It is not expected, however, that the future path of fertility in Hong Kong will follow exactly the experience of Singapore. As noted in the discussion above, Hong Kong gained about 100 000 female immigrants (who were in the childbearing age groups) during the period 1976–1980, and their fertility was considerably above that of indigenous women. Also, unlike in Singapore, there is not a strong population policy stressing the desirability of a small family. On the basis of these considerations and taking into account recent trends, an assumed gradual decline in the total fertility rate is most reasonable. Concerning the assumption that the total fertility rate would remain below the replacement level for the whole of the projection period, experience from other low fertility countries has not yet proved it to be impossible. As a matter of fact, the total fertility rate of Sweden has remained below the replacement level since 1968 without any sign of upsurge.

Difference between 1976 and 1981 fertility assumptions

The 1976-based projections incorporated fertility at 'high', 'medium' and 'low' levels. The medium fertility variant assumed that the total fertility rate would fall steadily until reaching a level of around 1.9 in 1987, after which it would rise slowly until reaching the replacement level of 2.1 in 1998. But the cumulative evidence from the data obtained in the past four years points to the possibility that the decline in period fertility rates will be more pronounced and continue longer into the future than could be envisaged in 1976 (Table 1.14). Therefore, in formulating the fertility assumptions in the current round of projections only a single fertility variant was considered. This, however, should not be read as implying that the future fertility trend is in principle determinable. Users of the projected data should constantly bear in mind the inherent uncertainty of the assumptions—even though they were based on longer historical trends and made by applying more sophisticated techniques—and the near certainty that time will prove that they are to some extent incorrect.

Table 1.1 Estimated mid-year population and birth rates, 1971–1981

Year	Mid-year population	Crude birth rate (per 1 000 populations)	Women aged 15 to 49	General fertility rate (per 1 000 women aged 15 to 49)
	(in 000s)		(in 000s)	
1971	4 045.3	19.7	919.8	86.7
1972	4 115.7	19.5	948.2	84.7
1973	4 212.6	19.5	983.3	83.6
1974	4 319.6	19.3	1 022.3	81.8
1975	4 395.8	18.2	1 050.8	75.9
1976	4 443.8	17.7	1 077.1	72.9
1977	4 509.8	17.7	1 111.3	72.0
1978	4 597.0	17.6	1 148.1	70.5
1979	4 819.4	17.0	1 215.9	67.4
1980	4 999.8	17.1	1 270.7	67.1
1981	5 133.8	16.9	1 316.8	65.9

Table 1.2 Age-specific fertility rates per 1 000 women, 1971–1981

Year	Age of women						
	15–19	20–24	25–29	30–34	35–39	40–44	45–49
1971	17	145	243	162	83	28	4
1972	17	139	248	146	77	26	3
1973	18	133	243	142	72	24	3
1974	19	133	219	137	66	21	3
1975	18	122	199	126	55	18	2
1976	17	110	192	120	49	15	2
1977	17	105	186	115	46	13	1
1978	15	99	179	114	44	11	1
1979	13	90	166	110	42	9	1
1980	12	89	161	104	40	9	1
1981	12	87	155	98	35	7	1

Index of rates with those for 1971 taken as base (100)†

1971	100	100	100	100	100	100	100
1972	102	96	102	90	93	91	89
1973	105	91	100	87	87	83	89
1974	111	92	90	85	79	74	69
1975	105	84	82	78	65	64	67
1976	102	76	79	74	59	51	42
1977	102	73	77	71	55	46	31
1978	90	69	73	70	52	40	31
1979	75	62	68	68	51	33	25
1980	73	61	66	64	47	30	22
1981	69	60	64	61	42	24	19

† Computed on unrounded figures.

Table 1.3 Percentage of women at given ages who were ever married, 1971, 1976 and 1981

<i>Year</i>	<i>Age of women</i>				
	<i>15-19</i>	<i>20-24</i>	<i>25-29</i>	<i>30-34</i>	<i>35-39</i>
1971	3	32	80	94	97
1976	4	32	74	93	97
1981	3	29	70	89	96

Table 1.4 Percentage distribution of live births by birth order, 1971, 1976 and 1981

<i>Year</i>	<i>All births</i>	<i>First births</i>	<i>Second births</i>	<i>Third births</i>	<i>Fourth or higher order births</i>
1971	100	27	23	17	33
1976	100	39	31	15	15
1981	100	44	33	15	8

Table 1.5 Total fertility rates and net reproduction rates (per woman), 1971-1981

	<i>1971</i>	<i>1972</i>	<i>1973</i>	<i>1974</i>	<i>1975</i>	<i>1976</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>	<i>1980</i>	<i>1981</i>
Total fertility rate	3.41	3.29	3.17	2.99	2.70	2.52	2.42	2.32	2.16	2.08	1.97
Net reproduction rate	1.63	1.55	1.50	1.42	1.26	1.18	1.14	1.09	1.01	0.98	0.93

Table 1.6 Actual and projected first-order birth rates per 1 000 women

Year	Age of women		
	20-24	25-29	30-34
1979-1981	57	65	20
1982	54	69	23
1983	53	69	24
1984	51	69	25
1985	50	69	26
1986	49	71	27
1987	49	71	28
1988	49	71	28
1989	49	71	28
1990	49	71	28
1991	49	72	29
1992	49	72	29
1993	49	72	29
1994	49	72	29
1995	49	73	29
1996	49	73	30
1997	49	73	30
1998	49	73	30
1999	49	73	30
2000	49	73	30
2001	49	73	30

Index of rates with those for 1979-1981 taken as base (100)†

1979-1981	100	100	100
1986	86	109	135
1991	86	111	145
1996	86	112	150
2001	86	112	150

* The figures below the broken line are projected rates.

† Computed on unrounded figures.

Table 1.7 Percentage of women born in selected years with at least one child by given age

<i>Mother's year of birth</i>	<i>Exact age</i>						
	20	25	30	35	40	45	50
1931 ^a	16.6	57.8	81.6	90.8	93.3	93.7	93.7
1936 ^b	12.7	56.8	81.3	89.9	91.6	91.9	91.9
1941 ^b	14.0	57.2	84.5	91.8	93.7	94.1	94.1
1946 ^b	12.3	52.1	82.7	90.4	92.4	92.8	92.8
1951 ^b	7.2	42.2	76.5	88.2	90.3	90.6	90.6
1956 ^c	7.2	37.6	72.2	86.1	88.3	88.6	
1961 ^c	5.8	32.3	67.9	82.3	84.4		
1966 ^d	5.0	29.5	65.6	80.5			
1971 ^d	5.0	29.5	65.9				
1976 ^d	5.0	29.4					
1981 ^d	5.0						

^a Based partly on the 1976 By-Census results and partly on birth statistics.

^b Based partly on the 1976 By-Census results, partly on birth statistics and partly on projections.

^c Based partly on birth statistics and partly on projections.

^d Based entirely on projections.

Table 1.8 Median age of mothers born in selected years at first birth

<i>Mother's year of birth</i>	<i>Median age at first birth</i>
1931	24.0 ^a
1936	24.1 ^a
1941	24.1 ^a
1946	24.7 ^a
1951	25.9 ^b
1956	26.7 ^c
1961	27.4 ^d
1966	27.7 ^e
1971	27.7 ^e

^a Based on the 1976 By-Census results.

^b Based partly on the 1976 By-Census results and partly on birth statistics.

^c Based entirely on birth statistics.

^d Based partly on birth statistics and partly on projections.

^e Based entirely on projections.

Table 1.9 Actual and projected second-order birth rates per 1 000 women

Year	Age of women		
	20-24	25-29	30-34
1979-1981	26	60	37
1982	24	60	39
1983	23	59	39
1984	22	58	39
1985	21	57	39
1986	20	56	39
1987	19	56	39
1988	19	55	39
1989	18	54	39
1990	17	53	39
1991	17	53	39
1992	17	53	39
1993	17	53	39
1994	17	53	39
1995	17	53	39
1996	17	53	39
1997	17	53	39
1998	17	53	39
1999	17	53	39
2000	17	53	39
2001	17	53	39
<i>Index of rates with those for 1979-1981 taken as base (100)†</i>			
1979-1981	100	100	100
1986	77	93	105
1991	65	88	105
1996	65	88	105
2001	65	88	105

* The figures below the broken line are projected rates.

† Computed on unrounded figures.

Table 1.10 Actual and projected age-specific fertility rates per 1 000 women

Year	Age of women						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49‡
1979-1981	12	89	161	103	38	8	1
1982	12	84	160	103	36	7	1
1983	12	81	158	103	35	6	1
1984	12	78	156	102	33	6	1
1985	12	76	153	102	32	5	1
1986	12	74	153	102	31	5	1
1987	12	73	151	102	31	5	1
1988	12	72	149	101	30	5	0
1989	12	71	148	100	29	4	0
1990	12	70	146	100	29	4	0
1991	12	69	146	99	28	4	0
1992	12	69	145	98	28	4	0
1993	12	69	145	98	28	4	0
1994	12	69	144	97	27	3	0
1995	12	69	144	97	27	3	0
1996	12	69	144	96	27	3	0
1997	12	69	143	96	27	3	0
1998	12	69	143	95	26	3	0
1999	12	69	143	95	26	3	0
2000	12	69	143	94	26	3	0
2001	12	69	143	94	26	3	0

Index of rates with those for 1979-1981 taken as base (100)†

1979-1981	100	100	100	100	100	100	100
1986	96	83	95	99	82	62	64
1991	96	78	91	96	74	47	49
1996	96	78	89	93	70	40	38
2001	96	78	89	91	68	36	33

‡ '0' signifies less than 1 but not zero.

* The figures below the broken line are projected rates.

† Computed on unrounded figures.

Table 1.11 Projected total fertility rates and net reproduction rates (per woman), 1982–2001

<i>Year</i>	<i>Total fertility rate</i>	<i>Net reproduction rate</i>
1982	2.01	0.95
1983	1.97	0.93
1984	1.94	0.92
1985	1.90	0.90
1986	1.88	0.89
1987	1.86	0.88
1988	1.84	0.87
1989	1.82	0.86
1990	1.80	0.86
1991	1.79	0.85
1996	1.75	0.83
2001	1.73	0.82

Table 1.12 Number of children ever born by women born in selected years by given age

<i>Mother's year of birth</i>	<i>Exact age</i>						
	20	25	30	35	40	45	50
1931 ^a	0.239	1.337	2.948	4.292	4.822	4.941	4.947
1936 ^b	0.178	1.164	2.496	3.310	3.659	3.720	3.724
1941 ^b	0.208	1.282	2.531	3.274	3.498	3.532	3.535
1946 ^b	0.203	1.198	2.299	2.811	2.984	3.008	3.010
1951 ^b	0.094	0.739	1.640	2.171	2.321	2.339	2.341
1956 ^c	0.092	0.587	1.378	1.897	2.036	2.052	
1961 ^c	0.069	0.472	1.220	1.719	1.852		
1966 ^d	0.058	0.415	1.138	1.623			
1971 ^d	0.058	0.404	1.120				
1976 ^d	0.058	0.405					
1981 ^d	0.058						

^a Based partly on the 1976 By-Census results and partly on birth statistics.

^b Based partly on the 1976 By-Census results, partly on birth statistics and partly on projections.

^c Based partly on birth statistics and partly on projections.

^d Based entirely on projections.

Table 1.13 International trends in total fertility rates (per woman), 1971–1980

<i>Country</i>	<i>1971</i>	<i>1972</i>	<i>1973</i>	<i>1974</i>	<i>1975</i>	<i>1976</i>	<i>1977</i>	<i>1978</i>	<i>1979</i>	<i>1980</i>
Hong Kong	3.41	3.29	3.17	2.99	2.70	2.52	2.42	2.32	2.16	2.08
Singapore	3.02	3.04	2.79	2.35	2.07	2.11	1.82	1.79	1.79	1.73
Japan	2.18	2.18	2.19	2.10	1.94	1.85	1.81	1.81	1.79	1.75
U.S.A.	2.27	2.02	1.90	1.86	1.80	1.77	1.83	1.80	1.86	—
Canada	2.14	1.98	1.89	1.84	1.82	1.80	1.81	1.77	—	—
England and Wales	2.39	2.20	2.03	1.91	1.79	1.72	1.68	1.75	1.86	1.90
France	2.49	2.41	2.30	2.11	1.93	1.83	1.87	1.83	1.87	1.96
Switzerland	2.03	1.92	1.82	1.73	1.60	1.53	1.52	1.49	1.50	1.53
West Germany	1.92	1.71	1.54	1.51	1.45	1.46	1.40	1.39	1.37	1.43
Norway	2.50	2.37	2.24	2.14	1.99	1.87	1.76	1.77	1.75	1.72
Sweden	1.98	1.93	1.88	1.89	1.78	1.69	1.65	1.60	1.65	1.68

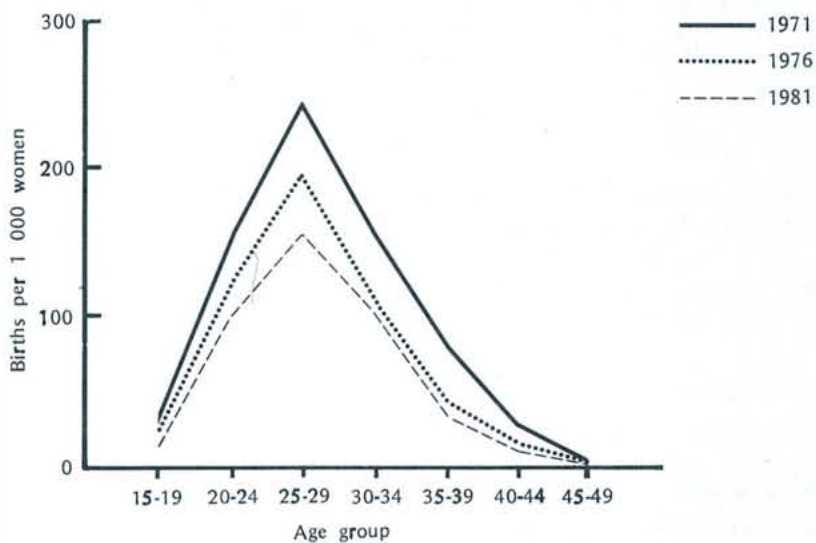
— Figure not available.

Table 1.14 Actual and projected (1976-based projections) total fertility rates (per woman), 1976–1981

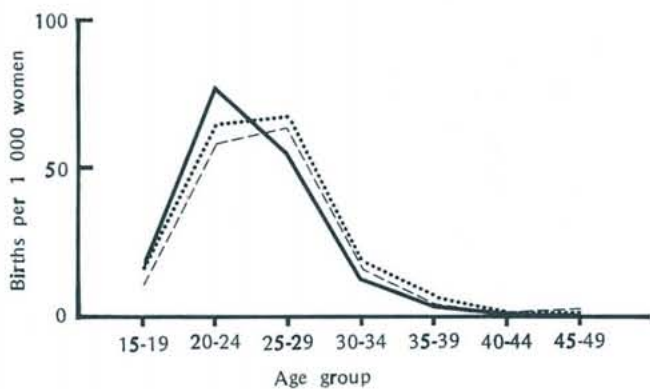
<i>Year</i>	<i>Actual</i>	<i>High variant</i>	<i>Medium variant</i>	<i>Low variant</i>
1976	2.52			
1977	2.42	2.43	2.42	2.28
1978	2.32	2.35	2.33	2.17
1979	2.16	2.29	2.25	2.09
1980	2.08	2.23	2.18	2.02
1981	1.97	2.19	2.12	1.96

Chart 1.1 Age-specific Fertility Rates : 1971, 1976 and 1981

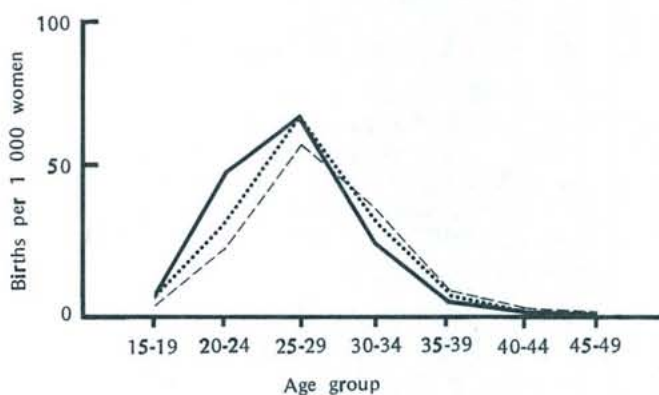
(a) All births



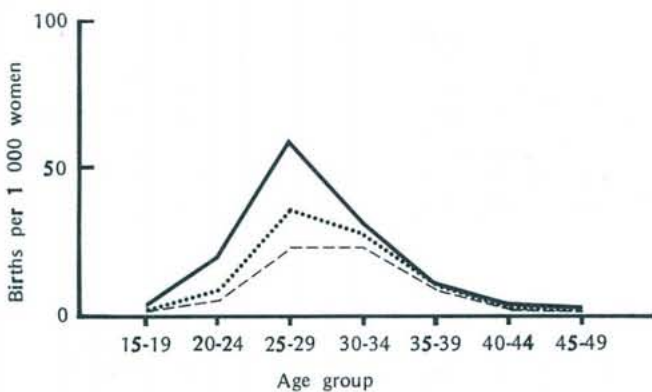
(b) First order



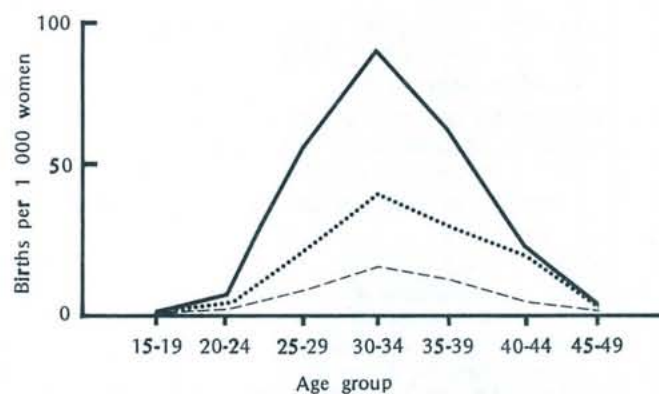
(c) Second order



(d) Third order



(e) Fourth order and over



2. Mortality

Mortality—past trends

The annual number of deaths in Hong Kong fluctuated steadily around 19 000 throughout the 1960's. Thereafter the steady trend in deaths started to increase, rising to 25 000 in 1980. During this period the crude death rate, which relates the number of deaths occurring during a calendar year to the estimated mid-year total population*, fell from 6 deaths per 1 000 population to 5. The rate of decrease has been far from constant over the period; for most years in the second half of the period, the rate fluctuated around 5 per 1 000 population (Table 2.1). However, the crude death rate is not a good indicator of the level of mortality as it takes no account of the changing age and sex structure of the population.

In order to reflect more accurately the trend in mortality during the period 1971–1980, it is necessary to discount the differences in the age and sex structure of the population between these years, as in the standardized death rates which are also shown in Table 2.1. It can be seen that there was a gradual decrease in mortality over the 10-year period. The death rate dropped continuously from 5 deaths per 1 000 population in 1971 to a corresponding figure of 4 in 1980.

Age-specific death rates

Mortality differs significantly between ages; in general, the death rate starts at a high level in the first year of life, falls to a minimum near age 11, then moves up slowly until mid life and finally rises rapidly at the older ages. Mortality also differs between sexes. Female mortality in infancy and throughout life is lower than male mortality. These differentials are shown in Chart 2.1.

Therefore, a greater insight into the decline in mortality can be gained by examining the trend in the age-sex-specific death rate (Table 2.2) which relates the number of deaths for each sex in a given age group occurring during a calendar year to the total population for each sex in that age group at the middle of that year. The trends of age-sex-specific death rates from 1971 to 1980 have shown the following features:

- (1) there has been a considerable fall in mortality in childhood and at the youngest adult ages, but the percentage improvement decreases with age and at advanced ages improvement has been very slow; and
- (2) male mortality has improved more rapidly than female mortality.

As a result of these changes, the difference in the age-specific death rates between males and females was gradually disappearing, particularly for certain ages (Table 2.3). This phenomenon, to some extent, is contrary to the experience of most other low mortality countries. It should, however, be noted that the relatively low death rates for males at ages 15 to 40 in particular and the declines over the past five years are indirectly associated with the large influx of immigrants during the same period. Hong Kong gained some 220 000 illegal immigrants from 1978 to 1980. The main features of the age-sex structure of these immigrants were:

- (1) a predominance of males (a sex ratio of 3:1); and
- (2) an excessively large proportion (some 93 per cent) of male immigrants falling into the age group 15–39.

Clearly an influx of immigrants of this size over the past four years has had a marked structural impact on the size and age and sex distribution of the population. Thus the age-specific death rates calculated on the changed population at risk showed a greater decrease than would be accounted for by a genuine decline in mortality. With the abolition of the 'reach-base' policy† one could discount the possibility of getting yet another spurious decline in the age-specific death rates for males due to the abnormal change of the age and sex structure of the population.

Cause-specific death rates

The different rates of mortality decline in different age groups, as mentioned in the discussion above, were directly attributable to different rates of improvement in specific causes of death. The pattern of the major causes of death in Hong Kong has changed considerably during the period from 1971 to 1980. Table 2.4 shows the percentage distribution of all deaths between 1971 and 1980 by cause. It can be seen that deaths due to infectious and parasitic diseases continued to decline, from 7 per cent of the total deaths in 1971 to 3 per cent in 1980. The fall in the proportion of deaths from congenital anomalies and conditions arising in the perinatal period was also fairly significant. On the other hand, neoplasms and diseases of the

* Mid-year population is employed to approximate the number of person-years in the calculation of the crude death rate. This approximation is used in the calculation of other mortality measures described in this paper.

† New legislation was passed by the Hong Kong Legislative Council on 23 October 1980 to provide for the repatriation of all immigrants entering Hong Kong from China illegally after 23 October 1980, even though they have 'reached base', i.e. evade capture. Previously, 'reach-base' illegal immigrants were allowed to remain in Hong Kong.

circulatory system, which in 1971 accounted for 21 per cent and 25 per cent of the total deaths respectively, accounted for 26 per cent and 30 per cent of all deaths in 1980. There was also an increase in deaths due to diseases of the genitourinary system.

Although there was a marked change in the percentage share of the total deaths by various cause groups between 1971 and 1980, the three leading causes of death remained the same throughout this period, namely diseases of the circulatory system, neoplasms and diseases of the respiratory system in that order.

The trend of mortality by major cause of death from 1971 to 1980 (Table 2.5) has shown the following features:

- (1) there has been a considerable fall in infant mortality from congenital anomalies, particularly for males;
- (2) there has been a significant improvement in mortality from diseases of the circulatory system and the respiratory system, and the percentage improvement is greater for males than for females;
- (3) male mortality from neoplasms has increased at every age after 45, markedly so at ages 65 and over; and
- (4) female mortality from neoplasms has declined at most ages, but the rate of improvement declines with age.

Expectation of life at birth

Table 2.6 shows the trend of the expectation of life at birth, defined as the average lifetime of a hypothetical cohort of births all assumed to be born in a given year, and thereafter subject to the same mortality rates prevailing in that year. This summary index is useful for describing the mortality conditions of the population over time, and for comparing with those of other populations.

Between 1971 and 1980 the expectation of life at birth increased by 4.3 years from 67.4 to 71.7 for males, and by 2.5 years from 75.0 to 77.5 for females. As a result of these changes, the difference in the corresponding expectations between males and females fell from 7.6 years in 1971 to 5.8 years in 1980. Again, this phenomenon is contrary to the trends in most other low mortality countries (Table 2.6). By the standards prevailing in all the other countries considered, Hong Kong's level of mortality, as summarized by the expectation of life at birth, is already very low. Further improvement, which although possible in the light of the existing socioeconomic conditions in Hong Kong and advances in medical technology, will be slow.

Method of projecting mortality

Basically, the projected death rates at ages 1 to 44 were derived by carrying forward past trends in the age-sex-specific death rates, and those at ages 0 and 45 and over by extrapolating trends in the age-sex-cause-specific death rates (using the techniques outlined below). In projecting the cause-specific death rates most attention was given to examining trends in the death rates from neoplasms and diseases of the circulatory system and the respiratory system, since mortality from these diseases contributes substantially to total mortality.

Specifically, the projection of mortality trends involved the fitting of three separate curves to each of the time series of the age-specific death rates by sex and cause, namely a linear regression curve, the reciprocal of the linear regression curve, and a generalized exponential curve. In general, the linear regression curve fitted least well and the speed of change of the extrapolated values was found to be unrealistic. In most cases, the reciprocal curve, which had a similar initial slope to the exponential curve, tended to tail less rapidly to the horizontal and provided the best fit in terms of the minimum value for the sum of the squares of the deviations of the actual values from the trendal values. The curve of best fit was then carried forward for n years into the future: n being determined on the basis of subjective judgement with reference to the actual values for the last few years, the effect of immigrants and the experience of other low mortality countries—Sweden in particular. The level of mortality in Sweden in 1978 was assumed to be the limit of the projected future mortality.

Having thus obtained the projected death rates, several cross checks were made to ensure their appropriateness and consistency. Firstly, the projected age-sex-specific death rates were examined in relation to past trends. Secondly, the projected age-sex-specific death rates at ages 1 to 44 were further checked against the assumption that the difference between the male and female rates would remain the same as observed in the period 1978–1980. Finally, an assessment was made of the effect on the expectation of life at birth of the projected age-sex-specific death rates. The difference between the male and female expectations of life is expected to stabilize at 5.8 years as observed in 1980. On the basis of these three checks, the initially projected death rates were modified to make them consistent with what was considered to be the most likely future path of mortality in Hong Kong.

Projected age-specific death rates

Table 2.7 shows the projected age-specific death rates for males and females and compares them with recent trends from 1978 to 1980. In general, a gradual continuation of past trends has been assumed. It may be noted that at the younger ages, the death rates are now so low that a change in the rate of improvement assumed at these ages would make little difference to the size of the projected population.

Table 2.8 shows the difference between the projected male and female age-specific death rates. The difference between these rates at ages 1 to 44 has been assumed to remain unchanged as observed in the period 1978-1980. The difference at most other ages is expected to be further reduced.

Table 2.9 shows the effect on the expectation of life of these assumptions concerning mortality improvement. The expectation of life of a male baby born in the year immediately preceding the projection date, viz. 1980, and experiencing the mortality rates of that year throughout his future lifetime, would be 71.7 years, while that on the mortality basis assumed for the final year of the projection, viz. 2001, would be 72.4 years. The corresponding expectations for a female baby are 77.5 years and 78.2 years.

Difference between 1976 and 1981 mortality assumptions

The medium mortality variant incorporated into the 1976-based population projections assumed that the expectation of life at birth would increase steadily to 72 years for males and 78.2 years for females by 1996. But the cumulative evidence from the data obtained in the past four years points to the possibility that the decline in the death rates will be more pronounced and continue longer into the future, particularly for males, than could be envisaged in 1976 (Table 2.10). Therefore, in formulating the mortality assumptions for the 1981-based projections only a single mortality variant was considered.

Table 2.1 Estimated mid-year population and death rates, 1971-1980

<i>Year</i>	<i>Mid-year population</i> (in 000s)	<i>Crude death rate</i> (per 1 000 population)	<i>Standardized death rate*</i> (per 1 000 population)
1971	4 045.3	5.0	5.0
1972	4 115.7	5.2	5.1
1973	4 212.6	5.0	4.8
1974	4 319.6	5.1	4.6
1975	4 395.8	4.9	4.4
1976	4 443.8	5.1	4.5
1977	4 509.8	5.2	4.4
1978	4 597.0	5.2	4.3
1979	4 819.4	5.2	4.2
1980	4 999.8	5.0	4.0

* Standardized death rates have been computed using the age-sex population distribution of 1971 as the standard population.

Table 2.2 Age-sex-specific death rates per 1 000 population, 1971–1980

Age Group	Death rate										Index of rates*		
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1971	1976	1980
<i>Male</i>													
0	21.2	19.2	18.4	19.2	16.1	16.2	14.7	13.5	14.0	12.7	100	76	60
1– 4	1.0	1.1	1.1	1.1	0.8	0.8	0.8	0.7	0.7	0.6	100	80	60
5– 9	0.5	0.5	0.4	0.4	0.5	0.4	0.3	0.3	0.4	0.3	100	80	60
10–14	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.3	100	75	75
15–19	0.7	0.9	0.8	0.6	0.5	0.6	0.5	0.5	0.6	0.5	100	86	71
20–24	1.2	1.4	1.3	1.1	1.0	1.0	1.0	1.0	0.9	0.7	100	83	58
25–29	1.7	1.5	1.7	1.4	1.2	1.2	1.2	1.3	1.1	1.0	100	71	59
30–34	2.0	1.9	2.0	2.1	1.6	1.8	1.5	1.7	1.4	1.2	100	90	60
35–39	2.8	2.7	2.5	2.1	2.0	2.2	2.3	2.0	2.1	1.7	100	79	61
40–44	4.3	4.2	4.1	3.9	3.8	3.4	3.5	3.0	3.4	2.7	100	79	63
45–49	6.2	6.3	6.0	6.0	5.6	5.8	5.5	5.4	5.7	5.1	100	94	82
50–54	10.4	9.8	10.5	9.7	9.2	8.9	8.7	9.3	8.7	7.9	100	86	76
55–59	17.7	17.3	14.7	14.5	14.6	14.1	14.1	14.0	13.8	13.8	100	80	78
60–64	28.8	29.2	27.2	25.8	23.2	23.7	23.7	21.5	21.8	19.7	100	82	68
65–69	43.0	43.8	40.0	38.9	37.7	39.6	37.8	36.5	35.6	33.9	100	92	79
70–74	61.0	64.9	58.5	56.6	54.5	60.3	55.6	53.6	52.6	46.9	100	99	77
75 and over	106.0	111.4	96.5	92.5	91.7	99.7	97.7	95.0	91.2	92.3	100	94	87
<i>Female</i>													
0	16.1	16.1	14.8	15.0	13.0	11.9	12.5	10.8	10.6	10.4	100	74	65
1– 4	0.8	0.9	1.0	1.0	0.7	0.8	0.7	0.7	0.6	0.6	100	100	75
5– 9	0.3	0.3	0.4	0.3	0.3	0.3	0.2	0.2	0.3	0.2	100	100	67
10–14	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	100	100	67
15–19	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	100	80	60
20–24	0.7	0.6	0.6	0.7	0.6	0.5	0.4	0.5	0.5	0.4	100	71	57
25–29	0.8	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.6	0.5	100	88	63
30–34	1.1	1.0	1.1	1.2	1.0	1.1	0.8	0.9	0.8	0.7	100	100	64
35–39	1.5	1.5	1.4	1.3	1.3	1.3	1.2	1.1	1.0	1.1	100	87	73
40–44	2.2	2.3	2.1	2.0	2.0	2.0	2.0	1.6	1.8	1.8	100	91	82
45–49	3.3	3.2	3.2	3.0	2.8	3.1	2.8	2.9	2.8	2.6	100	94	79
50–54	5.5	5.2	5.1	4.8	4.6	4.8	4.1	4.4	4.2	4.2	100	87	76
55–59	7.8	8.2	7.7	7.3	7.6	7.4	7.3	7.1	7.5	7.1	100	95	91
60–64	11.7	12.5	12.8	12.3	12.0	12.0	12.3	11.3	11.2	10.5	100	103	90
65–69	20.2	18.2	17.3	18.5	17.6	19.0	19.5	19.3	19.1	17.8	100	94	88
70–74	31.0	31.0	28.6	29.2	27.6	28.4	28.4	29.5	28.1	27.7	100	92	89
75 and over	73.4	74.1	68.4	68.6	68.7	71.5	74.0	70.2	70.5	67.4	100	97	92

* Rates for 1971 taken as base (100). Indexes are computed on unrounded figures.

Table 2.3 Difference between male and female age-specific death rates per 1 000 population, 1971–1980

Age group	Difference (Male – Female)									
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
0	5.1	3.1	3.6	4.2	3.1	4.3	2.2	2.7	3.4	2.3
1– 4	0.2	0.2	0.1	0.1	0.1	—	0.1	—	0.1	—
5– 9	0.2	0.2	—	0.1	0.2	0.1	0.1	0.1	0.1	0.1
10–14	0.1	0.1	0.1	0.1	—	—	0.1	—	—	0.1
15–19	0.2	0.4	0.4	0.2	0.1	0.2	0.2	0.2	0.3	0.2
20–24	0.5	0.8	0.7	0.4	0.4	0.5	0.6	0.5	0.4	0.3
25–29	0.9	0.6	0.8	0.6	0.5	0.5	0.5	0.6	0.5	0.5
30–34	0.9	0.9	0.9	0.9	0.6	0.7	0.7	0.8	0.6	0.5
35–39	1.3	1.2	1.1	0.8	0.7	0.9	1.1	0.9	1.1	0.6
40–44	2.1	1.9	2.0	1.9	1.8	1.4	1.5	1.4	1.6	0.9
45–49	2.9	3.1	2.8	3.0	2.8	2.7	2.7	2.5	2.9	2.5
50–54	4.9	4.6	5.4	4.9	4.6	4.1	4.6	4.9	4.5	3.7
55–59	9.9	9.1	7.0	7.2	7.0	6.7	6.8	6.9	6.3	6.7
60–64	17.1	16.7	14.4	13.5	11.2	11.7	11.4	10.2	10.6	9.2
65–69	22.8	25.6	22.7	20.4	20.1	20.6	18.3	17.2	16.5	16.1
70–74	30.0	33.9	29.9	27.4	26.9	31.9	27.2	24.1	24.5	19.2
75 and over	32.6	37.3	28.1	23.9	23.0	28.2	23.7	24.8	20.7	24.9

— Difference of less than 0.05.

Table 2.4 Percentage distribution of deaths by cause of death, 1971–1980

Cause of death	Year											increase (+)/ decrease (-) 1971–1980
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	%	
	%	%	%	%	%	%	%	%	%	%	%	%
Infectious and parasitic diseases	7.1	7.0	6.5	5.8	4.0	3.3	3.2	2.7	3.0	3.2		-3.9
Neoplasms	20.8	20.6	21.3	21.5	23.8	23.7	24.2	25.3	24.5	25.7		+4.9
Diseases of the circulatory system	24.9	24.4	25.2	25.5	27.6	29.0	29.0	30.7	29.6	29.6		+4.7
Diseases of the respiratory system	16.4	17.2	15.9	17.3	15.6	14.5	15.4	14.2	15.3	15.6		-0.8
Diseases of the digestive system	5.0	4.9	5.4	5.0	4.6	5.0	4.8	4.2	4.1	4.5		-0.5
Diseases of the genitourinary system	2.2	2.1	2.1	1.7	2.0	2.2	2.2	2.5	3.6	3.9		+1.7
Congenital anomalies and certain conditions originating in the perinatal period	4.4	4.4	4.2	4.3	4.3	3.9	3.7	3.4	3.3	3.1		-1.3
Symptoms, signs and ill-defined conditions	10.2	10.1	9.2	9.6	9.6	8.8	8.0	9.3	7.2	5.8		-4.4
Injuries and poisonings	6.8	7.0	7.7	6.8	5.8	6.6	6.7	5.2	6.8	6.2		-0.6
Other diseases	2.2	2.3	2.5	2.5	2.7	3.0	2.8	2.5	2.6	2.4		+0.2
All causes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		

Table 2.5 Percentage distribution of deaths and death rates by age by sex by leading cause of death, 1971, 1976 and 1980 (ranking according to 1980)

Male

Age group	Cause of death	Percentage			Death rate (for 100 000 population)		
		1971	1976	1980	1971	1976	1980
All ages	All causes	100 (11 500)	100 (12 500)	100 (13 900)	558	550	531
	1. Neoplasms	21	26	29	120	140	153
	2. Diseases of the circulatory system	23	27	27	126	148	144
	3. Diseases of the respiratory system	16	14	15	91	79	81
	4. Others	40	33	29	221	183	153
0	All causes	100 (800)	100 (600)	100 (500)	2 119	1 616	1 265
	1. Congenital anomalies and certain conditions originating in the perinatal period	63	73	76	1 333	1 188	957
	2. Diseases of the respiratory system	20	14	12	417	222	154
	3. Injuries and poisonings	3	2	4	67	30	47
	4. Others	14	11	8	302	176	107
1-44	All causes	100 (2 200)	100 (1 900)	100 (1 800)	135	109	90
	1. Injuries and poisonings	25	28	34	33	31	31
	2. Neoplasms	21	24	27	29	26	24
	3. Diseases of the respiratory system	12	9	9	17	10	8
	4. Others	42	39	30	56	42	27
45-54	All causes	100 (1 800)	100 (1 800)	100 (1 800)	818	728	647
	1. Neoplasms	34	38	42	278	280	275
	2. Diseases of the circulatory system	20	22	22	163	161	139
	3. Diseases of the respiratory system	11	11	11	88	79	69
	4. Others	35	29	25	289	208	164
55-64	All causes	100 (2 900)	100 (3 100)	100 (3 300)	2 230	1 833	1 649
	1. Neoplasms	26	32	38	584	589	625
	2. Diseases of the circulatory system	27	31	29	608	556	475
	3. Diseases of the respiratory system	16	13	13	353	244	212
	4. Others	31	24	20	685	444	337
65-74	All causes	100 (2 400)	100 (3 100)	100 (3 900)	5 008	4 710	3 864
	1. Diseases of the circulatory system	32	37	35	1 620	1 719	1 357
	2. Neoplasms	20	24	29	991	1 150	1 101
	3. Diseases of the respiratory system	19	16	17	972	777	673
	4. Others	29	23	19	1 425	1 064	733
75 & over	All causes	100 (1 400)	100 (2 000)	100 (2 600)	10 604	9 968	9 227
	1. Diseases of the circulatory system	32	36	35	3 425	3 602	3 265
	2. Diseases of the respiratory system	24	22	23	2 528	2 175	2 165
	3. Neoplasms	11	14	16	1 196	1 397	1 441
	4. Others	33	28	26	3 455	2 794	2 356

Table 2.5 Percentage distribution of deaths and death rates by age by sex by leading cause of death, 1971, 1976 and 1980 (ranking according to 1980) (Contd.)

Female

Age group	Cause of death	Percentage			Death rate (for 100 000 population)		
		1971	1976	1980	1971	1976	1980
All ages	All causes	100 (8 900)	100 (10 100)	100 (11 100)	448	466	466
	1. Diseases of the circulatory system	28	31	33	125	146	153
	2. Neoplasms	20	22	22	90	101	102
	3. Diseases of the respiratory system	17	15	16	74	68	74
	4. Others	35	32	29	159	151	137
0	All causes	100 (600)	100 (400)	100 (400)	1 608	1 195	1 039
	1. Congenital anomalies and certain conditions originating in the perinatal period	57	70	77	923	836	798
	2. Diseases of the respiratory system	25	12	9	403	146	93
	3. Infectious and parasitic diseases	4	5	4	66	54	43
	4. Others	14	13	10	216	159	105
1-44	All causes	100 (1 100)	100 (1 100)	100 (900)	78	67	51
	1. Neoplasms	22	24	29	17	16	14
	2. Injuries and poisonings	19	24	23	15	16	12
	3. Diseases of the circulatory system	15	14	13	12	10	7
	4. Others	44	38	35	34	25	18
45-54	All causes	100 (900)	100 (900)	100 (800)	433	390	340
	1. Neoplasms	40	41	42	174	161	143
	2. Diseases of the circulatory system	24	25	26	103	96	88
	3. Diseases of the genitourinary system	4	4	8	16	16	28
	4. Others	32	30	24	140	117	81
55-64	All causes	100 (1 400)	100 (1 600)	100 (1 700)	956	950	867
	1. Neoplasms	33	35	36	312	336	313
	2. Diseases of the circulatory system	31	32	33	294	308	290
	3. Diseases of the respiratory system	13	11	10	124	99	86
	4. Others	23	22	21	226	207	178
65-74	All causes	100 (2 100)	100 (2 400)	100 (2 700)	2 486	2 316	2 204
	1. Diseases of the circulatory system	36	40	40	902	919	876
	2. Neoplasms	23	24	24	564	554	542
	3. Diseases of the respiratory system	15	14	15	380	317	327
	4. Others	26	22	21	640	526	459
75 & over	All causes	100 (2 800)	100 (3 700)	100 (4 600)	7 336	7 153	6 740
	1. Diseases of the circulatory system	33	36	36	2 408	2 575	2 440
	2. Diseases of the respiratory system	21	21	23	1 563	1 490	1 525
	3. Symptoms, signs and ill-defined conditions	26	21	16	1 924	1 536	1 091
	4. Others	20	22	25	1 441	1 552	1 684

Note: Figures in brackets indicate the actual number of deaths rounded to the nearest hundred.

Table 2.6 International trends of expectations of life at birth, 1971–1980

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<i>Male</i>										
Hong Kong	67.4	68.1	68.7	69.1	70.0	69.7	70.1	70.6	70.7	71.7
Sweden	72.0	72.1	72.1	72.3	72.2	72.2	72.8	72.5	72.6	72.8
Norway	71.2	71.4	71.4	—	71.7	72.1	72.3	72.4	72.2	—
Switzerland	70.2	70.7	71.1	—	71.6	71.7	72.1	72.0	72.4	—
England & Wales	69.2	69.0	69.2	69.4	69.7	69.7	70.2	70.1	70.2	—
West Germany	67.5	67.6	67.8	68.2	68.1	68.6	69.2	69.2	—	—
France	68.5	68.6	68.9	68.9	69.1	69.2	69.7	69.9	70.1	—
U.S.A.	67.4	67.4	67.6	68.2	68.7	69.1	69.4	69.5	69.9	—
Canada	69.5	69.3	69.5	69.6	69.8	70.1	70.5	—	—	—
Japan	70.4	70.8	70.9	71.2	71.9	72.3	72.9	73.2	73.5	—
<i>Female</i>										
Hong Kong	75.0	75.6	75.9	76.0	76.5	76.5	76.6	76.7	77.1	77.5
Sweden	77.6	77.7	77.7	78.1	78.1	78.1	79.2	78.9	78.9	78.8
Norway	77.5	77.6	77.9	—	78.2	78.3	78.9	78.8	79.0	—
Switzerland	76.4	77.0	77.2	—	78.2	78.3	79.0	78.9	79.1	—
England & Wales	75.5	75.3	75.5	75.7	75.9	75.8	76.3	76.3	76.2	—
West Germany	73.9	74.2	74.4	74.7	74.7	75.3	76.0	76.0	—	—
France	76.1	76.4	76.5	76.9	76.9	77.2	77.9	78.0	78.3	—
U.S.A.	75.0	75.1	75.4	76.0	76.7	76.9	77.3	77.2	77.8	—
Canada	76.8	76.7	77.0	77.1	77.5	77.8	78.2	—	—	—
Japan	75.8	76.3	76.3	76.3	77.2	77.6	78.2	78.6	78.9	—
<i>Difference (Female – Male)</i>										
Hong Kong	7.6	7.5	7.2	6.9	6.5	6.8	6.5	6.1	6.4	5.8
Sweden	5.6	5.6	5.6	5.8	5.9	5.9	6.4	6.4	6.3	6.0
Norway	6.3	6.2	6.5	—	6.5	6.2	6.6	6.4	6.8	—
Switzerland	6.2	6.3	6.1	—	6.6	6.6	6.9	6.9	6.7	—
England & Wales	6.3	6.3	6.3	6.3	6.2	6.1	6.1	6.2	6.0	—
West Germany	6.4	6.6	6.6	6.5	6.6	6.7	6.8	6.8	—	—
France	7.6	7.8	7.6	8.0	7.8	8.0	8.2	8.1	8.2	—
U.S.A.	7.6	7.7	7.8	7.8	8.0	7.8	7.9	7.7	7.9	—
Canada	7.3	7.4	7.5	7.5	7.7	7.7	7.7	—	—	—
Japan	5.4	5.5	5.4	5.1	5.3	5.3	5.3	5.4	5.4	—

— Figures not available.

Table 2.7 Actual and projected age-sex-specific death rates per 1 000 population

Age Group	Death rate					Index of rates*				
	1978-80	1986	1991	1996	2001	1978-80	1986	1991	1996	2001
<i>Male</i>										
0	13.3	10.4	10.3	10.2	10.1	100	78	77	77	76
1- 4	0.7	0.5	0.5	0.5	0.5	100	77	72	69	68
5- 9	0.3	0.3	0.3	0.3	0.3	100	93	93	93	93
10-14	0.3	0.3	0.3	0.3	0.3	100	94	93	93	93
15-19	0.5	0.5	0.5	0.5	0.5	100	100	100	100	100
20-24	0.9	0.9	0.9	0.9	0.9	100	100	100	100	100
25-29	1.1	1.1	1.1	1.1	1.1	100	100	100	100	100
30-34	1.4	1.4	1.4	1.4	1.4	100	100	100	100	100
35-39	2.0	1.8	1.7	1.7	1.7	100	89	88	88	88
40-44	3.1	2.7	2.7	2.7	2.7	100	89	88	88	88
45-49	5.4	5.0	4.9	4.9	4.8	100	93	90	89	89
50-54	8.6	7.6	7.4	7.3	7.3	100	88	86	85	84
55-59	13.9	13.3	13.3	13.1	13.0	100	96	95	94	93
60-64	21.1	18.7	18.1	17.7	17.3	100	89	86	84	82
65-69	35.4	33.3	32.9	32.4	32.0	100	94	93	92	90
70-74	50.9	46.9	46.7	46.3	46.1	100	92	92	91	90
75 and over	92.8	89.0	88.7	88.5	88.5	100	96	96	95	95
<i>Female</i>										
0	10.6	9.0	9.0	9.0	9.0	100	85	84	84	83
1- 4	0.6	0.5	0.5	0.4	0.4	100	83	77	73	70
5- 9	0.2	0.2	0.2	0.2	0.2	100	90	87	85	83
10-14	0.2	0.2	0.2	0.2	0.2	100	77	74	72	71
15-19	0.3	0.3	0.3	0.3	0.3	100	100	100	100	100
20-24	0.5	0.5	0.5	0.5	0.5	100	100	100	100	100
25-29	0.6	0.5	0.5	0.5	0.5	100	84	84	84	84
30-34	0.8	0.7	0.7	0.7	0.6	100	88	86	85	84
35-39	1.1	1.0	0.9	0.9	0.9	100	91	87	83	80
40-44	1.7	1.7	1.6	1.6	1.5	100	96	93	91	90
45-49	2.8	2.5	2.5	2.4	2.4	100	91	90	88	86
50-54	4.2	3.9	3.8	3.7	3.7	100	92	90	89	86
55-59	7.2	6.9	6.8	6.7	6.7	100	95	94	93	92
60-64	11.0	10.7	10.5	10.3	10.2	100	97	95	94	93
65-69	18.7	18.1	18.0	17.6	17.4	100	97	96	94	93
70-74	28.4	26.8	26.1	25.6	25.1	100	94	92	90	88
75 and over	69.3	66.6	66.1	65.8	65.7	100	96	95	95	95

* Rates for 1978-1980 taken as base (100). Indexes are computed on unrounded figures.

Table 2.8 Actual and projected difference between male and female age-specific death rates per 1 000 population

Age group	<i>Difference (Male – Female)</i>				
	1978–1980	1986	1991	1996	2001
0	2.7	1.4	1.3	1.2	1.1
1– 4	0.1	—	—	—	—
5– 9	0.1	0.1	0.1	0.1	0.1
10–14	0.1	0.1	0.1	0.1	0.1
15–19	0.2	0.2	0.2	0.2	0.2
20–24	0.4	0.4	0.4	0.4	0.4
25–29	0.6	0.6	0.6	0.6	0.6
30–34	0.7	0.7	0.7	0.7	0.8
35–39	0.9	0.8	0.8	0.8	0.8
40–44	1.3	1.0	1.1	1.1	1.2
45–49	2.7	2.5	2.4	2.5	2.4
50–54	4.4	3.7	3.6	3.6	3.6
55–59	6.7	6.5	6.5	6.4	6.3
60–64	10.1	8.0	7.6	7.4	7.1
65–69	16.6	15.2	14.9	14.8	14.6
70–74	22.5	20.1	20.6	20.7	21.0
75 & over	23.5	22.4	22.6	22.7	22.8

— Difference of less than 0.05.

Table 2.9 Actual and projected expectations of life at birth

Year	<i>Expectation of life at birth</i>		<i>Difference (Female – Male)</i>
	<i>Male</i>	<i>Female</i>	
1978	70.6	76.7	6.1
1979	70.7	77.1	6.4
1980	71.7	77.5	5.8

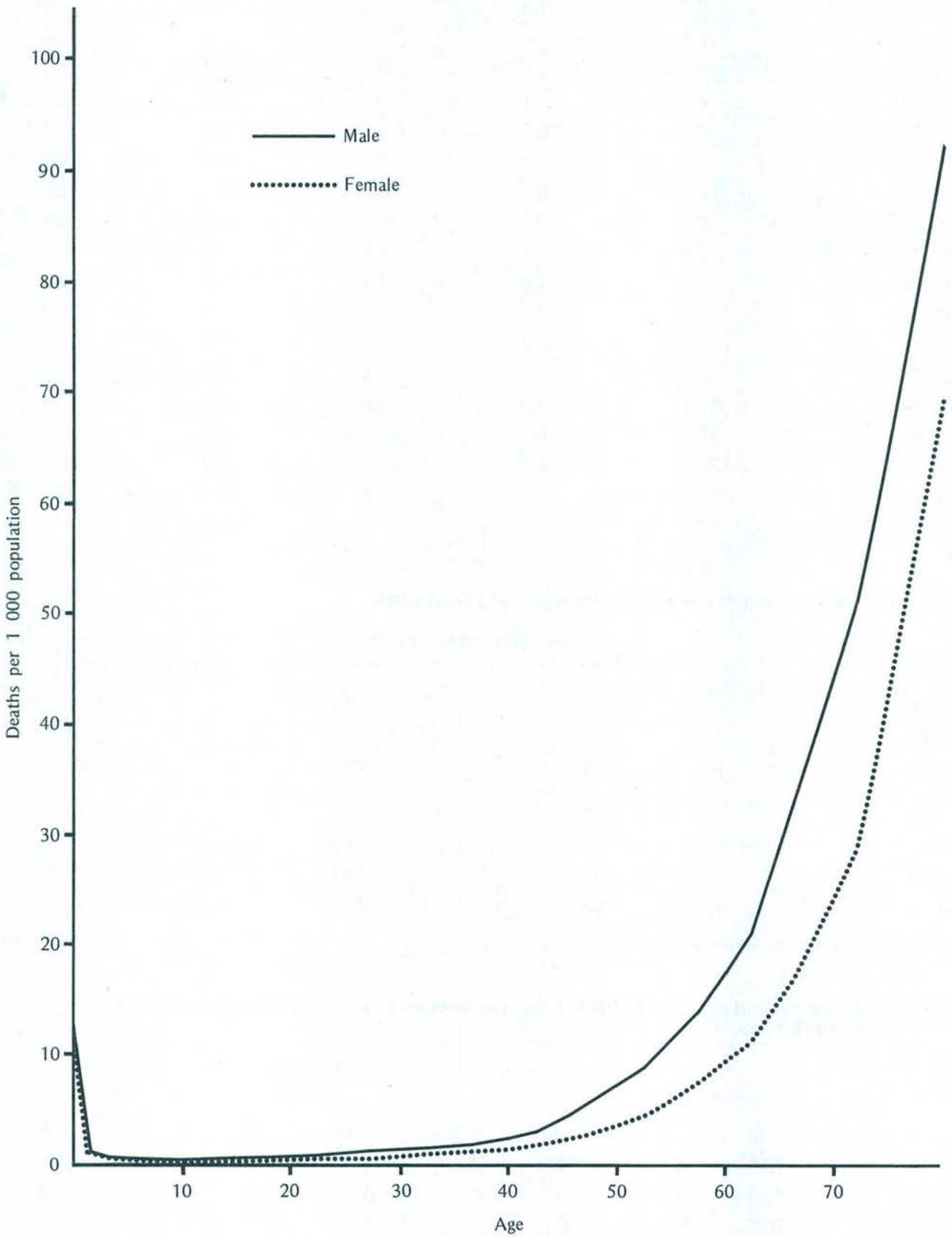
1986	72.1	77.8	5.7
1991	72.3	78.0	5.7
1996	72.4	78.1	5.7
2001	72.4	78.2	5.8

* Figures below the broken line are derived from projections.

Table 2.10 Actual and projected (1976-based projections) expectations of life at birth, 1977–1980

Year	<i>Actual</i>		<i>High variant</i>		<i>Medium variant</i>		<i>Low variant</i>	
	M	F	M	F	M	F	M	F
	1977	70.1	76.6	70.4	77.1	69.7	76.5	69.1
1978	70.6	76.7	70.5	77.2	69.9	76.6	69.2	76.0
1979	70.7	77.1	70.7	77.3	70.0	76.7	69.4	76.1
1980	71.7	77.5	70.8	77.3	70.1	76.8	69.5	76.2

Chart 2.1 Age-specific Death Rates : 1978-1980



3. Balance of Migration

In Hong Kong, migration is an uncertain element in the growth of population. An analysis of available data shows that there were approximately 500 000 Chinese immigrants during the 1950's; some 200 000 during the 1960's, and another 600 000 during the 1970's. Nearly 400 000 immigrants, legal and illegal, entered between 1978 and 1980. This brief review of the gross flows of migration over the past three decades indicates the difficulties encountered in formulating assumptions concerning future migration.

Emigrants

There is at present no information regarding the number of Hong Kong residents who emigrate. Under the provisions of the Registration of Persons Ordinance any person who emigrates has to surrender his identity card before departure, but many people do not do so. A system for the collection of visa applicants statistics has been operating since 1976. This provides some useful information on the number of applicants obtaining visas to selected countries and their age and sex distribution. However, because of incomplete coverage and the fact that some persons after obtaining an immigrant visa may change their mind about going or may return to Hong Kong after a short stay abroad, the statistics obtained from this system cannot represent the actual volume of emigration.

Crude estimates of the gross outflows of Hong Kong residents have to be derived from the time series of passengers statistics by taking the difference between total arrivals and departures of those holding Hong Kong British Passports or Certificates of Identity. In the long run, any temporary movements (including persons going abroad for tourism or study) should be eliminated by this process, and the cumulative difference over time should provide an indication of the volume of emigration.

Table 3.1 shows the arrival and departure figures at the immigration control points in relation to Hong Kong residents. There was consistently a negative balance of the figures throughout the period 1971–1981. The cumulative negative balance for the whole period amounted to 273 000.

Legal immigrants from China

The number of legal immigrants from China fluctuated from year to year over the period 1971–1981. In the late 1960's the number of these immigrants came down to a very low level. From the second half of 1972 the number increased significantly. It reached a peak of about 55 000 in the year 1973, but thereafter declined, a total of 18 000 being recorded in 1976. Since 1976 the number had climbed up again and reached a level of 70 000 in 1978 and 1979. In 1980 and 1981 the number decreased moderately and remained at about 55 000.

Legal immigrants from other countries

With the existing migration data collection system, there is no specific information on the number of legal immigrants from other countries. However, some crude estimates of the gross inflows of these immigrants can be derived from the summary statistics on three components, namely (1) new arrivals of people from other countries granted permanent or temporary residential status by Immigration Department, (2) visitors from other countries having changed their visitor status to permanent or temporary residential status and (3) balance of all in and out movements of these two categories of people.

These summary statistics are available for the period 1977–1981, and show that annual new arrivals from other countries fluctuated between 16 000 and 19 000 and that the number of visitors who had changed status increased gradually from a total of 9 000 in 1977 to 15 000 in 1981. However, there was a negative balance of all arrivals and departures of these people (including those who immigrated during the years before 1977) throughout the period, increasing gradually from 18 000 in 1977 to 26 000 in 1981. The net effect is that approximately 36 000 legal immigrants were added to Hong Kong's population during the past five years, giving an annual gain of some 7 000.

Illegal immigrants

Statistics on the number of illegal immigrants are incomplete and difficult to obtain. Before the revision of immigration policy at the end of 1980, such data only became available when illegal immigrants surfaced for registration for identity cards. The estimate of the number of illegal immigrants entering Hong Kong in 1971 was around 15 000, which increased rapidly to some 30 000 in the year 1974. In 1975–1977 the number decreased by two thirds. During the years 1978–1980, there was large-scale illegal immigration from China. The estimated total number of illegal immigrants allowed to remain in Hong Kong was, for the three-year period, of the order of some 220 000. The abolition of the 'reach-base' policy declared in October 1980 was a decisive and necessary move to stop the high rate of illegal immigration. Since then, illegal immigration has been largely checked.

Future migration

A net inward migration of 44 500 per year was assumed in the light of the historical background as described in the preceding sections for purposes of projecting population.

Table 3.1 Arrivals and departures of Hong Kong residents (Hong Kong British Passport or Certificate of Identity holders), 1971-1981

<i>Year</i>	<i>Arrival</i>	<i>Departure</i>	<i>Balance</i>
1971	128 988	140 481	-11 493
1972	155 538	174 311	-18 773
1973	247 877	281 057	-33 180
1974	320 259	353 645	-33 386
1975	357 046	398 908	-41 862
1976	394 569	435 014	-40 445
1977	435 865	451 160	-15 295
1978	590 531	619 893	-29 362
1979	656 437	669 211	-12 774
1980	769 063	787 665	-18 602
1981	910 457	928 652	-18 195
1971-1981	4 966 630	5 239 997	-273 367

4. Methods of Computation

Introduction

To make a population projection, it is necessary to establish first accurate data on the age and sex structure of the population at a point in time to form the base for the projection. The base population in each sex-age group is then projected for future years based on the projected number of future births and deaths and net immigration.

Base population

The base population for the present projections was derived from the 1981 Census. The Census consisted of two separate operations: the marine census and the land census. The former was conducted in February and the latter in March. In the first place, it was necessary to bring these two enumerated populations to the same reference date. The enumerated marine population was therefore adjusted from the reference date of 2 February 1981 to the land census reference date of 9 March 1981 by 'aging' the population for 36 days and by adding births and subtracting deaths by age which occurred during the same period. Migration among the marine population was taken to be nil. The enumerated land population and the adjusted marine population were then added together to form the total population as at 9 March 1981.

This 'total population' was then adjusted for underenumeration on the basis of the land post-enumeration check. For the young ages 0-4, known birth figures for the period 3 August 1976-9 March 1981 from Births and Deaths Registries were used as a control to guard against underenumeration of children under 5 which was found to be relatively more severe than that for older ages.

The adjusted 'total population' was then further adjusted for error due to a misstatement of age. As shown in Chart 4.1, this kind of error was found in the various age digits in the age and sex distribution of the population. In this adjustment the population figures were first arranged in quinquennial age groups 0-4, 5-9, 10-14 etc. This set of groupings was found to give the least age-reporting error. From the grouped data, graduated population figures at single years of age were obtained by osculatory interpolation using Greville's multipliers. The graduated population is given in Chart 4.2.

The total population after these adjustments was brought forward to mid-year 1981. This was achieved by forward 'aging' the population by 113 days from 9 March to 30 June 1981, and by adding births and subtracting deaths by age which occurred during the 113-day period. Population increase brought about by net immigration during the same period was also added. The result of these adjustments was the estimated population at mid-year 1981, the base population for the projection.

Births

On the basis of an analysis of the past and current fertility data, a set of assumptions was made concerning future fertility. The future number of births for a projection year was obtained by applying the projected age-specific fertility rates to the average number of women in each childbearing age in the year and summing up the results over the age span from 15 to 49. The projected number of births for each projection year, after allowing for infant deaths, would form the population under 1 at the end of that year.

Since separate projections were to be made for males and females, it was necessary to project the number of births by sex. The projected age-specific fertility rates referred to births of both sexes combined; the number of male and female births were estimated by reference to an average sex-ratio at birth using known birth data for the years 1970 to 1980 as shown in Table 4.1 below.

Table 4.1 Known births by sex, 1970-1980

<i>Year</i>	<i>Male</i>	<i>Female</i>
1970	39 608	36 983
1971	41 095	38 692
1972	41 472	38 865
1973	42 282	39 708
1974	42 966	40 613
1975	41 519	38 240
1976	40 775	37 727
1977	41 330	38 687
1978	41 772	39 183
1979	42 349	39 621
1980	44 099	41 187
	459 267	429 506

$$\begin{aligned} \text{Average sex-ratio at birth for 1970-1980} &= \frac{459\,267}{429\,506} \times 1\,000 \\ &= 1\,069 \text{ male births per } 1\,000 \text{ female births} \end{aligned}$$

Survivorship

Based on the assumptions concerning future mortality, a set of future age-sex-specific death rates was derived. The projected age-sex-specific death rates were converted into q_x (the probability of dying between exact age x and exact age $x+1$). The life table functions l_x (survivors of the life table cohort at exact age x) and L_x (number of person-years lived by the life table cohort from exact age x to exact age $x+1$) were then computed, and from values of these two life table functions the survival ratios (L_{x+1}/L_x) were derived.

The population of each sex at exact age x at the beginning of a projection year (year t), after allowing for deaths during that year by applying the survival ratio to the population, would become the population at exact age $x+1$ at the beginning of the following projection year (year $t+1$). In notation form, this could be represented as follows:

$$P_{x(t)} \cdot S_{(x,x+1)(t,t+1)} = P_{(x+1)(t+1)}$$

where $P_{x(t)}$ = number of persons at exact age x at the beginning of a projection year (year t)
 $S_{(x,x+1)(t,t+1)}$ = survival ratio of the population from exact age x in year t to exact age $x+1$ in year $t+1$
 $P_{(x+1)(t+1)}$ = number of persons at exact age $x+1$ at the beginning of year $t+1$

The survival ratio at birth (L_0/l_0) was calculated and applied to the projected number of births for a projection year to give the number surviving at age under 1 at the end of that year.

The life tables and the projected survival ratios are given in a separate publication in this series entitled 'Hong Kong Life Tables'.

Migration

To simplify the computation process for the projection, it was assumed that the balance of migration over a projection year would be concentrated on the last day of that year. In this way, it was not necessary to take account of the births and deaths among migrants during the same period (which would be negligible in any case). The balance of migration was added to the projected population at the end of the projection year t , which formed the population at the beginning of the projection year $t+1$. The immigrants were then assumed subject throughout the subsequent projection years to the same birth rates and survival ratios as those assumed for the whole Hong Kong population.

Chart 4.1 1981 Census Population before Graduation

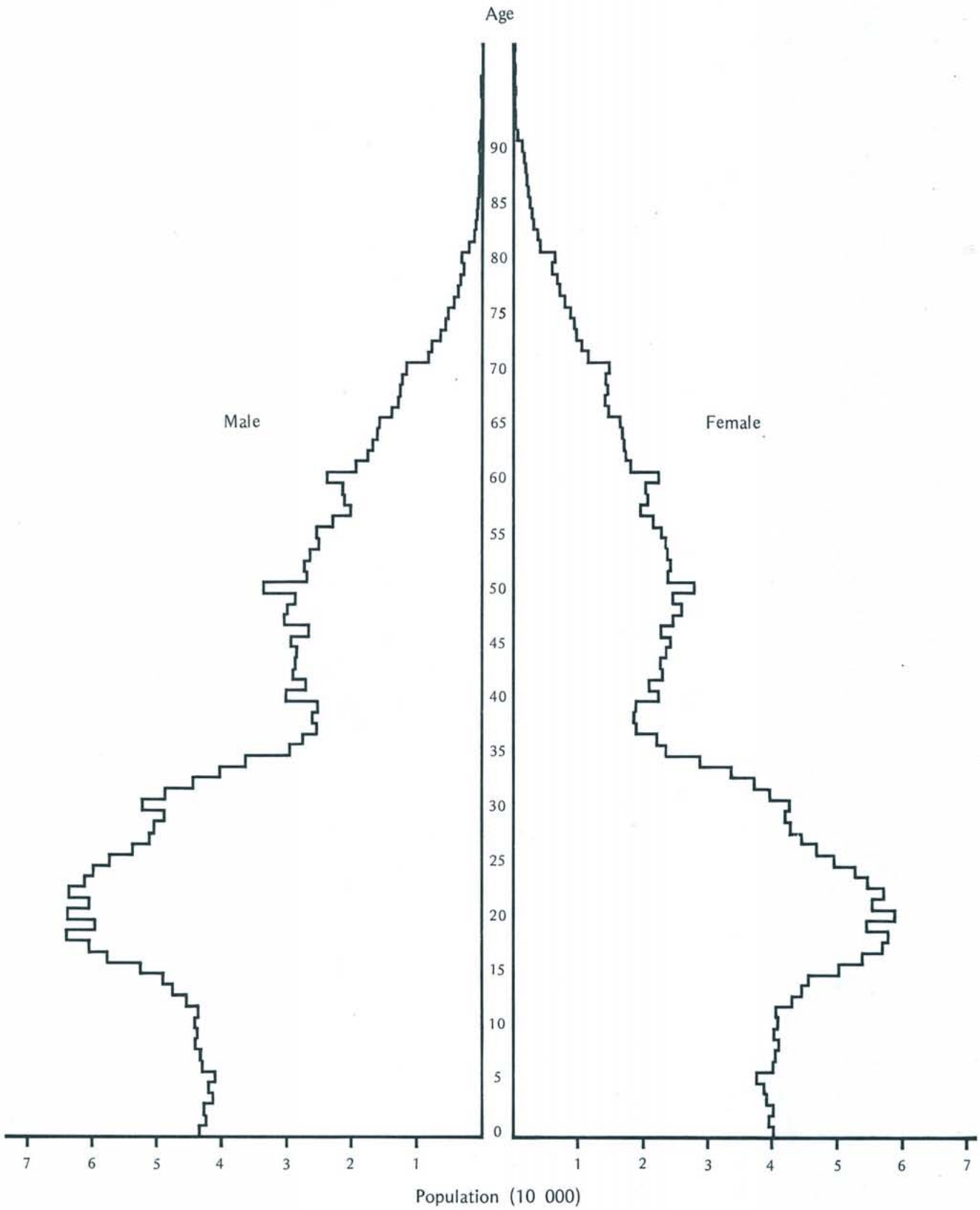
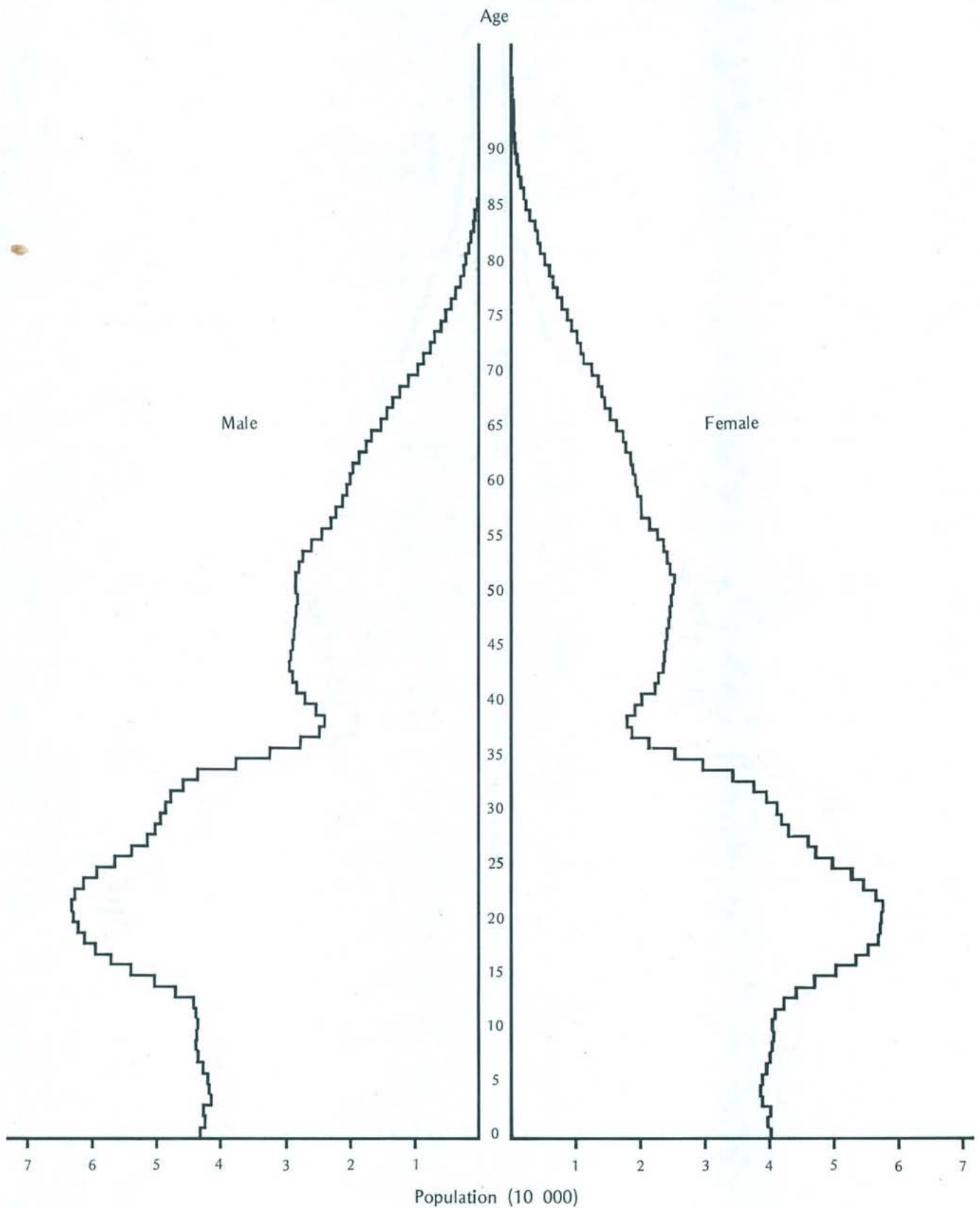


Chart 4.2 1981 Census Population after Graduation*



*Graduation performed by osculatory interpolation using Greville's multipliers.

