



INSTITUTE OF SOUTHEAST ASIAN STUDIES

**NEW POPULATION AND
LABOUR FORCE PROJECTIONS
and
POLICY IMPLICATIONS
FOR SINGAPORE**

Saw Swee-Hock

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**Research Notes and Discussions Paper No. 61
INSTITUTE OF SOUTHEAST ASIAN STUDIES
1987**

Published by
Institute of Southeast Asian Studies
Heng Mui Keng Terrace
Pasir Panjang
Singapore 0511

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Cataloguing in Publication Data

Saw, Swee Hock

New population and labour force projections and policy implications for Singapore.

(Research notes and discussions paper/Institute of Southeast Asian Studies: no. 61)

1. Population forecasting -- Singapore.
2. Labour supply -- Singapore.
3. Singapore -- Population policy.
4. Labour policy -- Singapore.
- I. Institute of Southeast Asian Studies.

II. Title.

III. Series.

DS501 I596 no. 61 1987

ISBN 9971-988-55-0

ISSN 0219-8828

Printed in Singapore by General Printing & Publishing Services Pte Ltd

ISEAS Institute of Southeast Asian Studies

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INTRODUCTION

It is customary in Singapore to prepare and publish population projections after the results of the latest decennial census of population are made available. Following the completion of the 1980 Census of Population, three different projections were eventually published in 1983. The first set by sex, age group, and ethnic group for intervals of five years from 1980 to 2030 was prepared and published by the Department of Statistics in Singapore Census of Population 1980: Administrative Report. The second set by sex and age group for every five years up to 2030 was prepared and published by the then Singapore Family Planning and Population Board as Population Projections for Singapore, 1980-2030. The third set by sex and age group for every five years up to 2070 was prepared by Saw Swee-Hock and published by the Institute of Southeast Asian Studies as Population Projections for Singapore, 1980-2070.

The above population projections are somewhat dated now because they are all based on population figures obtained from the census conducted in June 1980 and fertility indices derived from births occurring in 1980. The availability of mid-1985 population estimates by sex and age as well as fertility indices for 1985 enables us to compute a more up-to-date set of population projections. Furthermore, the availability of the relevant

data collected in the annual labour-force survey conducted in 1985 makes it possible to proceed a stage further to compute a new set of labour force projections.

There are good reasons for preparing the new population and labour force projections now rather than years later when the figures from the next decennial census to be held in 1990 become available. The results of the projections have been used in conjunction with the current review of population trends and policies to ensure that the demographic goal of stabilizing the population in the future can be attained. The new projections will also provide more up-to-date figures to users who may wish to utilize them for a variety of reasons, such as the forecasting of future demand for housing, water, electricity, and other goods and services that are dependent on the size of the population.

Three separate projections have been prepared based on three different assumptions regarding the future course of fertility trends in Singapore. The three projections are: Projection A, based on the assumption that fertility will move back to replacement level in 2000; Projection B, on the assumption that fertility will remain constant at the 1985 level; and Projection C, on the assumption that fertility will decline further to 0.668 in 2000. The results of these three projections will serve to show what would happen to the population if fertility trends follow certain paths in the future. Since the government has agreed to introduce changes to its population control programme to raise fertility back to the replacement level, readers who wish to use the projected population and labour force should adopt the set of figures shown under Projection A.

II

METHODOLOGY

The population projections were prepared by the component method which consists of separate projections of both the number of males and females in each age group of the population. It is usual to project the population by time-intervals equal to the age-intervals into which it has been divided. Since the 1985 base population has been divided into quinary age groups, the projections are most easily made for five-year intervals of time which implies that at the end of the five-year period all the survivors of one age group would have moved into the next higher age group. Each cohort of the 1985 sex-age group is diminished to account for mortality with the passage of time. This step requires a set of five-year survival ratios which are deemed to represent mortality in each cohort during specific periods of time subsequent to 1985. A multiplication of the original number in each sex-age group by the relevant ratio will yield the estimated number of persons five years older at a date which is five years later. A repetition of the procedure will furnish the estimated population aged ten years older than those at the base date and for the ten years later.

In the second step the future number of children born in each five-year time-interval subsequent to the base year is estimated in order to fill the vacuum in the first age group 0-4

at periods of time every five years later. This requires the formulation of a set of plausible assumptions regarding the future course of fertility in terms of the gross reproduction rates. Having worked out these rates, they are utilized in conjunction with the female population in the relevant reproductive age to derive the estimated number of births for the various five-year periods. The number of births surviving to the end of a given five-year period can be estimated by multiplying the number of births during the period with the appropriate survival ratio. This estimated number of survivors is used to fill the vacuum in the first age group 0-4 at every five-year time-interval.

In constructing the new population and labour force projections, the four separate sets of data used in the computation are obtained from different sources. The 1985 base population classified by sex and quinary age group up to 85 and over is taken from the mid-year population estimates prepared by the Department of Statistics. The figures obtained from these estimates terminate at 70 and over, and the figures for the four age groups from 70 to 85 and over were estimated on the basis of the percentages in these age groups as determined in the 1980 Population Census.

The values of the survival ratios, known as P_x , for the various quinary age groups for each of the two sexes are computed from the values of the L_x column of the abridged life table. The figures for the L_x column are obtained from the author's abridged life tables which were published in "Increasing Life Expectancy in Singapore during 1969-1981", Singapore Medical Journal, 25 (1984). To reflect improving mortality, the computed P_x values are increased over time with the aid of the United Nations model life tables.

The age-specific fertility rates and the gross reproduction rates are based on the mid-1985 population estimates mentioned earlier, and on birth data supplied in advance by the Department of Statistics pending their publication in the Report on the Registration of Births and Deaths for the year 1985. The female population by quinary age group and the births by similar age group of mothers are used to compute the age-specific fertility rates and the gross reproduction rates. While the latter rates are used to formulate our fertility assumptions, the former rates are applied to the future female population in the reproductive ages to estimate the number of births in every five-year period after 1985.

The "additional information" required to prepare the labour force projections refers to the age-specific labour force participation rates by sex for 1985. These rates are derived from data obtained in the annual labour force survey conducted by the Ministry of Labour in mid-1985. The labour force or economically active population is defined to include those working during the reference week as well as those not working during the reference week but actively looking for work during the week.

The three sets of population projections are computed on the basis of the following future course of migration, mortality, and fertility:

Projection A

Migration

It is assumed that the population in Singapore is a closed population not subject to international migration.

Mortality

It is assumed that the 1985 mortality level with a life expectancy at birth of 70.2 years for the males and 75.3 years for the females will improve over time to a life expectancy of 72.6 years for the males and 75.7 years for the females.

Fertility

It is assumed that the gross reproduction rate will rise from 0.779 in 1985 to 0.854 in 1990, 0.936 in 1995 and 1.025 in 2000, after which it will remain constant at this replacement fertility level until 2070.

Projection B

Migration

The assumption is similar to that used in Projection A.

Mortality

The assumption is similar to that used in Projection A.

Fertility

It is assumed that the gross reproduction rate will remain

constant below the replacement level at the 1985 rate of 0.779 throughout the whole period of projection.

Projection C

Migration

The assumption is similar to that used in Projection A.

Mortality

The assumption is similar to that used in Projection A.

Fertility

It is assumed that the gross reproduction rate will fall from 0.779 in 1985 to 0.740 in 1990, 0.703 in 1995, and 0.668 in 2000, after which it will remain constant at this level until 2070.

In addition to the above assumptions used to prepare the population projections, it is necessary to formulate another assumption in preparing the labour force projections. It is assumed that the age-specific labour force participation rates for each sex for 1985 will remain unchanged during the whole period of projection. This assumption is applied to all the three labour force projections.

III

FUTURE POPULATION TRENDS

The long-term demographic goal of Singapore is to stabilize its population at a certain number some time in the first half of the 21st century. In order to ensure the attainment of this goal, two conditions must be fulfilled. The first condition is that fertility must be reduced to replacement level, and the other condition is to maintain it at this level indefinitely. The first condition was accomplished in 1975 when fertility was reduced near to the replacement level with the gross reproduction rate equivalent to 1.025. However, the second condition has become elusive because fertility continued to fall below this level to reach the low of 0.779 in 1985. The continuous decline of fertility below replacement level can be attributed to Singapore's comprehensive population control programme as well as to many conducive economic, social, and cultural factors favouring a small family size among the masses in general.

The above points should be borne in mind when interpreting the results of the three population projections summarized in Table 1. It can be shown from Projection A that if we succeed in moving fertility back to the replacement level of 1.025 in the year 2000 and hold it at that point indefinitely, the total population of Singapore will reach the peak of about 3.39 million in 2030 and will remain just slightly below this figure

TABLE 1
Projected Population, 1985-2070

Year	Projection A		Projection B		Projection C	
	Population (1,000)	Annual Growth Rate	Population (1,000)	Annual Growth Rate	Population (1,000)	Annual Growth Rate
1985	2,558.0	-	2,558.0	-	2,558.0	-
1990	2,702.6	1.11	2,691.3	1.02	2,686.0	0.98
1995	2,850.0	1.07	2,809.2	0.86	2,789.2	0.76
2000	2,987.1	0.94	2,899.5	0.63	2,857.7	0.49
2005	3,101.7	0.73	2,961.3	0.42	2,895.8	0.26
2010	3,191.4	0.57	2,999.7	0.26	2,911.0	0.11
2015	3,266.1	0.46	3,018.1	0.12	2,904.9	-0.04
2020	3,328.3	0.38	3,013.8	-0.03	2,872.9	-0.22
2025	3,371.8	0.26	2,979.1	-0.23	2,807.5	-0.46
2030	3,391.2	0.11	2,912.3	-0.45	2,708.3	-0.72
2035	3,382.4	-0.05	2,814.0	-0.65	2,577.5	-0.99
2040	3,357.9	-0.15	2,698.0	-0.84	2,429.1	-1.18
2045	3,332.3	-0.15	2,576.7	-0.92	2,275.3	-1.30
2050	3,316.9	-0.09	2,459.6	-0.93	2,125.5	-1.35
2055	3,314.3	-0.02	2,350.8	-0.90	1,984.4	-1.36
2060	3,316.9	0.02	2,246.2	-0.91	1,849.4	-1.40
2065	3,320.0	0.02	2,144.9	-0.92	1,720.6	-1.43
2070	3,319.9	0.00	2,044.9	-0.95	1,596.9	-1.48

indefinitely. The annual rate of population growth will be reduced continuously from 1.11 per cent during 1985-90 to 0.11 per cent during 2025-30, after which it will stay flat near the zero growth level. We can, therefore, expect the population to experience zero population growth around the year 2030, and from that time onwards the population is expected to remain almost stationary at slightly below 3.4 million.

The results of Projection B reveal that a completely different scenario will emerge if fertility is not pushed back to replacement level and is allowed to continue indefinitely in the future at the 1985 level of 0.779. The population will grow from 2.56 million in 1985 to the peak of 3.02 million in 2015, after which it will start to shrink and fall back to 2.58 million in 2045. It will continue to fall progressively below the present size to touch the low of 2.04 million towards the end of the period in 2070. The annual rate of increase will decelerate faster from 1.02 per cent during 1985-90 to 0.12 per cent during 2010-15, and thereafter we will witness the appearance of negative growth rate which will decline over the years to reach -0.95 per cent during 2065-70. It is clear that the decline in population will take place eventually because fertility would have remained below replacement level. In other words, not enough children will be born to allow the population to replace itself in the next generation.

The position would be worse if fertility were allowed to fall further from the 1985 level to 0.668 in the year 2000 and to remain constant thereafter. Projection C shows that in this case the population will only reach the maximum of 2.91 million in twenty-five years' time in 2010. After that it is expected to decline faster to reach the small size of 1.60 million in 2070. The annual growth rate will drop from 0.98 per cent during