

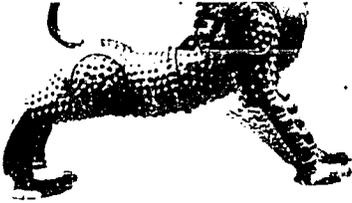
P.N.-ART-CRS 71807

**SOUTHEAST ASIA DEVELOPMENT ADVISORY GROUP
OF THE ASIA SOCIETY**

SN

301.32072

L477 C2



A DEMOGRAPHIC ANALYSIS OF INTER-ETHNIC
ASSIMILATION AND ITS IMPLICATION FOR
POPULATION CHANGE IN SINGAPORE

Che-Fu Lee

A.I.D.
Reference Center,
Room 1656 NS

September 1973

This is the final report on a grant made by the Southeast Asia Development Advisory Group (SEADAG) of The Asia Society, New York. Its views and conclusions are exclusively those of the author.

Contents

	Page No.
1. Overview	1
2. Interethnic Marriage as an Index of Assimilation	4
2.1 Introduction	4
2.2 The Methodology	8
2.3 Analytical Results	14
2.4 Summary and Discussions	20
3. Differential Process of Nuptiality and Fertility Transition Among the Major Ethnic Groups	26
3.1 Introduction	26
3.2 The Data and Adjustment	33
3.3 The Analytical Methods	34
3.4 Malthusian and Neo-Malthusian Transitions	38
3.5 Summary and Discussions	44
4. Alternative Trends of Ethnic Convergence and Implications for the Population Growth	46
4.1 Assumptions on Nuptiality and Fertility Change	47
4.2 The Population Projections	49
5. Summary and Conclusions	54

Tables

Appendix

Selected Bibliography

Demographic Analysis of Inter-Ethnic Assimilation and...

SN

301.32072 Southeast Asia Development Advisory Group
L477 (SEALAG).

Demographic Analysis of Inter-Ethnic Assimilation and Its Implication for Population Change in Singapore. Che-Fu Lee. Sep. 1973.

1 v.

Not to be quoted.

1. Community development - Singapore. 2. Population - Research - SN. 3. Demography - SN. 4. Migration - Internal - SN. I. Inter-Ethnic Assimilation... II. Che-Fu Lee. III. Title.

1. Overview

The objective of this study is to investigate changes in the number and type of inter-ethnic marriages, patterns of nuptiality and marital fertility in Singapore and to analyze the impact of such changes on overall population trends. Insight into the dynamics of these processes is especially crucial to the understanding of modernization given the following paradox: a) from the limited perspective of political conflict, in the early stages of modernization one is often led to observe intensified differentiation along ethnic lines as ethnicity becomes a base for mobilization by political parties; b) on the other hand, modernization implies a broadening of limited horizons and expanded participation on a national level with increasing education and urbanization. This study, by an investigation of ethnic patterns and trends of the selected demographic behaviors, may shed some light on the relative importance of the two factors of the paradox.

Students of comparative ethnic relations tend to focus on power conflict and socio-ethnic stratification. This type of analysis leads one to observe intensified differentiation along ethnic lines in the process of modernization (e.g. Schermerhorn, 1970; Hunter, 1966). For a more complete picture of the situation, the countervailing factor of ethnic assimilation which is also occurring has to be considered. It is the working assumption of this study that population change and socio-economic

development are concomitant phenomena of a society undergoing modernization. Population change, however, must be understood by its demographic components. Nuptiality and fertility were selected for this study. Changes in each of these demographic components vary from one ethno-cultural group to another. A trend toward similarity in these demographic behavior patterns serves as an indicator as well as a consequence of modernization.

Another important demographic aspect of interethnic relationships is found in interethnic marriage. In almost every country in Southeast Asia stricter regulation of immigration has been introduced since the establishment of an independent sovereignty. The consequence has been an increasing sex balance within each ethnic group residing in a multi-ethnic society favoring intra-group marriage. On the other hand, one may also hypothesize that the barrier to interethnic marriage may be weakened when nationalization and modernization leads to assimilation. These considerations suggest the following question: whether or not a trend toward an increased interethnic marriage is discernible from marriage data for Singapore? The interethnic marriage analyzed in this study is meant to gauge the extent of direct intermingling between ethno-cultural groups in Singapore.

Needless to say, studies of interethnic assimilation and integration should cover broader grounds than what may be

revealed by the demographic data. Unfortunately, a review of literature and a visit to Singapore during which a number of the local researchers were consulted, convinced the present investigator that a gap exists in the available information for in-depth studies of ethnic relationships in Singapore. There exists a lack of data on attitudes and orientations, on social and cultural practices, and on whether there has been some behavioral convergence among the different groups, thus increasing acculturation, assimilation, and integration. Survey studies have just recently been employed in Singapore, especially those in connection with fertility research (e.g., Chang, 1973; Chen, 1972). The government has been engaged in some data collection by sample survey (e.g., 1966 Household Sample Survey; and a number of housing surveys), but publications are slow in coming and are rather jealously guarded against being used by outsiders (for example, the 1970 census has not been released except for an interim report on the population enumerations). Although descriptive material about political conflict, tension and unrest are abundant whenever ethnic problems are at issue, these descriptions are generally not based upon investigations of the general populace, but are usually a distillation of public statements and/or headline events.

Because of the need to establish a balance in studying interethnic relationships and the limitation in availability

of data, this study project has focused on a demographic analysis. As marriage and childbearing are largely conditioned by other socio-cultural and economic situations, interethnic differentials in nuptiality and fertility have been discovered to have implications for the broader social context. As a consequence, some light may also be shed on related policy implications.

The main thrust of this research report consists of two distinguishable sections: one is an analysis of interethnic marriage as observed in the 1960's; the other is an investigation of the differential processes of nuptiality and fertility transition among the major ethnic groups, and an analysis of the implications of differential programs of family planning for the three ethnic groups in Singapore. Then it is followed by a section of alternative population projections done separately for each of the three major ethnic groups in Singapore, based on the observation of the differential processes of nuptiality and fertility transition. The report concludes with a summary and some discussion of policy implications for a balanced social development.

2. Interethnic Marriage As An Index of Assimilation

2.1 Introduction

Intermarriage across lines of race, ethnicity or other

socio-cultural groupings has been a topic attracting considerable attention in sociology (see, for example, a variety of articles in the special issue of the International Journal of Sociology of the Family (1971) on "Intermarriage in a Comparative Perspective"). Since marriage and mate selection are universally regulated by group norms and conventions, out-marriage crossing group boundaries is frequently a function of the socio-cultural distance between such groups. It has been proposed that "the ultimate test of equality and assimilation is to be found in the willingness of different races and groups to intermarry with and accept one another as family kin" (Monahan, 1971: 95).

Following this perspective of intermarriage as an index of assimilation or integration between racially or ethnically different groups, it is interesting to investigate some time trends in a multi-ethnic society such as Singapore. Among the two million or so Singapore population (according to the 1970 census) 76 per cent are Chinese, 15 per cent Malays, 7 per cent Indians and Pakistanis and about 2 per cent "Others" which include Eurasians, Europeans, Arabs, Ceylonese, and other minor groups.

The ethnic issues which arose during the decade of the 1960's in Singapore accounted for a significant part of the "adverse conception" or "ambiguity" in the politics of the

Malaysian Federation in 1963, and they became explicit in the confrontations between the rival parties which culminated in the 1965 separation from the Federation (see also Milne, 1966; Grossholtz, 1966; and Parmer, 1966). The Alliance Party of the United Malays National Organization (UMNO), which dominates the federal government of Malaysia had hoped to incorporate Singapore as the "New York" of the "Malay Malaysia." However, the People's Action Party (PAP) of the Singapore government proposed the concept of "Malaysian Malaysia" purporting to create a new national identity open to the citizens of all ethnic origins in the Federation.

Despite the fact that the Chinese overwhelmingly dominate the population of Singapore, since its separation from Malaysia to become an independent state, the PAP government has been a consistent proponent of a new national identity regardless of ethnic origin. A policy priority has been set of "all-out growth"---intensive capital investment for industrialization and economic development (Chee, 1973: 158). This policy has led to prosperity as indicated by an estimated per annum growth rate of 14% in the GNP during 1972. The development strategies served to induce multinational participation as well as to integrate internally the pluralistic society. Domestically, the expanded job market in rapid industrialization drew 70,000 Malaysian workers into Singapore in 1972 and an estimated 50,000

workers will be needed annually in the coming decade (Chee, 1973: 158-159). What does this imply for other domestic matters, given the government's heavy investment in social welfare programs? Two prominent concerns of the government, for example, center on public housing projects and family planning programs. The Housing and Development Board has set a goal of some 222,000 public housing units by 1975, which would mean a public provision of homes for half or more of Singapore's population (Yeh, 1971 and also Yeh and Lee, 1968). At the end of the First Five-Year Plan (1966-71), the Singapore Family Planning and Population Board successfully reached its goal of involving 180,000 acceptors of family planning which accounted for 60% of the eligible married women aged 15-44. The Second Five-Year Plan (1971-76) sets a target of 80,000 new acceptors yearly (Wan, 1973: 117).

Given this evidence of an accelerating involvement by the Singapore government in modernization and development, the question arises as to the concomitant changes in and/or consequences for inter-group relationships within the Singapore population. In view of the multi-ethnic character of the population, the government provides education in the four official languages of Malay, Chinese, Tamil, and English (see Hean, 1969). However, because of a long history of selective immigration and a lack of direct intermingling, occupational and other

socio-cultural differences between the ethnic groups remain in Singapore. The major ethnic groups are still distinguishable in terms of social class and are represented by different interests (see Hassan, 1970; and Neville, 1969). The question arises whether these differences between ethnic affiliations are reduced or are intensified during the process of modernization in Singapore? Furthermore, are the internal politics of Singapore heading toward less intergroup conflict and stability or are they undermining the foundation of a pluralistic society?

These are all important questions. Unfortunately, the data needed to answer them are hard to get. Professor Yeh in concluding his analysis of recent trends and issues in Singapore's Social Development had to conclude by calling for "a more comprehensive set of social indicators to keep track of the non-economic aspects of the national development process." (Yeh, 1971: 292). It is in this spirit that we attempt to investigate trends in interethnic relations in Singapore by using interethnic marriage as an index.

2.2 The Methodology

The data used for this analysis of interethnic marriage in Singapore were obtained from the yearly Registration of Births, Deaths, and Marriages (the Registrar General Reports 1962-1969).

This set of data, except for 1969, has also been investigated by Hassan (1971). His analysis of interethnic marriage, however, appears to be somewhat inadequate, especially in terms of relating intermarriage to interethnic relationships in a broader concept. Hassan (1971) analyzed the data from two simple perspectives. One, he observed the trend of intermarriage by counting the per cent of intermarriage among all registered marriages for all ethnic groups combined from 1962 to 1968. Secondly, he pooled the 1962-68 intermarriages and computed the percentage attributable to each type of interethnic marriage. In the first analysis, Hassan attempted to measure the trend in the likelihood of intermarriage in Singapore as an index of change in overall interethnic relationships. However, there are problems in both of his intended inferences. First of all, intermarriages not only reflect the propensity of a given group to accept the alter-group for marriage partners, but also reflect a given sex-and-age composition, or what demographers term "marriage market." To indicate changing relationships between groups, changes in the proportion of intermarriage must control for the variation in the market situation, which, as Hassan has also noted, is uneven among the ethnic groups and is subject to change from year-to-year. Secondly, a percent of intermarriage without specification as to who is marrying whom tends to obscure the complex ethnic

composition of Singapore. For instance, Muslims among Malays and Indian-Pakistanis may be overrepresented in the overall registered intermarriages when all ethnic groups are combined. Such a measure, by lumping together all types of intermarriage as a percentage of total marriages, could well be affected by the oscillation in the number of some particular pair of high interethnic marriages. Thirdly, the size of the various groups in Singapore differs greatly. It is a simple truism that, given the same likelihood of outmarriage, the larger the population the greater will be the number of intermarriages between this population and other groups. Using the percent of all intermarriage as an index for comparison over time will be weighted unduly to reflect changes in the outmarriage pattern by ethnic groups of a particularly large size, e.g. the Chinese. This problem of unequal population size is also applicable to Hassan's second analysis of the percent of total intermarriages attributable to each set of intermarriages between pairs of ethnic groups. If this percentage measure were meant to indicate the relative distance between pairs of groups, then it could be a spurious index since the larger-sized groups will account for higher proportions of the total even if there is no difference in their propensity of outmarriage. It is, thus, little wonder that Hassan (1971: Table III) found that intermarriage between the Chinese and the other ethnic groups is

rated high in his ordering of the tendency to intermarry (see also the third column of Table 2.5). Finally, by pooling together the data of 1962-68, Hassan failed to investigate changes over time in the relative status of the specified inter-ethnic relations.

The method of analysis explained below is intended to remedy the shortcomings just described in using intermarriage as an index of interethnic relationships. Generally, in a comparison of two sets of multinomial distributions, one would want to control for the different marginal distributions in order to investigate changes in the conditional probability inherent in the cells of a cross-classified table. Perhaps this issue is best illustrated by sociologists' studies of social mobility (see, for example, Levine, 1967, and also cited by Mosteller, 1968: 9). A comparative study of inter-generational mobility by occupational categories, for instance, must take into account the different occupational structures of different societies or of the same society at different points in time. This necessarily involves some adjustment for the marginal distributions of the overall occupational distributions in different populations in order to compare the fluidity of generational changes in occupational categories.

The same consideration of changing contexts within which matches of marriage partners by age or group affiliation

are an issue has also been utilized in some studies of marriage (see McFarland, 1971; and Romney, 1971). In essence, we may conceive of an observed number of marriages as a consequence of market availability of unmarried men and women as well as the desirability or preference for certain characteristics of marriage partners. To measure changes in the desirability or disposition to marry another with specific characteristics, one must control for the changeable market situation, especially the supply of desired mates.

Since the number of marriages in and out of ethnic boundaries changed substantially during the 1960's in Singapore, the comparability of the marriage market situation for each of the ethnic groups from year to year is in question. The sex ratio and the proportion in marriageable ages were uneven among the ethnic groups. (Hassan, 1971: 309). However, a precise measure of the impact of imbalanced sex ratios and definitions of marriageable age ranges are not easily determinable. Hence, to measure the relative change in intermarriage disposition among the ethnic groups, we assume de facto that the observed (registered) numbers of brides and grooms in each ethnic group from year to year reflect the changing market situation as far as availability is concerned.

To control for variations over a period of time in the number of brides and grooms affiliated with different ethnic

groups, we employed, following Romney (1971), the technique of "reiterative multiplication." This technique to "normalize" a frequency distribution is accomplished by successive multiplications of rows and columns by a suitable factor at each step until the margins converge to the desired marginal distribution. Specifically in our application, we transform the table of marriages by sex and ethnic group observed in 1962, the initial year such data became available, to conform to the marginal distributions of each of the later years (see Table 2.1). This is done to obtain an expected distribution of intermarriage between ethnic groups for each of the years after 1962, as if the propensities of intermarriages remained the same as in 1962 even though the marriage market (number of brides and grooms involved) changed to conform to the situation of each of the following years. Detailed comparisons of the actually observed intermarriages and the numbers expected on the basis of the 1962 propensity of interethnic marriage (in parenthesis in Table 2.1) can then be made for each pair of ethnic groups.

In another application of this technique of normalization, we transform the observed tables of intermarriages so that all the marginals equal 100 (see Table 2.3). This is to facilitate a computation of statistics which summarizes the likelihood of intermarriage between two ethnic groups

relative to in-group marriages. Computation of such a statistic presupposes an equal availability of marrying males and females for each of the ethnic groups under investigation. Once the chances of meeting are equalized for all ethnic categories, the index "R" (in Table 2.4) is computed as the ratio of intermarriages (the average of appropriate off-diagonal cells \bar{O}) to inmarriages (the average of the appropriate diagonal cells \bar{D}). This index can be interpreted as the likelihood of intermarriage between ethnic groups given equality in the chance of meeting. (See Romney, 1971: 194 for a more detailed explanation. The index "R" we use here for intermarriage is the inverse of Romney's, where he was measuring in-group marriage).

2.3 Analytical Results

Presented in Table 2.1 are comparisons of interethnic marriages for each year from 1963 through 1969 with the intermarriage distribution of 1962. In parenthesis are the numbers of marriages expected based on the intermarriage distribution of the initial year 1962. Thus each type of interethnic marriage observed yearly for 1963-69 can be compared against the 1962 expectation which has been adjusted for the corresponding current "marriage market." For example, the actual intermarriages between Chinese brides and Malay grooms were recorded as 34 in 1963; 74 in 1964; 96 in 1965; 92 in 1966; 78 in 1967; 38 in 1968; and 17 in 1969, while based on the 1962 distribution,

the corresponding expectations given the changing numbers of brides and grooms in the intermarriage markets of 1963-1969 were 61 in 1963; 69 in 1964; 77 in 1965; 85 in 1966; 79 in 1967; 43 in 1968; and 42 in 1969. In other words, the intermarriages between Chinese brides and Malay grooms were higher each year during 1963-1966 than could be expected from the 1962 data, but not during 1967-1969.

Table 2.3 shows the normalized distributions of inter-ethnic marriages for 1962-65 and 1966-69, assuming that each of the ethnic groups has a balanced market i.e., an equal number of males and females, and assuming that all ethnic groups are of equal size. While the first analysis (Table 2.1) compared the same types of interethnic marriage over time, however uneven the supplies of brides and grooms in each ethnic group, the second analysis (Table 2.3) compares, across different types of interethnic marriages as well as over time (1962-65 vs. 1966-69), the relative likelihood of intermarriage among different pairs of interethnic marriages, assuming that the uneven supplies of brides and grooms are equalized for all ethnic groups.

To assist reading the results as presented in Table 2.1, we computed in Table 2.2 the ratios of the observed to the expected intermarriages/between the major ethnic groups in Singapore, i.e., Chinese, Malays, and Indian/Pakistanis

(they supplied substantially more brides from year-to-year than other minority groups). Given that the number of intermarriages fluctuates from year-to-year, Chinese brides were married to Indian (including Pakistanis hereafter) and Eurasian grooms with a number consistently higher during each year than could be expected from the initial year (1962). Malay brides married Chinese and Indian grooms and Indian brides married Malay grooms more than the 1962 expectation. Though some types of intermarriage as expected from 1962 were small in number (less than 10) and the computed ratios are rather sensitive to the numerical fluctuations, a higher ratio of intermarriage between the three major ethnic groups seemed to occur during the years 1963-65 when compared to 1962.

It is important to ask whether there is persistence in such a trend. Once interethnic integration is stimulated, as reflected in intermarriage, will it continue? Thus we were led to a more general analysis of the likelihood of intermarriage between different ethnic groups in Singapore. To avoid statistical spuriousness, we pooled the marriage data for 1962-65 to represent the first half of the 1960's, and 1966-69 for the latter half of the decade.

One advantage of normalizing the interethnic marriage table becomes apparent in Table 2.3. By looking at the recorded numbers of intermarriage in 1962-65, and in 1966-69, it appears

that the larger-sized ethnic groups have a much greater number of brides married out to the lesser-sized ethnic groups than the reverse. Comparing, for example, the first column with the first row, in the table on actual numbers of intermarriages 1962-65, there were 300 Chinese brides married to Malay grooms, but only 38 Malay brides married to Chinese grooms; there were 94, 185, 134, and 59 Chinese brides respectively married to Indian/Pakistanis, Europeans, Eurasians and "Others" (mainly Arab and Ceylonese) grooms, but correspondingly only 22, 21, 56 and 21 married in the reverse ways. When the data are normalized, by assuming equal marginals of brides and grooms, the contrast is much reduced (see first column and first row of the normalized table under 1962-65 in Table 2.3). Here the percentage of Chinese brides who married Malay grooms is 1.31 while the percentage of Malay brides who married Chinese grooms is 0.61. The percentage of Chinese brides who married Indian, European, Eurasian and "Others" is 0.75, 1.33, 4.46, and 1.17 respectively; the percentages for the corresponding reverse marriages are 0.81, 1.26, 4.46, and 1.83. In other words, when the uneven supply of brides and grooms were controlled for each of the ethnic groups, intermarriages appeared more symmetric in the two-sex exchanges between a given pair of ethnicities, than were seen in the actual numbers. Thus, the actual numbers showing a greater proportion of brides

outmarrying than grooms for intermarriages of a larger-size group with a relatively smaller minority group, must be interpreted with caution. The sex composition of the marrying population and the differential group sizes must be taken into account in any probability inference about the propensity to "export" brides of the larger sized ethnic groups.

In fact, comparing the likelihood of in-group marriage among all ethnic groups (the diagonals in the two normalized distributions in Table 2.3), we found that the larger the size of an ethnic group, the more likely its members were to marry within their own group. The numbers in the diagonals follow the rank order of Chinese, Malay, Indian/Pakistanis, Eurasian, and "Others." Except for Europeans, whose residence in Singapore perhaps is not comparable to other groups, the above order seems to coincide with that of the group size. This result seems to bear on the general assumption recently postulated by Lazar (1971: 3), "the larger the in-group, the greater the probability of in-group marriage," if the probability measure takes into account a control for any imbalanced sex ratios and any unequal group sizes which affect entry into the marriage market.

Table 2.4 further processed the information in Table 2.3 to obtain a comparison of intermarriage vs. in-marriage between pairs and for all ethnic groups combined. Overall,

by averaging both bride and groom outmarriages, which is justifiable on the basis of the relatively symmetric exchange discussed above, the likelihood of out-marriage is about seven out of a hundred given an equal distribution of brides and grooms for all ethnic groups. There was a slight decrease in this likelihood of intermarriage from 7.21% in the first half of the 1960's to 7.13% in the later half. When pair relationships are compared, the likelihood to intermarry is very uneven from one type of interethnic marriage to another, although the order of magnitude remains fairly stable from 1962-65 to 1966-69 (see Table 2.4).

If the likelihood to intermarry is used as an indicator of interethnic distance, the social distance between pairs of ethnic groups can be seen in Table 2.5. It is interesting to compare this likelihood to intermarry between pairs of ethnic groups with Hassan's (1971: 314) percent of intermarriage attributed to each pair relationship. He concluded that Malay-Indians were the pair most likely to intermarry, followed by Chinese-Malay, Chinese-European, Chinese-Eurasian, Chinese-Indian, etc. (see the third column of Table 5). The ordering of the likelihood to intermarry, as presently measured with differences in group size and sex composition controlled, appears quite different. The likelihood of intermarriage between Malay and Indian, and Chinese-Eurasian remains

high. The other high pairs are Eurasian-"Others," Malays-"Others," Indian-"Others," (those with $R^2 \geq 5.0$) and European-Eurasian, etc. In other words, the relatively small sized minority groups emerge as most likely to intermarry with the majority groups, which would not have been detected without a proper control for uneven demographic compositions and numbers. Using the percent of total intermarriages creates a bias toward intermarriages between the larger sized ethnic groups. Any intended inference about inter-group distance by using intermarriage as an index should be done with great caution because of these confounding elements.

2.4 Summary and Discussion

The analysis above calls attention to some methodological problems involved in using intermarriage as an index of interethnic integration and/or assimilation. Especially when changes over a period of time are at issue, the index of interethnic marriage must be used carefully by controlling for other demographic factors which affect the so-called "marriage market."

To maintain comparability for an investigation of trends over time, we first adjusted the 1962 distribution of interethnic marriages to the yearly variations in the "marriage market" of 1963 to 1969. Compared to the expected distributions based on the pattern of intermarriages in 1962, the number of

intermarriages between the major ethnic groups i.e., Chinese, Malays, and Indian/Pakistanis in Singapore seemed to be larger than the 1962 expectations, at least for the first half of the 1960's. However, the choice of one single year, 1962, as the base year for comparison was arbitrary and subject to the sensitive oscillation of small numbers of intermarriages in some cases. This suggested a second analysis as to whether there was a persistent trend toward more interethnic marriages and whether the patterns of relative likelihood to intermarry between the ethnic groups had been altered in the 1960's in Singapore. To test these hypotheses we divided the decade into two parts i.e., the years before 1965 and those after, to avoid working on small numbers and being influenced by statistical spuriousness. Furthermore, we controlled for the unequal sizes and distributions of brides and grooms among the ethnic groups, so that the relative likelihood of intermarriage between different types of ethnic matchings could be compared on the basis of an equal market situation.

Although there was little change in the overall likelihood of interethnic marriage during the decade of the 1960's, different pairs of ethnic groups varied greatly in their likelihood to intermarry. The relative likelihood of intermarriage for each of the ethnic pairs remained stable from 1962-65 to 1966-69. No particular trend of change in interethnic relationships

seemed to be sustained as observed in the interethnic marriages during the 1960's in Singapore. The likelihood to intermarry, considering the unequal chance of meeting one another, between the three major ethnic groups in Singapore is substantial only between Malays and Indian/Pakistanis. Moreover, as was undetected by Hassan (1971), the likelihood of intermarriage is generally high between the minority ethnic groups--European, Eurasian, and "Others" (mainly Arabs and Ceylonese)--each of which accounts for less than 1% of the Singapore population--and one of the majority ethnicities. The above analytical results are not apparent without resorting to a relatively elaborate method such as the one we employed in this reanalysis, since numbers of intermarriages in the cases involving a minority group are necessarily small relative to total intermarriages. The fact that a minority ethnic is more disposed to out-marry someone from a major ethnic group, while outmarriages in major ethnic groups, though relatively few, are more likely to occur with a minority ethnic group, sets the stage for some sociological speculations. Minority groups may represent newer immigrants who are situated in a market where an imbalanced sex ratio exists. However, this factor had been controlled statistically in our computation of the index of likelihood to intermarry. Other social factors such as religion, socio-economic class (Hassan, 1971 did investigate these two aspects

to some extent) etc., may also be an important basis for the choice of desirable mates. Thus, a more reasonable interpretation, may be that ethnic affiliation is but one among many other criteria for choosing a marriage partner. For a small sized minority group in a society, assuming that its members are subject to other social differentiations among themselves, the chances are less favorable in finding desirable mates who match these other criteria within the ethnic boundaries. Merton distinguishes between "agathogamy" (marriage according to group norms) and "cacogamy" (marriage not according to group norms) (cited by Lazar, 1971). Within a small minority ethnic group that is highly differentiated on other counts, ethnic identity may not be as institutionalized as a prime norm for marriages. Outmarriage crossing the ethnic boundary may not necessarily be "cacotic."

On the other hand, for a large ethnic group, intermarriage with partners affiliated with a small minority group may not constitute a normative offense. The reasons for this are twofold. First, only an insignificant proportion of the total marriages accounts for outmarriage. Explicit norms or sanctions as generally understood are rarely institutionalized or invoked for non-prevalent or non-threatening behavior. Secondly, for a major group, a small ethnic group may not be defined as an out-group as clearly as are other groups whose

size rivals that of a given majority. To be considered as "cacogamous" then, interethnic marriages must be between two groups of fairly large sizes. In this light, intermarriage between the major ethnic groups, Chinese, Malay, and Indian, in Singapore would be "cacotic." A possible exception may be intermarriages between Indians and Malays, where a common religion (Muslim among the Indian/Pakistanis) is the primary norm for partner selection in marriage. Besides, the Indians are the smallest of the large ethnic groups and show a considerably greater inclination for interethnic marriage than the Chinese and the Malay (Khatena, 1970: 462).

Until better measures and data become available for studying interethnic relationships, it is tempting to extrapolate from interethnic marriages to other social interactions between ethnic groups in Singapore. Certainly, a rapid change in direct social mingling cannot be expected, especially to the extent of accepting others of different ethnic affiliations for marriage partners. Singapore has had a relatively short history of its own national identity, and only recently has been confronted with the problem of integrating its citizens of multiple ethnic origins. Earlier, in the British colonial era, the policy was simply to accommodate people of different origins in their due positions within the colonial economy. The compartmentalization of socio-economic

sectors became represented by respective ethno-cultural groups. Singapore, as an independent state, inherited willingly or unwillingly this consequence of colonial administration. How and when the historical problem of socio-economic and political differences among the multi-ethnic citizens will be resolved is a difficult question to answer readily. It is imperative, however, that changes in the inter-group relationship be assessed from time to time if policy is to be realistic.

The decade of the 1960's marked a milestone in Singapore's economic development, and in some respects also, social improvement. Inter-group relationships which are crucial for political stability and for smooth social development, have not received sufficient attention. If the index of interethnic marriage is a reliable test of inter-group social distance, the 1960's did not evidence any significant changing trend. Furthermore, as implied in the preceding analysis of inter-marriage, difficulties may be greater in resolving differences between major ethnic groups. Direct social interactions may be enhanced between the Chinese and Malays, in particular, by government policies (e.g., subsidized education which has been undertaken), designed to bring social equality among groups.

Interethnic marriage is but one way of looking at interethnic assimilation. Assimilation may also be observed from denominators which are less direct. The following section

deals with some demographic aspects of interethnic assimilation as may be observed in the age-patterns of marriage and childbearing among the ethnic groups in Singapore. The major question is whether or not amid the development process there is a trend toward a behavioral convergence among ethno-cultural groups. These differential patterns of demographic behavior among the socio-cultural groups are important, not only for a better understanding of different ethnic heritages, but also for its implications for future population size and structure in Singapore.

3. Differential Process of Nuptiality and Fertility Transition Among the Major Ethnic Groups

3.1 Introduction

In a short span of one and a half decades, Singapore has reduced by almost 50% its crude birth rate from the pre-transition level of 42.7 births per thousand population in 1957 to an estimated 22.6 in 1972 (Wan and Lee, 1973: 117). This rapid and continuous decline of fertility in Singapore has been noted by a number of writers (see for example, You, 1963; Yeh, 1967 and 1971; and Chang, 1970). Detailed demographic analyses of the transition process, however, are yet to be produced. Among the few demographers who attempted an explanation of the Singapore fertility transition, Chang (1970) and Saw (1970) have come the closest to an analysis

of differential processes of fertility transition among the major ethno-cultural groups.

Employing the data available for 1957 (Census) and 1966 (Household Survey), Chang (1970) made a comparative analysis of the changes in crude birth rates of the three ethnic groups--Chinese, Malays, and Indian/Pakistanis--in terms of changes in the three components of fertility, i.e., the proportion of women in childbearing years of age, the proportion of married women, and the fertility of married women. Chang (1970: 97) observed that the decrease in the Chinese birth rate between 1957 and 1966 was due exclusively to changes in the proportion of married women of childbearing years of age and the fertility of the married women. For Malays, though there was some decline in the overall birth rate between 1957 and 1966, the fertility of the married women in fact increased. This was counterbalanced by a reduction in the proportion of women married and a smaller proportion of women in the reproductive age range in 1966. In the case of Indian/Pakistanis, marital fertility was found to have changed little, but the proportion of married women was lower in 1966. This quantitative analysis of Chang's did shed some light on the different configurations of the three demographic components affecting the changing fertilities of these three ethnic groups. Yet, the components are only indirect measures of actual changes

in fertility and nuptiality behaviors. Until the proportions of married women in the childbearing ages are further analyzed in terms of age patterns at first marriage and of first birth, and until the birth rates of married women are expressed by duration of marriage, it is difficult to ascertain how changes in the tempo of marriage and childbearing behaviors interact to change women's age patterns of childbirth. It is, moreover, hard to judge, especially when data are cross-sectionally observed and at best reflect a "synthesized cohort" pattern, whether a measured proportionality of married women in a given age category and thus the adjusted birth rate of the married women at that age are plausible. The plausibility should be based on a realistic consideration of a reasonable age at which marriage begins, the ultimate proportion of women ever married throughout the childbearing ages, and the age distribution of marriage frequency, etc. This will be discussed later in a special methodology section.

Quantitative analysis without behavioral references generally will not carry one very far. This may be illustrated by a series of population projections which Saw (1970, Chapter 11 and Appendix 3) made respectively for the three ethnic groups in Singapore. Based on his estimate of 1962 age-specific fertility rates, Saw projected the differential growths of the ethnic groups by simply assuming three alternative series of

quantitative reductions in the birth rates by 5-year intervals beginning from 1962. Already Saw's prospects of the fertility changes have been negated by an estimate of 1971 fertility rates for the three ethnic groups, based on registered births (see Table 3.1). The 1971 age-specific fertility rates indicate a level that is lower than even the lowest prospects (or, the most rapid fertility decline) of Saw's projections. This is true for all three ethnic groups as measured by the summary index of the fertility schedules--Gross Reproduction Rate (GRR)--which reflects the average number of female births given by a woman if she lives out the whole reproductive span of years. In the case of the Chinese, the fertility rates for ages over 30 are all lower in 1971 than what Saw projected for 1972. For Malays and Indian/Pakistanis, also the 1971 fertility schedules are all significantly lower than the 1972 projections; and interestingly, even lower than those projected for 1987 in the case of Malays.

This comparison is not meant to be a criticism of Saw's projections. As is well understood among the practicing demographers, population projections are used to extract the implications of a given situation observed at a point in time, and not necessarily to predict the future. It is, however, important to point out that in carrying out such projections, care must be taken to weigh the different aspects of behavioral

change that lead to an age schedule of fertility rates. In particular, changes in the tempo of marriage and childbearing should be taken into account in addition to possible quantity changes in births as expressed by the GRR.

A change in the age pattern of marriage, especially when it marks a delay in the starting point of reproduction, has now been commonly characterized as "Malthusian transition." Conscious limitation of fertility within marriage, on the other hand, is called "Neo-Malthusian" transition. Both Malthusian and Neo-Malthusian transitions can be expected to have occurred within the Singapore population during the impressive decline of its fertility in the recent decades. It is of special importance to delve into changes in nuptial patterns and in tempo and quantity of fertility within marriage when differential processes of fertility transition are to be investigated for different ethno-cultural groups.

In the preceding section the interethnic relationships in Singapore have been analyzed in light of interethnic marriage in the 1960's. Little evidence was found of a trend toward increased direct intermingling between the major ethnic groups in Singapore. The question remains whether in the process of modernization there is a trend toward behavioral convergence among the different ethnocultural groups. Lacking direct survey data to measure a broad scope of social behaviors, demographic

behaviors such as marriage and childbearing may be used to reflect the extent of change currently going on among the different groups. Age at marriage may be affected by laws on the minimum eligible age (e.g. the Women's Charter of 1961); by changes in the status of women; by education; and by labor force participation, etc. The tempo and quantity pattern of childbearing, similarly, will be modified by changes involved in the process of modernization and urbanization. More importantly, the large scale organized effort of family planning engaged in by the Singapore government since 1966 calls for some assessment as to the varying impact on segments of the Singapore population. Have public policies been accepted and social programs been distributed differentially among the major ethnic groups?

The First Five Year Plan (1966-71) has recently been analyzed by Chang and Yeh (1972) who looked into the profiles of the family-planning acceptors. Although ethnic differentials in fertility behavior and attitudes were not found to be particularly striking among the acceptors' sample, Chinese women clearly showed an inclination to start their family planning earlier in the stages of family building and to space as well as limit their childbearing. What will be the consequences of these behavioral changes on the differential fertility rates? How does one connect such observations of behavioral change with demographic targets set by the planning programs? And

conversely, how is family planning which directly affects household behavior regarding the number of and spacing of children modified if demographic targets are set to reach certain levels of fertility rates?

No perfectly established methodology is as yet known to this writer that would provide precise answers to the question of linking behavioral changes and demographic rates. The demographic methods developed for the present analysis have been accumulated in the past year and are still in the process of development (see Lee and Lin, 1973; Lee and Chao, 1973a and 1973b). It is possible, however, with the present version of our demographic method to see in a new light the relative differences in the fertility transitions of the ethnic groups in Singapore. The methodology, moreover, may be useful for other demographers who have access to local clinical data (e.g. Chang and Yeh, 1972) in extending their analysis from observations of behavioral change to demographic prospects as well. The present study is limited by the scope of available data for Singapore. Because of this limitation, however, a major strength of the developed method in utilizing less than direct information is demonstrated. Following some brief discussions on the data employed in this analysis, and a section on methodology, ethnic differentials in fertility will be analyzed in terms of Malthusian and Neo-Malthusian transitions.

Based on these observed transitions, differential prospects of future population growth among the major ethnic groups in Singapore will then be analyzed.

3.2 The Data and Adjustment

There are two basic reference points for nuptiality and fertility data in Singapore, namely the 1957 Census and the 1966 Singapore Household Sample Survey (see Chang, 1970). At the time of this writing, the Census of 1970 has not been released except an interim report on population enumerations (Singapore Government Printing Office, 1971). Vital registrations and marriages have been published yearly, but the completeness of these data are problematic except for those of very recent years (Saw, 1970: Chapter 2). Thus, population numbers for the denominator of vital and nuptial rates have to be estimated, and the numerator counts of births and marriages must be adjusted.

For the present analysis, demographic rates are observed in 5-year age categories. We have selected the fertility estimates of Saw (1970: 83) for the year 1962 in order to fill in the midpoint between 1957 and 1966, and have estimated the 1971 rates by using the registration and population data as reported in the 1970 Census Interim Report. The age schedules of fertility rates are presented in Table 3.2 for the years 1957-71. From these period fertility rates, two

cohort rates for the birth cohorts who were 15-19 years of age in 1957 and 1962 can be constructed, at least up to age 29. Since the fertility pattern under age 30 is usually crucial in determining the whole reproduction schedule (ending at age 49), the two constructed cohort rates for those aged 15-19, c.1957 and c.1962 are useful in reflecting the actual birth cohorts who have gone through the significant transition period of 1957-71. Later on, these two cohort fertility rates will be analyzed separately from the cross-sectional rates of 1957-71.

The nuptiality data are mainly the measure of proportions of married women in the years of childbearing age. Since only 1957 and 1966 provide this type of information, the years 1962 and 1971 are estimates. For 1962 it was estimated by an interpolation of 1957 and 1966; and for 1971, the registered marriages in that year were used to compute the marriage frequencies. Unfortunately, except for the Chinese, the computed frequencies are ostensibly low, so that the proportion of married women in the reproductive years of age estimated from these frequencies appear to be implausible. Therefore, they were adjusted for some age categories (25-29, 30-34) to simulate the 1966 pattern for Indians and Malays (see Table 3.3).

3.3 The Analytical Methods

Technical details of a new method for the concomitant analysis of nuptiality and duration schedule of marital fertility have been described in a separate paper (Lee and Lin, 1973). Presented in the following is a conceptual summary of the analytical procedures.

3.3.1 A Standard Duration Pattern of Marital Fertility:

Duration schedules of marital fertility vary according to two major factors: (1) the "risk of conception" for the first-parity child, and (2) the decline in the risk of conception for the later parities relative to that of the first one. The process of decline in the conception risk as a function of parity is considered to follow the "Gaussian function," which reflects a random process of dropping-out of the fecund marriage group by permanent sterilization (as distinguished from temporary sterility such as during the period of pregnancy and the post-partum period).

The temporal dimension of marital duration is conceived to be an alternating process of exposure to the conception risk and temporary non-exposure to such risk when one is pregnant and in the post-partum recovery period.

These arguments were formalized mathematically and an inventory of the "standard" marital-duration specific fertility rates were generated. An excerpt of the duration patterns of marital fertility within the most often used range

of variation in the parameters λ and σ is listed in the Appendix Table A.1. The duration pattern of marital fertility is measured by the average accumulated family size in the 5-year interval of marriage duration for women who were married in the same year. The probability of the first conception (λ) may be conceived as the average time required for the first legitimate conception by taking the inverse ($12 \cdot 1/\lambda$) where the factor of 12 is to adjust the time unit to months as seen in the third column of Table A.1. For ease in understanding the other parameter σ , it may be interpreted that, on the average, the time required for conceiving the $(\sigma+1)$ parity becomes more than double that of the first parity. For example, a marital fertility schedule characterized by $\lambda=1.2$ and $\sigma=2$ indicates that the average time for the first parity conception is 10 months (ie., $12/\lambda$) and the average interval for conceiving the third $(\sigma+1)$ parity child is more than 20 months after the second birth.

These model duration schedules of marital fertility rates have been tested against a wide variety of marital fertilities recorded for some European countries (see Lee and Chao, 1973a). Although good data on duration patterns of marital fertility for the Asian countries are not yet available, a combined fitting of the nuptiality schedule and the model marital fertility rates to the Asian age-specific

fertility rates, unspecified for marital status, has been fairly satisfactory (see Lee and Chao, 1973b)..

3.3.2 A Standard Age Pattern of Marriage

To combine marital-duration specific fertility rates with age patterns of nuptiality, it is essential that we have reliable data for the latter. Unfortunately, nuptiality data are often reported in the form of the proportion of married women by age, which does not directly indicate the frequencies of entering marriage at each age of the female population, especially when data are classified by a broad age interval of 5 years or more.

To get around this difficulty, we have found particularly helpful the "standard age schedules of marriage" recently proposed by Coale (1970). He has demonstrated that a wide variety of marriage data can be fitted by a double exponential function simply by adjusting three parameters: (1) the beginning age at which significant numbers of marriages can be observed (a_0); (2) the proportion of women eventually married (C); and (3) the concentration of marriage distributed along the age scale (k).

The data on the proportion of married women between age 15 and 34 for the three major ethnic groups in Singapore in 1957 and 1966 were fitted for the above three parameters

(see Table 3:3). Thus, the average marriage frequency (the number of marriages occurring in an age interval per 1,000 women was obtained for each of the age intervals from Coale's standard schedule.

3.3.3 Age Schedule of Fertility, Nuptiality and Marital Fertility

Once the standard age schedule of marriage (g) and the standard duration schedule of marital fertility (mf) are ascertained for a cohort of women, the cohort age-specific fertility rates (f) can be expressed by the following algorithm:

$$\underline{f} = \underline{g} \cdot \underline{mf}$$

\underline{f} is a column matrix of age-specific fertility rates, \underline{g} is its age-specific marriage frequencies, and \underline{mf} is a triangular matrix of marital fertilities by age at marriage and duration of marriage. In other words, a given observed fertility rate can be decomposed into nuptiality and marital fertility patterns and expressed in terms of the parameters, a_0 , k , C , λ , and σ .

3.4 Malthusian and Neo-Malthusian Transitions

In most of the Asian populations, women are almost universally married. Singapore is no exception. The proportion of women eventually married is as high as 95-100% (C in Table 3.3). If the data on proportion of married women aged 15-34 for 1957, 1962, 1966, and 1971 (assuming that these represent patterns of actual cohorts) are used to investigate the changing pattern of nuptiality, the more important factors changing

over time are the beginning age of marriage (a_0) and the distribution of marriage according to the women's age (k). By 1957, the Chinese age pattern of marriage was distinctly different from those of the Malays and the Indian-Pakistanis. The earliest age at which significant numbers of marriages were observed among the Chinese was 14.5. The Malays and Indians did not reach this pattern until 1966 and 1971. In other words, only in the very recent years have the Malay and Indian age patterns of marriage converged to the Chinese pattern of 1957. The Chinese since 1957 have delayed their beginning age of marriage and also manifested increased variation in age at marriage ($k=.65$ in 1957 and $.75$ in 1966; the 1971 pattern fitted by $k=.55$ may not be reflecting the actual cohort marriage process). The inflated k and changes since 1957 can also be seen in the Malay and Indian marriages. That is to say, there has been a general trend for all three ethnic groups to show increasing variation in the age at marriage. Although for Malays and Indians, there are still certain segments of the population marrying young, the trend is toward a later marriage pattern for other segments in the female population. Thus, the classical Malthusian transition, the delaying of marriage, is seen among the three major ethnic groups in Singapore during these last decades characterized by fertility decline.

Since the nuptiality data may not be reliable or precise enough to indicate the gradual process by which women populations enter wedlock and start reproducing within marriage, the standardized age schedule of marriage frequency for the age interval 15-34 is obtained for the closest fit parameters (see "g" rows in Table 3.3). These age schedules of marriage frequencies are then used together with the standard marital-duration schedules to remedy the problem (see Appendix Table A.1; the actual inventory used for computer fittings contains greater details than the excerpt in this table).

Based on the period fertility data for the years 1957-71 and the marriage patterns analyzed in Table 3.3, the closest patterns of duration-specific marital fertility rates were found by the least-square fitting method. Table 3.4 presents the parameters describing the variations in the marital fertility patterns as well as the marriage patterns. The two parameters for the marital-duration patterns of fertility are (1) the average number of months estimated for the first legitimate conception since marriage ($12/\lambda$), and (2) the parity (σ) at which the conception probability of the next child will require more than twice the time of the first conception. Marital fertility as implied by a given set of the above parameters was also expressed in terms of the average family size by age of married women (25 and 35) classified

into two groups by age at marriage (under 25 and 25-34).

A technical difficulty in fitting the period data on the fertility rates becomes obvious as seen in the parameters estimated for the years 1957-71. For all three ethnic groups, the estimated parameter ($12/\lambda$) fluctuates tremendously from 1957 to 1971. It is hardly conceivable that the average interval of the first legitimate conception varies between 8 and 24 months for Chinese; 7 and 20 months for Malays; and 5 and 20 months for Indians. The problem lies in the changing shape of the fertility curve by the women's age when it is observed cross-sectionally. The period fertility schedules can be misleading particularly when there is a fertility transition. In the case of Singapore, the successful campaign in family planning may have resulted in delayed childbearing by the young and more recent marriage cohorts, and in a tremendous reduction in the number of births by the older married women who have arrived at a later stage of reproduction. Together these factors will produce an unwarrantedly low age-specific fertility rate in a period of such fertility transition. It is instructive, however, to underscore the mechanism of estimating the parameter $12/\lambda$ as affected by the changing fertility schedule in these successive periods of 1957-71. For all three ethnic groups, the interval for the first conception dipped in 1962 and 1966, and rose tremendously in

1971 (see Table 3.4). This is understandable once we interpret that in 1962 and 1966, the fertility reduction was mainly due to the older women so that the period fertility schedule was lopsided toward the younger ages. Such age patterns of the fertility schedule will thus lead to an estimate of short interval for the first birth. The general rise in the parameter $12/\lambda$ in 1971 for all three groups may be important in its implication. That is, the younger age groups in the 1970's may have started a practice of slow pace in family building, so that an enlarged first-birth interval is indicated.

A more reliable investigation of the actual trend of change in marital fertility should analyze cohort fertilities. From the available data, the two birth cohorts who were aged 15-19 c.1957 and c.1962 were constructed up to age at least 29. Fortunately, the analytical method of fitting the standard age patterns of marriage and standard duration-schedules of marital fertility can utilize incomplete data on birth rates by age specification. These two cohorts five years apart were thus analyzed as shown in Table 3.5. It becomes clear that a general trend toward a lower marital fertility from c.1957 to c.1962 is observed for all three ethnic groups. The interval between marriage and the first parity conception in the case of cohort analysis varies over a much smaller range than in the case of period analysis,

and thus the estimates seem to be reasonable. It is longest and most stable in the Chinese pattern of marital fertility (10 months). For Malays, that interval between marriage and first conception shows a slight decrease, which may be the result of lower infant mortality or fetus wastage since this estimate is based on live-birth rates only. Indian marital fertility is characterized by the shortest interval (less than 5 months) between marriage and first conception.

The other parameter σ , which indicates the rapidity of decline in the risk of conception as parity progresses, had a general declining trend from c.1957 to c.1962 for all three groups. The result, when combined with the probability of first conception, is a decline in the cumulated number of births by marriage duration. The average family size by age 35 for those married under age 25 had declined from 4.86 to 3.82 among the Chinese c.1957-c.1962; from 6.21 to 5.49 among the Malays; and from 5.75 to 4.35 among the Indians. It is important to note that these two birth cohorts aged 15-19 c.1957, and c.1962 had gone through a period of vigorous campaigning for family planning from 1966 to 1971, although the effect of such campaigns may account for changes mainly when cohorts have already gone far into the process of family building.

Based on the two parameters $12/\lambda$ and σ combined (see Table 3.5), it is to be noted that marital fertility patterns are quite different among the three ethnic groups. The Chinese take an average of 10 months to conceive the first child after marriage, while Malays are in the order of 6-7 months and Indians, less than 5 months. The Chinese cohorts slowed down the pace of childbearing from c.1957 to c.1962 by spacing more in the early parity. The c.1957 took about 20 months after the birth of the 3rd parity to conceive the next. The c.1962 spent about the same time for the interval between the 2nd birth and the third conception. Following this interpretation of the two estimated parameters $12/\lambda$ and σ , the pace of family building is much faster among the Indians and Malays. The interval between 2nd birth and the 3rd conception for Indians c.1962 remained as short as 9 months. The interval between 3rd birth and the fourth conception for Malays c.1962 was less than 12 months. In other words, the fertility reduction in the later stage of family building is generally observed among all three ethnic groups, but Indians and Malays have changed little in terms of childspacing.

3.5 Summary and Discussions

There is evidence of both Malthusian and Neo-Malthusian control of fertility among all three major ethnic groups in Singapore. The analyzed patterns of marriage and marital

fertility of the two actual cohorts aged 15-19 c.1957 and 1962 indicate the following process of transition: the Chinese have been leading in both the rapidity and extent of an increased average age at marriage. The two cohorts observed do not necessarily reveal a significant change in the beginning age of marriage. In other words, a segment of the population marrying young still exists among these two cohorts. However, age at marriage varies more among women c.1962 than c.1957. The observation of this greater variation in age at marriage is followed by Malay and Indians as well, though their beginning age of marriage is earlier than that of the Chinese. A declining fertility within marriage again is generally observed among all three groups. The major change when the cohorts of c.1957 and c.1962 are compared, lies in fertility control practiced more prevalently and successfully among the married women who have at least attained a certain desired family size. Again, Chinese are leading in the rapidity and extent of the decline in the marital fertility. Moreover, when the average intervals between parities are considered, Chinese women seemed to space their childbearing much more than the Malays and Indians.

Such discerned patterns of differential nuptiality and marital fertility for the three major ethnic groups serve as the basis on which some alternative prospectives of the

population growth in Singapore are derived in the following section.

4. Alternative Trends of Ethnic Convergence and Implications for the Population Growth

In the First Five-Year Plan (1966-71), the demographic target was set to reach a crude birth rate of 20 in 1971 for the overall population in Singapore. This was apparently occasioned by the rapid decline of the fertility rates observed in the first half of the 1960's. As estimated (Wan and Lee, 1973) for 1970-1972, there were signs of an upturn in the crude birth rate after 1970, from a low of 21.8 in 1969, instead of a continuous decline. This is no surprise to demographers, because the crude birth rate is crude in the sense that it leaves uncontrolled other factors such as age composition, proportion of married women and proportion of women who are at different stages of family building, etc., which influence the magnitude of the crude birth rate observed at a given period.

To avoid the flaws of a simplistic projection by extrapolating the cross-sectional birth rates, we assume some reasonable prospects of nuptiality and fertility change separately for each of the three major ethnic groups in the following, based on the analyses in the preceding section.

4.1 Assumptions on Nuptiality and Fertility Change

The alternative patterns of nuptiality and marital fertility are assumed for the most recent cohorts or the immediate future cohorts who are aged 15-19 c.1970 and c.1975. Judging from both period statistics of marriage and those cohort patterns c.1957 and c.1962 (see Tables 3.4 and 3.5), nuptiality of cohorts aged 15-19 c.1970 may be characterized as follows:

Ethnic Group	Parameters a_0	% Married by Age					
		k	C	19	24	29	34
Chinese	16.0	.75	.95	3.4	37.6	72.5	88.3
Malays	14.5	.65	.95	12.8	59.5	84.9	92.4
Indians	14.5	.65	.95	12.8	59.5	84.9	92.4

Patterns of marital fertility currently characterizing the c.1970 women cohorts are rather difficult to determine. The Chinese c.1962 were observed to have parameters $12/\lambda=10.0$ and $\sigma=2.0$. With an increasing practice of child-spacing, it would not be hard to expect of the reproductive Chinese women a set of parameters $12/\lambda=10.0$ and $\sigma=1.0$. This latter pattern, though arbitrarily assigned, is a low level and slow tempo of fertility widely observed in the low-fertility countries like Japan, and the western European countries (see Lee and Chao, 1973a; and 1973b). For the Malays and Indians, based on the investigated c.1962 pattern, the c.1970 may assume the parameters $12/\lambda=8.0$ and $\sigma=3.0$. Since we are to derive the implications of these alternative patterns possibly assumed

by the c.1970 and c.1975, the marital fertility presented in terms of average number of births by years of marriage duration may help visualize the alternative assumptions:

Level of Fertility	Parameters		Births by Years of Duration				Total
	$12/\lambda$	σ	5	10	15	20	
Low (Chinese)	10.0	1.0	1.64	.52	.20	.14	2.50
High (Malays & Indians)	8.0	3.0	2.32	1.85	.96	.55	5.68
Intermediate (Malays & Indians)	8.0	2.0	2.18	1.27	.54	.30	4.29

The alternative prospects, combining the nuptiality and marital fertility for differential changes of the three groups are detailed as follows:

Assumption I: Demographic differences among the three groups are eliminated by c.1975, and both marriage and fertility converge to the Chinese pattern c.1970. The age-specific fertility rates constructed on the basis of this assumption may be read from Table 4.1. The c.1970 and c.1975 patterns have a long-term consequence in the population growth, since these younger groups of women will not complete their fertility until the years 2000 and 2005. Each of the age-specific fertility rates in between 1970 and the ultimate period when the c.1970 pattern of fertility is reached, is obtained by interpolation (see Coale and Tye, 1961). This assumption is an optimistic one. It is postulated as a reference point for comparison with other prospects.

Assumption II: No dramatic changes in the ethnic demographic

behaviors are expected. The Malays and Indians are to continue what possibly are the current patterns of nuptiality and marital fertility. The nuptiality is the one characterized by $a_0=14.5$, $k=.65$, and $C=.95$; and the marital fertility by $12/\lambda=8.0$ and $\sigma=3.0$ (see the charts just presented above).

Assumption III: Nuptiality patterns of the Malays and Indians are to converge to the Chinese "late" pattern of marriage. The marital fertility, though not coinciding with the Chinese "low" pattern, is modified by an increasing childspacing after the first parity. The "intermediate" level of fertility ($12/\lambda=8.0$ and $\sigma=2.0$) is considered to reflect a gradual reduction more or less according to the existing difference between the two ethnic groups and the Chinese.

4.2 The Population Projections

The population projections are not meant to be prophetic. To derive fuller implications of alternative assumptions is the major purpose in carrying out the following projections based on the postulated premises. In addition to the differential routes of demographic changes just described under the three assumptions, the constructed cohort fertility schedules are the result of some speculation on the quantity of births. The constructed fertility schedules under Assumption I would have a cumulative fertility of 1.31 by age 35

(as presently the nuptiality and marital fertility patterns are analyzed only up to age 35). It is supposed that a "just replaceable" level of fertility may be reached by such combination of nuptiality and marital fertility. The age-specific fertility rates for age categories 35-39, 40-44, and 45-49 were derived by an assumption of the total fertility rate equal to 2.05 (GRR=1). Incidentally, the intrinsic growth rate (the mortality schedule is simply assumed to follow the West model level 23, see Coale and Demney, 1966) of this fertility schedule constructed under Assumption I comes very close to a stable "zero growth" ($r = -.0005$ and intrinsic birth rate, $b = 14.3$).

The fertility schedule under Assumption II reaches the cumulative fertility of 4.36 by age 35, and therefore is assumed to end at 4.5 for the total fertility rates (GRR=2.20). Presupposed in setting that quantity of births is that the family planning program will be extremely effective in limiting the size of families and, especially so for those who come into the later stage of reproduction. Such a constructed fertility schedule has an intrinsic growth rate of .0328 and an intrinsic birth rate of 34.4 per thousand.

The fertility schedule constructed under Assumption III reaches a cumulative fertility of 3.27 by age 35. Thus, a total fertility of 3.8 is assigned. The stable-population

measures of this fertility schedule are $r=.0234$ and $b=28.1$.

Numerical changes of the population under each of the three assumptions may be seen with reference to the projections on the female population 1970-2000 as presented in Appendix Table A.2 (the male population is omitted due to space consideration). The crude birth rate and proportion of the population under age 15 for the years 1970-2000 in Table A.2, however, consider the population of both sexes. A few insights derived from the alternative projections are discussed in the following:

- 1) The demographic target set at a crude birth rate of 20.0 per thousand, by those concerned with family planning, is not realistic on the short run. The projection based on the most optimistic assumption (Assumption I), which involves a dramatic change in nuptiality and fertility behavior and an elimination of the ethnic differences for the incoming cohorts to the reproductive age, indicates that a crude birth rate of 20.0 will not be reached earlier than the year 1980 (Chinese in 1985; Malays in 1995; and Indians in 1990). This suggests that the future prospects of population growth may be more realistically measured by the age pattern of nuptiality and marital fertility as currently practiced. Sample surveys for such investigations with reference to the assumed model patterns as described by the series of parameters a_0 , k , C , λ , and σ , may be needed in

order to foresee the future demographic rates--the age-specific fertility rate.

2) Except for an immediate reduction of the fertility to the extent as assumed under Projection I, a significant upturn of period age-specific fertility rates may be expected in the 1980's. Under Assumption II and III, the Malay and Indian fertilities are to decline gradually. The current family planning may have an effect of temporarily depressing or slowing down the pace of the younger cohorts' fertility. Unless there is a significant change in family-size orientation, the "make-up" process may lead to a relatively high level of fertility when this group of women comes into a late stage of reproduction. Thus, the crude birth rate can be as high as 41.6 for Malays in 1985 and 40.1 for Indians in the same year, under Assumption II. Under Assumption III, the corresponding figures are 33.2 and 30.3.

3) Numerical consequences of the population growth, whether an immediate convergence in nuptiality and fertility among the ethnic groups or not, may be significant. In the year 2000, Malays will have a total population of 553,630 under Assumption I, 879,929 under Assumption II, and 711,987 under Assumption III. For Indians, the counterparts are 220,993, 287,105, and 282,163. Put in a different perspective, the Malay population would be almost 60% greater if the nuptiality

and fertility remain as that of the current pattern, than it would be if these demographic patterns converge to those of the Chinese. And the Malays would have a 30% extra population if nuptiality converges to the Chinese pattern but the marital fertility changes only gradually. For Indians both assumptions II and III would project a population, in the year 2000, almost 30% greater than Assumption I.

4) The total population of Singapore, including the three ethnic groups, is to grow from 2.036 million in 1970 to 3.191 under Assumption I; to 3.583 under Assumption II; and 3.410 under Assumption III. The ethnic composition in 1970 was 78% Chinese, 15% Malays, and 7% Indians. Under Assumption I the year 2000 would have little change in this composition (76% Chinese, 17% Malays, and 7% Indians); but Assumptions II and III project slightly different compositions (67%, 25%, and 8% under Assumption II and 71%, 21%, and 8% under Assumption III). Perhaps more importantly, differential consequences of these alternative assumptions should be analyzed in terms of the age structure respectively projected for the three groups. Under Assumption I, the proportion of population under age 15 for all three groups is to decline from a level around or beyond 40% to a level lower than 30% in the year 2000. Under Assumption II, however, both Malays and Indians are expected to have the proportion of population under age 15 well beyond 40%. And, Assumption III maintains a "young" population

structure with almost 40% under age 15. These differences in the age structure of the ethnic population obviously have important implications for the social and economic future of the coming generation.

5. Summary and Conclusions

Students of the Southeast Asian region have been impressed by recent developments in Singapore during the late 1960's and the early 1970's, not only by the unique rate of economic "boom," but also by the outstanding public involvements in social development. Macro-analysis of both phenomena is generally available in such documentations as growth of GNP, government investment in public housing, and numbers of family planning acceptors, etc. However, micro-analysis of the impact of modernization and rapid development, as well as assessment of a balanced social development are still awaiting the more systematic collection of what is often considered to be "soft data."

Due to the technical nature of the methodologies employed, the above detailed presentation of our studies are divided into three major sections: one is an analysis of interethnic marriage as observed in the 1960's (Section 2), the second is an investigation of the differential processes of fertility transition among the three major ethnic groups

(Section 3); and an analysis of the implications of differential growth prospects for the three ethnic groups in Singapore (Section 4). A summary of the major findings of these sections is in order, while policy implications are derived in conclusion:

1) Registration data on interethnic marriages for 1962-69 were analyzed to measure interethnic distance and its changing trends in Singapore. Attempts were made to overcome some of the methodological difficulties involved in using intermarriage as a gauge of inter-group relationship. No substantial trends of change were discovered for interethnic marriage in Singapore during the decade of 1960. However, the stronger likelihood to out-marry among the smaller minority ethnicities (Eurasians, Europeans and "Others," including mainly Arabs and Ceylonese) with marriage partners in the majority ethnic groups (Chinese, Malays, and Indians-Pakistanis) is clearly indicated, when the index of likelihood of intermarriage is controlled for unequal sex compositions and group sizes. This suggests that obstacles in intergroup assimilation may be greater between the major ethnic groups, especially between Chinese and Malays. Thus, a direct policy designed to bring some reduction of differences among these major groups and a vigorous assessment of the consequences of any other policies, whether advertent or

inadvertent, on socio-economic differentials between the groups are called for.

2) The literature of population studies in general and the on-going analysis of Singapore's population in particular reveal a gap between the demographic targets set by development policies and the action programs for family planning. There is a lack of meaningful studies on the implications of changing aggregate birth and marriage rates for behavioral change in the family-building process occurring to average households. On the other hand, there is also a lack of studies on the implications for aggregate demographic prospects of certain behavioral changes observed for the acceptors of family planning programs. Both situations often have arisen from a lack of a comprehensive methodology that links the two types of analyses.

A demographic method has been developed by the researchers of this study project which attempts to make recorded demographic data relevant to an understanding of underlying behavioral changes. We are enabled by this method to analyze concomitant changes in the pattern of entry into marriage and in the tempo of childbearing within marriage as both interact to generate an age-schedule of birth rates. The latter is usually available from Census and Registration data. This method is applied to an investigation of the differential processes of fertility decline among the Chinese, Malays and

Indian-Pakistanis.

There is evidence of both a "Malthusian" (from an early to a late pattern of marriage) and a "Neo-Malthusian" control of fertility among all three major ethnic groups in Singapore. The Chinese have been leading in both the rapidity and extent of this transition. The Malays seem to be slower in this transition while the Indian-Pakistanis rank between the two other groups in the modification of their marital fertility, but remain "early" in their age at marriage. These findings are consistent with a previous study by Chang (1970) who employed different methods of analysis. In our present effort additional insights were gained by translating these changes into meaningful behavioral indices. Marital fertility patterns are seen in the average number of births at different stages of married life and are described by the speed of having the first child after marriage, and by how the length of time between conceptions is increased as the number of births increases. By these we can judge the behavioral modification in fertility limitation by either spacing or reducing the family size or both. Although some control by limiting the accumulated family size is observable for all three ethnic groups, prolonging the time for early conceptions within marriage is apparent only among the Chinese women and is prominent only as late as 1970.

3) These observations enable us to draw some differential prospects of further fertility change in the near future for the three ethnic groups. If the current Second Five-Year Plan (1971-1976) is to work successfully, reasonable targets and appropriate program efforts should be differentiated according to the different subject populations such as ethno-cultural groups and should be realistically planned according to such differentiation. On the basis of most recent patterns of marriage and marital fertility for the three ethnic groups, we have projected behavioral patterns for the Chinese, Malays, and Indian-Pakistanis along actual cohorts (or age groups) who would be subject to the current family planning programs.

Population projection is not primarily an exercise to generate a precise vision of future numbers, which differ rather insignificantly for a short-run projection. However, crucial differences in the age structure among the three ethnic groups may result from alternative routes of fertility transition followed by the currently reproducing age cohorts. If the ethnic differences in marriage and childbearing patterns are maintained, the Malays and Indians are expected to have a much higher dependency-ratio (as measured by the proportion under age 15) than the Chinese in the coming generation. Whereas, if the incoming reproductive cohorts are to converge to the Chinese pattern of marriage and childbearing, the proportion of the population under age 15 will be reduced to a level

lower than 30% in the year 2000.

As revealed in the population projection, it is rather difficult to expect a crude birth rate lower than 20.0 per thousand in the decade of 1970, even under the most optimistic assumption on the prospective fertility change. This is the case for all three ethnic groups due to the large number of young cohorts as a consequence of the post-war baby boom in Singapore. Moreover, effective programs for family-size limitation are necessary during the 1970's in order to bring fertility of those who are currently aged 35 and over down to a very low level, if the demographic target is set to reach a low level of 20.0 in the next decade. For the younger age cohorts, especially among the Malays and Indians, a rigorous campaign for a small family-size orientation is a precondition for a reduced birth rate. Otherwise, the apparent slowing-down of the pace of family-building, as may have been the impact of present planning programs, would have only a temporary effect. The 1980's overall fertility rate may bulge again as it is contributed to by a "making-up" process in the later stage of reproduction among those who are experiencing a depressed fertility at the beginning. This analysis, more than incidentally, supports the advocates of reorienting the Second Five-Year Plan toward a campaign of small-family norms, rather than simply providing clinical services

for fertility control (see Wan and Lee, 1973).

This research as a whole, though technically different in analysis by section presentations in the above, seems to indicate that direct intermingling between the ethnic groups in Singapore is not evident as measured by intermarriages. However, there are signs of behavioral convergence among the three major ethnic groups as far as the demographic analysis of marriage and marital fertility can reveal. It is possible that the "natural" course of inter-group assimilation to the extent of intermarrying must be preceded by a gradual elimination of other differences which create the general social inequality between ethno-cultural groups. In this perspective, conscious policy planning and public program designs may be necessary to help implement a goal of intergroup integration.

Although this study project has attempted to break through limitations set by data which are less than direct, we must urge, in conclusion, that a balanced social development policy demands systematic collection of direct measurements of individuals' behavioral changes in the general populace over time. Singapore has recently made some headway in this direction (e.g., current studies by Chang and Yeh, 1972; Chang, 1973; and Chen, 1972). However, it is worth reiterating that in-depth survey studies should also be designed to

supplement the gap of information in macro-scale analysis.
Otherwise studies of either type may lose sight of each other.

TABLES

Table 2.1

Marriages⁺ in Singapore by Ethnicity of Bride
and Groom: The Actual and the (Expected)²

Groom	Bride						Total
	Chinese	Malay	Indian	European	Eurasian	Other	
<u>1962</u>							4259
Chinese	4229	5	4	5	11	5	1304
Malay	46	1211	33	0	0	14	388
Indian (a)	15	49	312	0	5	7	254
European	46	2	0	188	13	5	84
Eurasian	31	2	0	13	34	4	95
Other (b)	21	17	8	2	9	38	6384
Total	4388	1286	357	208	72	73	
<u>1963</u>							4812
Chinese	4769(4780)	14 (5)	6 (4)	4 (6)	14(13)	5 (5)	1469
Malay	84 (61)	1324(1356)	50 (35)	0 (0)	1 (0)	10(17)	406
Indian	21 (19)	72 (53)	294(319)	1 (0)	9 (7)	9 (8)	281
European	40 (52)	1 (2)	1 (0)	218(207)	16(15)	5 (5)	69
Eurasian	35 (25)	0 (1)	4 (0)	1 (10)	27(29)	2 (3)	90
Other	10 (22)	21 (15)	9 (7)	1 (2)	6(10)	43(36)	7127
Total	4959	1432	364	225	73	74	
<u>1964</u>							5440
Chinese	5404(5405)	8 (5)	5 (4)	4 (7)	14(13)	5 (7)	1497
Malay	74 (69)	1354(1368)	47 (37)	0 (0)	0 (0)	22(23)	422
Indian	29 (21)	63 (52)	317(331)	3 (0)	4 (7)	6(11)	296
European	43 (52)	0 (2)	5 (0)	231(222)	9(14)	8 (6)	70
Eurasian	32 (26)	1 (1)	1 (0)	0 (11)	35(27)	1 (4)	85
Other	11 (20)	14 (12)	3 (6)	4 (2)	7 (8)	46(38)	7810
Total	5593	1440	378	242	69	88	

Table 2.1 Continued

<u>Groom</u>	<u>Bride</u>						<u>Total</u>
	<u>Chinese</u>	<u>Malay</u>	<u>Indian</u>	<u>European</u>	<u>Eurasian</u>	<u>Other</u>	
<u>1965</u>							
Chinese	6260 (6273)	11 (6)	7 (6)	8 (7)	17 (12)	6 (7)	6309
Malay	96 (77)	1546 (1564)	66 (52)	0 (0)	0 (0)	9 (23)	1717
Indian	29 (18)	61 (46)	328 (355)	4 (0)	4 (4)	6 (8)	432
European	56 (63)	1 (2)	3 (0)	256 (250)	9 (13)	10 (9)	335
Eurasian	36 (34)	1 (2)	4 (0)	2 (14)	32 (29)	5 (4)	80
Other	17 (29)	17 (18)	13 (10)	3 (3)	3 (9)	65 (51)	119
<u>Total</u>	<u>6494</u>	<u>1637</u>	<u>422</u>	<u>273</u>	<u>65</u>	<u>101</u>	<u>8992</u>
<u>1966</u>							
Chinese	7455 (7452)	8 (6)	6 (5)	6 (7)	14 (17)	6 (8)	7495
Malay	92 (85)	1547 (1556)	51 (45)	0 (0)	0 (0)	20 (24)	1710
Indian	33 (26)	67 (59)	387 (402)	2 (0)	8 (7)	9 (11)	506
European	66 (71)	0 (2)	5 (0)	250 (242)	19 (17)	0 (7)	340
Eurasian	31 (30)	0 (1)	1 (0)	0 (10)	35 (28)	4 (4)	73
Other	11 (24)	16 (14)	9 (7)	2 (2)	2 (9)	55 (40)	95
<u>Total</u>	<u>7688</u>	<u>1633</u>	<u>459</u>	<u>262</u>	<u>78</u>	<u>94</u>	<u>10219</u>
<u>1967</u>							
Chinese	8137 (8139)	11 (7)	2 (7)	11 (8)	16 (13)	5 (8)	8182
Malay	78 (79)	1529 (1545)	70 (53)	0 (0)	2 (0)	18 (20)	1697
Indian	33 (24)	63 (58)	442 (460)	1 (0)	8 (5)	9 (9)	556
European	75 (79)	6 (3)	4 (0)	258 (256)	8 (14)	8 (7)	359
Eurasian	37 (34)	2 (2)	5 (0)	2 (11)	26 (24)	3 (4)	75
Other	19 (24)	17 (14)	6 (9)	5 (2)	3 (6)	41 (84)	91
<u>Total</u>	<u>8379</u>	<u>1628</u>	<u>529</u>	<u>277</u>	<u>63</u>	<u>84</u>	<u>10960</u>

Table 2.1 Continued

Groom	Bride						Total
	Chinese	Malay	Indian	European	Eurasian	Other	
<u>1968</u>							
Chinese	8621(8615)	17 (14)	7 (12)	9 (8)	17(21)	13(13)	8684
Malay	38 (43)	1584(1590)	58 (45)	0 (0)	0 (0)	13(16)	1693
Indian	27 (18)	84 (82)	520(539)	4 (0)	7 (6)	12(10)	654
European	62 (75)	9 (5)	6 (0)	247(245)	23(20)	8(10)	355
Eurasian	35 (27)	0 (2)	5 (0)	1 (9)	28(28)	2 (4)	71
Other	15 (20)	22 (23)	10 (11)	3 (2)	7 (8)	50(44)	107
Total	8798	1716	606	264	82	98	11564
<u>1969</u>							
Chinese	9500(9507)	22 (16)	14 (13)	9 (5)	15(17)	12(11)	9572
Malay	17 (42)	1568(1577)	68 (45)	1 (0)	2 (0)	20(13)	1676
Indian	46 (20)	83 (93)	583(618)	6 (0)	8 (5)	18 (9)	744
European	125 (130)	13 (8)	13 (0)	256(260)	21(25)	9(14)	437
Eurasian	44 (38)	1 (3)	1 (0)	0 (8)	33(28)	3 (4)	82
Other	31 (25)	38 (28)	11 (14)	2 (1)	3 (7)	33(43)	118
Total	9763	1725	690	274	82	95	12629

- 1) Registered under the Women Charter and the Muslim Ordinance
- 2) Expected as based on the intermarriage distribution in 1962.
 - a) Including Pakistanis
 - b) Mainly Arabs and Ceylonese

Table 2.2

Ratio of Actual Intermarriages to the Expected
Number as of 1962 by Ethnicity of Bride and Groom

<u>Brides</u>	<u>Grooms</u>	1962	1963	1964	1965	1966	1967	1968	1969
Chinese	Malay	100	138	107	125	108	99	88	40
	Indian (a)	100	111	138	161	127	138	150	230
	European	100	77	83	89	93	95	83	96
	Eurasian	100	140	123	106	103	109	130	116
	Other (b)	100	45	55	59	46	79	75	124
Malay	Chinese	100	280*	160*	183*	133*	157*	121	138
	Indian	100	136	121	133	114	109	102	89
	European	100	50*	0*	50*	0*	200*	180*	163*
	Eurasian	100	0*	100*	50*	0*	100*	0*	33*
	Other	100	140	117	94	114	121	96	136
Indian	Chinese	100	150*	125*	117*	120*	29*	58	108
	Malay	100	143	127	127	113	132	129	151
	European	---	---	---	---	---	---	---	---
	Eurasian	---	---	---	---	---	---	---	---
	Other	100	129*	50*	130	129*	67*	91	79

* Denominator (expected number based on the 1962 distribution) is less than 10.

- Denominator is zero.

(a) Including Pakistanis

(b) Mainly Arabs and Ceylonese

160

Table 2.3

Singapore Marriages by Race of Bride, by Race of Groom,
the Actual and the Normalized, 1962-65 and 1966-69

Groom	Bride						Total
	Chinese	Malay	Indian	European	Eurasian	Other	
<u>1962-65</u>							
<u>Actual</u>							
Chinese	20,662	38	22	21	56	21	20,880
Malay	300	5,435	196	1	1	55	5,988
Indian (a)	94	245	1,251	8	22	28	1,648
European	185	4	9	893	47	28	1,166
Eurasian	134	4	9	16	128	12	303
Other (b)	59	69	34	10	25	190	387
Total	21,434	5,795	1,521	949	279	334	30,312
<u>Normalized</u>							
Chinese	90.98	0.61	0.81	1.26	4.46	1.88	100
Malay	1.31	86.60	7.10	0.06	.08	4.86	100
Indian	0.75	7.19	83.44	0.88	3.19	4.55	100
European	1.33	0.11	0.54	87.81	6.12	4.09	100
Eurasian	4.46	0.49	2.50	7.28	77.16	8.11	100
Other	1.17	5.01	5.62	2.71	8.98	76.51	100
Total	100	100	100	100	100	100	600
<u>1966-69</u>							
<u>Actual</u>							
Chinese	33,713	58	29	35	62	36	33,933
Malay	225	6,228	247	1	4	71	6,776
Indian	139	297	1,932	13	31	48	2,460
European	328	28	28	1,011	71	25	1,491
Eurasian	147	3	12	5	122	12	301
Other	76	93	36	12	15	179	411
Total	34,628	6,707	2,284	1,077	305	371	45,372
<u>Normalized</u>							
Chinese	91.07	0.60	0.63	1.97	3.54	2.18	100
Malay	0.81	85.87	7.21	0.08	0.30	5.73	100
Indian	0.73	6.01	82.68	1.43	3.46	5.69	100
European	1.38	0.45	0.95	88.56	6.31	2.35	100
Eurasian	4.58	0.36	3.03	3.25	80.40	8.38	100
Other	1.43	6.71	5.50	4.72	5.98	75.66	100
Total	100	100	100	100	100	100	600

(a) Including Pakistanis

(b) Mainly Arabs and Ceylonese

47

Table 2.4

Likelihood of Inter-marriage by
Types of Ethnic Combinations

Types of Inter-marriage	Average In-marriage (\bar{D})		Average Inter-marriage (\bar{O})		Likelihood of Inter-marriage ($R=\bar{O}/\bar{D}$)	
	1962-65	1966-69	1962-65	1966-69	1962-65	1966-69
Chinese/Malays	88.79	88.47	.96	.71	1.08	.80
Chinese/Indian (a)	87.21	86.88	.78	.68	.89	.78
*Chinese/European	89.40	89.82	1.30	1.68	1.45	1.87
Chinese/Eurasian	84.07	85.74	4.46	4.06	5.31	4.74
*Chinese/Other (b)	83.75	83.37	1.53	1.81	1.83	2.17
Malays/Indian	85.02	84.28	7.15	6.61	8.41	7.84
*Malays/European	87.21	87.22	.09	.27	.10	.31
*Malays/Eurasian	81.88	83.14	.29	.33	.35	.40
*Malays/Other	81.56	80.77	4.94	6.22	6.06	7.70
*Indian/European	85.63	85.62	.71	1.19	.83	1.39
*Indian/Eurasian	80.30	81.54	2.85	3.25	3.55	3.99
*Indian/Other	79.98	79.17	5.09	5.60	6.36	7.07
European/Eurasian	82.49	84.48	6.70	4.78	8.12	5.66
*European/Other	82.16	82.11	3.40	3.54	4.14	4.31
Eurasian/Other	76.84	78.03	8.55	7.18	11.13	9.20
Overall	83.75	84.04	6.04	5.99	7.21	7.13

* Increased inter-marriage 1962-65 to 1966-69

(a) Including Pakistanis

(b) Mainly Arabs and Ceylonese

Table 2.5

Order of Inter-ethnic Distance as
Indicated by Likelihood of Inter-marriage

	1962-1965 (R)	1966-1969 (R)	1962-1968 (S) (a)
Order of Interethnic Distance	1 Eurasian-"Others" (11.31)	Eurasian-"Others" (9.20)	Malay-Indian (25.10)
	2 Malay-Indian (8.41)	Malay-Indian (7.84)	Chinese-Malay (17.63)
	3 European-Eurasian (8.12)	Malay-"Others" (7.70)	Chinese-European (13.10)
	4 Indian-"Others" (6.36)	Indian-"Others" (7.07)	Chinese-Eurasian (10.21)
	5 Malay-"Others" (6.06)	European-Eurasian (5.66)	Chinese-Indian (7.61)
	6 Chinese-Eurasian (5.31)	Chinese-Eurasian (4.74)	Malay-Arabs (b) (4.55)
	7 European-"Others" (4.14)	European-"Others" (4.31)	Chinese-"Others" (4.52)
	8 Indian-Eurasian (3.55)	Indian-Eurasian (3.99)	Indian-"Others" (3.55)
	9 Chinese-"Others" (1.83)	Chinese-"Others" (2.17)	European-Eurasian (3.18)
	10 Chinese-European (1.45)	Chinese-European (1.87)	European-"Others" (2.03)
	11 Chinese-Malay (1.08)	Indian-European (1.39)	Indian-Eurasian (1.97)
	12 Chinese-Indian (.89)	Chinese-Malay (.80)	Eurasian-"Others" (1.76)
	13 Indian-European (.83)	Chinese-Indian (.78)	Indian-European (1.18)
	14 Malay-Eurasian (.35)	Malay-Eurasian (.40)	Malay-European (.72)
	15 Malay-European (.10)	Malay-European (.31)	Malay-Eurasian (.24)

(a) from Hassan (1971) Table III p. 314

(b) Arabs account for a majority of the "Others" category

Table 3.1

Age Specific Fertility Rates 1971* vs. Saw's
"Low" Prospects for 1972 and 1987 by Ethnic Groups

<u>Chinese</u>	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>	<u>GRR</u>
1971	.0215	.1376	.2195	.1486	.0671	.0236	.0028	1.51
1972	.0204	.1355	.1853	.1515	.1043	.0456	.0061	1.58
Diff. 1971- 72	.0011	.0021	.0342	-.0029	-.0372	-.0220	-.0033	-.07
1987	.0125	.0832	.1138	.0930	.0641	.0280	.0038	.97
<hr/>								
<u>Malays</u>								
1971	.0501	.1895	.1721	.1181	.1010	.0380	.0083	1.65
1972	.1110	.2998	.2351	.1818	.1207	.0387	.0077	2.41
Diff. 1971- 72	-.0609	-.1103	-.0630	-.0637	-.0197	-.0007	.0006	-.76
1987	.0809	.2186	.1714	.1325	.0880	.0282	.0056	1.75
<hr/>								
<u>Indians</u>								
1971	.0388	.2163	.1941	.1200	.0583	.0172	.0032	1.58
1972	.1038	.3045	.2079	.1316	.0833	.0276	.0024	1.88
Diff. 1971- 72	-.0650	-.0882	-.0138	-.0116	-.0250	-.0104	.0008	-.30
1987	.0695	.2040	.1393	.0882	.0591	.0185	.0016	1.44

* Estimates based on 1971 registered births and 1970 census population

Table 3.2

Age-Specific Fertility Rates by Ethnic Groups

<u>Chinese</u>	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>35-39</u>	<u>40-44</u>	<u>45-49</u>	<u>GRR</u>
1957	.0468	.2821	.3610	.3084	.2100	.0850	.0126	3.1937
1962	.0319	.2117	.2895	.2637	.1630	.0712	.0096	2.4600
1966	.0216	.1676	.2441	.1787	.1032	.0469	.0085	1.8795
1971	.0215	.1376	.2195	.1486	.0671	.0236	.0028	1.5139
<u>Malays</u>								
1957	.1940	.3376	.3174	.2214	.1326	.0416	.0104	3.0610
1962	.1536	.4150	.3254	.2516	.1671	.0536	.0106	3.3290
1966	.1014	.3631	.3785	.3017	.2030	.0747	.0170	3.5107
1971	.0501	.1895	.1721	.1181	.1010	.0380	.0083	1.6515
<u>Indians</u>								
1957	.2346	.3926	.3405	.2557	.1547	.0555	.0048	3.5083
1962	.1525	.4474	.3054	.1934	.1297	.0405	.0035	3.1640
1966	.0888	.3392	.3221	.1714	.1265	.0452	.0041	2.6763
1971	.0388	.2163	.1941	.1200	.0583	.0172	.0032	1.5802

Sources: 1957 and 1966, Chang 1970
1962, Saw 1970
1971 Estimate based on 1971 Registration and 1970 Census

Table 3.3

Proportion of Women Married by Ethnic Group

Chinese								
<u>1957</u>								
Data (X)	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>a₀</u>	<u>k</u>	<u>c</u>	
Standard X	.1250	.5970	.8760	.9120	14.5	.65	.95	
Standard g	.1283	.5945	.8486	.9241				
	.0653	.0816	.0268	.0076				
<u>1962</u>								
Data (X)	.0790	.4815	.8120	.8995				
Standard X	.0817	.5012	.8106	.9017	15.0	.70	.95	
Standard g	.0526	.0875	.0350	.0105				
<u>1966</u>								
Data (X)	.0330	.3660	.7480	.8870				
Standard X	.0336	.3761	.7246	.8830	16.0	.75	.95	
Standard g	.0350	.0902	.0476	.0165				
<u>1971</u>								
Data (X)	.0635	.4940	.7465	.8165				
Standard X	.0600	.5024	.7701	.8350	16.0	.55	.85	
Standard g	.0605	.0900	.0250	.0059				
Malays								
<u>1957</u>								
Data (X)	.5220	.8750	.9330	.9340				
Standard X	.5182	.8829	.9534	.9424	13.0	.40	.95	
Standard g	.1147	.0262	.0036	.0010				
<u>1962</u>								
Data (X)	.3465	.7725	.9255	.9415				
Standard X	.3409	.7858	.9161	.9467	13.0	.55	.95	
Standard g	.0905	.0495	.0113	.0027				
<u>1966</u>								
Data (X)	.1710	.6700	.9180	.9490				
Standard X	.1771	.6685	.9070	.9766	14.0	.65	1.0	
Standard g	.0733	.0783	.0247	.0071				
<u>1971</u>								
*Data (X)	.2440	.5855	.6915	.7245				
Standard X	.1771	.6685	.9070	.9766	14.0	.65	1.0	
Standard g	.0733	.0783	.0247	.0071				

Table 3.3 Continued

<u>Indian</u>								
<u>1957</u>	<u>15-19</u>	<u>20-24</u>	<u>25-29</u>	<u>30-34</u>	<u>a₀</u>	<u>k</u>	<u>C</u>	
Data (X)	.4730	.8510	.9390	.9540				
Standard X	.4794	.8651	.9347	.9475	12.5	.475	.95	
Standard g	.1006	.0326	.0061	.0011				
<u>1962</u>								
Data (X)	.3115	.7610	.9320	.9495				
Standard X	.3094	.7889	.9432	.9857	13.0	.60	1.0	
Standard g	.0864	.0588	.0156	.0043				
<u>1966</u>								
Data (X)	.1500	.6710	.9250	.9450				
Standard X	.1587	.6827	.9149	.9778	14.5	.60	1.0	
Standard g	.0786	.0825	.0236	.0063				
<u>1971</u>								
*Data (X)	.1765	.6270	.7515	.7920				
Standard X	.1587	.6827	.9149	.9778	14.5	.60	1.0	
Standard g	.0786	.0825	.0236	.0063				

* Estimated from registered marriage and 1970 census population. The low proportion of women married apparently is due to marriage underregistration.

Table 3.4

Parameters of Nuptiality and Marital Fertility by Marriage Cohorts

Ethnic Group	Year	Marriage Pattern			Marital Fertility						
		a_0	k	c	Married by Age 25 No. births			Married 25-34 No. births			
					$12/\lambda$	σ	by 25	35	$12/\lambda$	σ	by 35
Chinese	1957	14.5	.65	.95	12.0	5.0	2.16	5.77	12.0	5.0	2.16
	1962	15.0	.70	.95	12.0	3.0	2.01	4.62	12.0	3.0	2.01
	1966	16.0	.75	.95	8.0	2.0	2.11	3.99	8.0	1.7	1.99
	1971*	16.0	.55	.85	24.0	3.0	1.38	3.57	24.0	3.0	1.38
Malays	1957	13.0	.40	.95	12.0	4.0	2.15	5.28	13.3	4.0	2.00
	1962	13.0	.55	.95	7.5	4.0	2.57	4.79	9.2	4.0	2.37
	1966	14.0	.65	1.0	7.1	4.0	2.63	6.18	7.1	4.0	2.63
	1971*	14.0	.65	1.0	20.0	1.7	1.36	2.91	21.8	1.7	1.32
Indians	1957	12.5	.48	.95	7.3	4.0	2.63	6.12	9.2	4.0	2.37
	1962	13.0	.60	1.0	4.6	3.0	2.81	5.69	6.3	3.0	2.60
	1966	14.5	.60	1.0	8.0	3.0	2.37	5.14	10.0	3.0	2.20
	1971*	14.5	.60	1.0	20.0	1.8	1.38	3.00	21.8	1.8	1.34

* See footnote Table 3.3

Table 3.5

Parameters of Nuptiality and Marital Fertility, by Age Cohorts

Ethnic Group	Cohort	Marriage Pattern			Marital Fertility						
		\bar{a}_0	\bar{k}	\bar{c}	$\frac{12}{\lambda}$	σ	Married by Age 25 No. Births		Married 25-34 No. Births		
							by 25	35	$\frac{12}{\lambda}$	σ	by 35
Chinese	1957	13.5	.80	.85	10.0	3.0	2.18	4.86	12.6	3.0	1.98
	1962	14.0	.95	.95	10.0	2.0	1.95	3.82	10.9	1.85	1.89
Malays	1957	12.5	.43	.90	6.9	4.0	2.69	6.21	8.3	4.0	2.52
	1962	12.5	.55	.80	5.7	3.0	2.65	5.49	7.7	3.0	2.43
Indians	1957	12.5	.50	.95	4.3	3.0	2.86	5.75	4.7	3.0	2.81
	1962	12.5	.65	.95	4.4	2.0	2.48	4.35	4.4	2.0	2.48

Table 4.1
Assumptions on the Prospective Fertilities by
Cohorts Aged 15-19 c.1970 and c.1975
and by 5-Year Period 1970-2000

Assumption I

Chinese		Age-Specific Fertility Rate									
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	
15-19	.0458	.0319	.0235	.0250	.0250	.0250	.0250	.0250	.0250	.0250	
20-24	.2321	.2217	.1676	.1376	.1002	.1002	.1002	.1002	.1002	.1002	
25-29	.3610	.2895	.2441	.2195	.1739	.1383	.1383	.1383	.1383	.1383	
30-34	.3034	.2637	.1787	.1486	.1486	.1231	.0976	.0976	.0976	.0976	
35-39	.2100	.1630	.1032	.0671	.0412	.0227	.0223	.0342	.0342	.0342	
40-44	.0350	.0712	.0469	.0236	.0192	.0147	.0081	.0080	.0122	.0122	
45-49	.0126	.0096	.0035	.0028	.0028	.0029	.0029	.0016	.0016	.0024	
Period	6.53	5.25	3.39	3.12	2.58	2.13	1.97	2.02	2.05	2.05	
T.F.					Cohort T.F.		3.6	3.0	2.5	2.05	2.05
					Cohort GRR		1.8	1.5	1.2	1.0	1.0
							c.1955	1960	1965	1970	1975
Malays											
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	
15-19	.1940	.1536	.1014	.0357	.0250	.0250	.0250	.0250	.0250	.0250	
20-24	.3376	.4150	.3631	.1895	.1437	.1002	.1002	.1002	.1002	.1002	
25-29	.3174	.3254	.3785	.1721	.1862	.2004	.1383	.1383	.1383	.1383	
30-34	.2214	.2516	.3017	.1181	.1181	.1313	.1445	.0976	.0976	.0976	
35-39	.1326	.1671	.2030	.1010	.0654	.0652	.0828	.0530	.0342	.0342	
40-44	.0416	.0536	.0747	.0380	.0307	.0234	.0233	.0296	.0189	.0122	
45-49	.0164	.0106	.0170	.0083	.0071	.0059	.0047	.0047	.0059	.0038	
Period	6.28	6.88	7.19	3.31	2.88	2.76	2.59	2.24	2.10	2.05	
T.F.					Cohort T.F.		6.0	4.5	3.6	3.0	2.05
					Cohort GRR		2.9	2.2	1.8	1.5	1.0
							c.1955	1960	1965	1970	1975
Indians											
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	
15-19	.2346	.1525	.0688	.0357	.0250	.0250	.0250	.0250	.0250	.0250	
20-24	.3926	.4474	.3392	.2163	.1437	.1002	.1002	.1002	.1002	.1002	
25-29	.3405	.3054	.3221	.1941	.1870	.2004	.1383	.1383	.1383	.1383	
30-34	.2557	.1934	.1714	.1200	.1200	.1300	.1445	.0976	.0976	.0976	
35-39	.1547	.1297	.1265	.0533	.0531	.0659	.0643	.0530	.0342	.0342	
40-44	.0555	.0405	.0452	.0172	.0181	.0190	.0236	.0232	.0189	.0122	
45-49	.0048	.0035	.0041	.0032	.0034	.0036	.0038	.0047	.0046	.0038	
Period	7.19	6.36	5.49	3.22	2.75	2.72	2.50	2.21	2.09	2.05	
T.F.					Cohort T.F.		6.00	4.5	3.6	3.0	2.05
					Cohort GRR		2.9	2.2	1.8	1.5	1.0
							c.1955	1960	1965	1970	1975

Table 4.1 Continued

Assumption II

Malays		Age-Specific Fertility Rate								
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
15-19	.1940	.1536	.1014	.0912	.0912	.0912	.0912	.0912	.0912	.0912
20-24	.3376	.4150	.3631	.1935	.2680	.2680	.2680	.2680	.2680	.2690
25-29	.3174	.3254	.3737	.1721	.2991	.3029	.3029	.3029	.3029	.3029
30-34	.2214	.2516	.3017	.1181	.1696	.2293	.2096	.2096	.2096	.2096
35-39	.1326	.1671	.2030	.1010	.0654	.1570	.1116	.0198	.0198	.0198
40-44	.0416	.0536	.0747	.0380	.0275	.0234	.0725	.0515	.0071	.0071
45-49	.0104	.0106	.0170	.0083	.0070	.0060	.0047	.0121	.0086	.0014
Period	6.28	6.88	7.19	3.64	4.64	5.39	5.30	4.78	4.54	4.50
T.F.					Cohort T.F.		6.0	5.5	5.0	4.5
					Cohort GRR		2.9	2.7	2.4	2.2
							c.1955	1960	1965	1970

Indians		Age-Specific Fertility Rate								
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
15-19	.2346	.1525	.0338	.0912	.0912	.0912	.0912	.0912	.0912	.0912
20-24	.3926	.4474	.3392	.2163	.2680	.2680	.2680	.2680	.2680	.2680
25-29	.3405	.3054	.3221	.1941	.3030	.3029	.3029	.3029	.3029	.3029
30-34	.2557	.1934	.1714	.1200	.1888	.2662	.2096	.2096	.2096	.2096
35-39	.1547	.1297	.1265	.0533	.0531	.1465	.0817	.0198	.0198	.0198
40-44	.0555	.0405	.0452	.0172	.0181	.0190	.0676	.0377	.0071	.0071
45-49	.0048	.0035	.0041	.0032	.0034	.0036	.0038	.0113	.0063	.0014
Period	7.19	6.36	5.49	3.50	4.17	5.49	5.12	4.70	4.52	4.50
T.F.					Cohort T.F.		6.0	5.5	5.0	4.5
					Cohort GRR		2.9	2.7	2.4	2.2
							c.1955	1960	1965	1970

Table 4.1 Continued

Assumption III

Malays		Age-Specific Fertility Rates									
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	
15-19	.1940	.1536	.1014	.0412	.0412	.0412	.0412	.0412	.0412	.0412	.0412
20-24	.3376	.4150	.3631	.1995	.1713	.1713	.1713	.1713	.1713	.1713	.1713
25-29	.3174	.3254	.3787	.1721	.2613	.2507	.2507	.2507	.2507	.2507	.2507
30-34	.2214	.2516	.3017	.1181	.1580	.1564	.1900	.1900	.1900	.1900	.1900
35-39	.1326	.1671	.2030	.1010	.0654	.1256	.1056	.0694	.0694	.0694	.0694
40-44	.0416	.0536	.0747	.0380	.0275	.0234	.0580	.0487	.0320	.0320	.0320
45-49	.0104	.0106	.0170	.0083	.0070	.0060	.0047	.0097	.0031	.0053	.0053
Period	6.28	6.88	7.19	3.36	3.66	3.87	4.11	3.91	3.81	3.80	
T.F.					Cohort T.F.	6.0	5.2	4.4	3.8		
					Cohort GRR	2.9	2.5	2.2	1.9		
						c.1955	1960	1965	1970		

Indians		Age-Specific Fertility Rates									
Ages	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	
15-19	.2346	.1525	.0838	.0412	.0412	.0412	.0412	.0412	.0412	.0412	.0412
20-24	.3926	.4474	.3392	.2163	.1713	.1713	.1713	.1713	.1713	.1713	.1713
25-29	.3405	.3054	.3221	.1941	.2437	.2507	.2507	.2507	.2507	.2507	.2507
30-34	.2557	.1934	.1714	.1200	.1368	.1290	.1900	.1900	.1900	.1900	.1900
35-39	.1547	.1297	.1265	.0583	.0659	.1088	.0866	.0694	.0694	.0694	.0694
40-44	.0555	.0405	.0452	.0172	.0181	.0236	.0502	.0400	.0320	.0320	.0320
45-49	.0048	.0035	.0041	.0032	.0034	.0036	.0047	.0034	.0067	.0053	.0053
Period	7.19	6.36	5.49	3.25	3.65	3.94	3.97	3.86	3.84	3.80	
T.F.					Cohort T.F.	6.0	5.2	4.4	3.8		
					Cohort GRR	2.9	2.5	2.2	1.9		
						c.1955	1960	1965	1970		

18

APPENDIX

Table A.1

Excerpt of Standard Fertility Table

Parameters		Average Births by Five Year Interval of Marriage					Total
σ	λ	$12/\lambda$	0-5	5-10	10-15	15-20	
1	.5	24	1.09	.65	.28	.15	2.17
	.6	20	1.20	.64	.25	.14	2.23
	.7	17	1.30	.63	.23	.13	2.29
	.8	15	1.39	.61	.21	.13	2.34
	1.0	12	1.53	.57	.20	.14	2.44
	1.2	10	1.64	.52	.20	.14	2.50
	1.5	8	1.77	.48	.20	.15	2.60
	2.0	6	1.91	.43	.22	.14	2.70
1.5	2.4	5	1.98	.43	.22	.14	2.77
	.5	24	1.19	.90	.47	.28	2.84
	.6	20	1.33	.92	.46	.26	2.97
	.7	17	1.45	.93	.44	.25	3.07
	.8	15	1.55	.94	.42	.24	3.15
	1.0	12	1.72	.93	.39	.22	3.26
	1.2	10	1.86	.93	.37	.21	3.37
	1.5	8	2.02	.91	.34	.20	3.47
2.0	2.0	6	2.22	.87	.32	.20	3.61
	2.4	5	2.33	.85	.32	.19	3.69
	.5	24	1.24	1.09	.65	.40	3.38
	.6	20	1.39	1.15	.64	.39	3.57
	.7	17	1.52	1.19	.62	.37	3.70
	.8	15	1.64	1.21	.61	.36	3.82
	1.0	12	1.83	1.25	.59	.34	4.01
	1.2	10	1.91	1.26	.58	.33	4.08
3.0	1.5	8	2.18	1.27	.54	.30	4.29
	2.0	6	2.41	1.27	.50	.28	4.46
	2.4	5	2.55	1.26	.48	.27	4.56
	.5	24	1.28	1.32	.94	.65	4.19
	.6	20	1.44	1.44	.96	.64	4.48
	.7	17	1.58	1.52	.98	.63	4.71
	.8	15	1.71	1.59	.98	.62	4.90
	1.0	12	1.93	1.70	.98	.60	5.21
3.0	1.2	10	2.11	1.78	.97	.58	5.44
	1.5	8	2.32	1.85	.96	.55	5.68
	2.0	6	2.58	1.93	.93	.52	5.96
	2.4	5	2.73	1.98	.91	.50	6.12

Table A.1 Continued

Parameter		Average Births by Five Year Interval of Marriage					
σ	λ	$12/\lambda$	0-5	5-10	10-15	15-20	Total
4.0	.5	24	1.30	1.45	1.14	.86	4.75
	.6	20	1.46	1.59	1.21	.88	5.14
	.7	17	1.61	1.71	1.25	.88	5.45
	.8	15	1.74	1.81	1.28	.88	5.71
	1.0	12	1.97	1.97	1.33	.87	6.14
	1.2	10	2.15	2.09	1.35	.86	6.45
	1.5	8	2.38	2.23	1.37	.84	6.82
	2.0	6	2.65	2.38	1.37	.81	7.21
	2.4	5	2.80	2.46	1.37	.79	7.42
5.0	.5	24	1.30	1.52	1.28	1.03	5.13
	.6	20	1.47	1.68	1.38	1.07	5.60
	.7	17	1.62	1.82	1.45	1.10	5.99
	.8	15	1.76	1.94	1.51	1.11	6.32
	1.0	12	1.99	2.13	1.60	1.13	6.85
	1.2	10	2.18	2.28	1.65	1.14	7.25
	1.5	8	2.40	2.45	1.71	1.13	7.69
	2.0	6	2.68	2.65	1.77	1.12	8.22
	2.4	5	2.84	2.77	1.80	1.10	8.51

Table A.2
Alternative Projection on Female Population by Ethnic Groups

Chinese - Assumption I

Year Age Group	1970	1975	1980	1985	1990	1995	2000
0-4	82,393	110,060	108,832	98,802	91,487	94,692	99,863
5-9	93,790	82,297	109,933	108,706	98,687	91,381	94,582
10-14	106,321	98,651	82,181	109,778	108,552	98,548	91,252
15-19	93,540	106,092	98,430	82,005	109,542	108,319	98,336
20-24	79,596	93,272	105,788	98,156	81,769	109,227	108,008
25-29	52,166	79,304	92,929	105,400	97,796	81,469	108,826
30-34	51,813	51,907	78,910	92,467	104,876	97,310	81,064
35-39	41,645	51,433	51,526	78,331	91,790	104,107	96,597
40-44	36,206	41,157	50,831	50,923	77,414	99,715	102,888
45-49	29,676	35,530	40,389	40,882	49,972	75,969	89,021
50-54	27,999	28,806	34,488	39,204	48,419	48,506	73,741
55-59	27,136	26,685	27,454	32,870	37,365	46,147	46,231
60-64	21,053	24,996	24,581	25,289	30,277	34,418	42,507
65-69	15,349	18,215	21,626	21,267	21,879	26,195	29,778
70-74	9,509	11,910	14,133	16,730	16,501	16,977	20,325
75+	10,182	7,588	7,474	8,953	10,630	10,842	11,052
TOTAL	783,374	867,902	949,513	1,018,812	1,076,956	1,134,822	1,194,071
Crude Birth Rate	.0217	.0258	.0233	.0197	.0172	.0169	.0170
% Under 15	37.6	34.2	32.2	31.5	28.1	25.4	24.2
Population							

Malays - Assumption I

Year	1970	1975	1980	1985	1990	1995	2000
Age Group							
0-4	22,242	21,896	23,905	27,320	27,868	24,623	23,372
5-9	26,038	22,216	21,870	23,878	27,228	27,835	24,595
10-14	23,126	26,001	22,165	21,339	23,844	27,250	27,796
15-19	17,951	23,076	25,945	22,137	21,792	23,793	27,191
20-24	15,607	17,899	23,010	25,871	22,074	21,730	23,724
25-29	8,749	13,557	17,834	22,826	25,776	21,993	21,650
30-34	10,343	8,706	13,490	17,745	22,812	25,648	21,883
35-39	8,201	10,267	8,642	13,391	17,615	22,644	25,460
40-44	6,810	8,105	10,147	8,541	13,234	17,409	22,379
45-49	5,090	6,603	7,954	9,958	8,381	12,987	17,084
50-54	3,598	4,041	6,487	7,720	9,665	8,135	12,606
55-59	2,779	3,429	4,709	6,182	7,353	9,212	7,754
60-64	2,045	2,560	3,159	4,338	5,695	6,778	8,485
65-69	1,043	1,769	2,215	2,733	3,753	4,927	5,864
70-74	698	899	1,373	1,718	2,120	2,912	3,823
75+	640	529	515	822	1,078	1,324	1,799
TOTAL	152,960	172,444	193,438	217,119	240,354	259,210	275,467
Crude Birth Rate	.0289	.0257	.0251	.0256	.0236	.0194	.0173
% of Population Under 15	46.4	40.6	35.3	34.1	33.4	31.3	28.0

Malays - Assumption II

Year	1970	1975	1980	1985	1990	1995	2000
Age Group							
0-4	22,242	25,409	41,584	54,450	57,989	53,704	70,728
5-9	26,032	22,216	25,379	41,536	54,387	57,922	58,636
10-14	23,126	26,001	22,185	25,343	41,478	54,310	57,940
15-19	17,951	23,076	25,945	22,137	25,239	41,388	54,193
20-24	13,607	17,899	23,010	25,871	22,074	25,216	41,270
25-29	8,749	13,557	17,834	22,926	25,776	21,993	25,124
30-34	10,343	8,706	13,490	17,745	22,812	25,604	21,883
35-39	8,201	10,267	8,642	13,391	17,615	22,644	25,460
40-44	6,810	8,105	10,147	8,541	13,234	17,409	22,379
45-49	5,090	6,683	7,954	9,953	8,381	12,987	17,034
50-54	3,598	4,941	6,487	7,720	9,665	8,135	12,606
55-59	2,779	3,429	4,709	6,162	7,358	9,212	7,754
60-64	2,045	2,560	3,159	4,333	5,695	6,778	8,485
65-69	1,043	1,769	2,215	2,733	3,753	4,927	5,864
70-74	698	809	1,373	1,718	2,120	2,912	3,823
75+	640	529	515	822	1,078	1,324	1,799
TOTAL	152,960	175,957	214,626	265,411	318,704	371,519	434,928
Crude Birth Rate	.0289	.0266	.0393	.0416	.0369	.0321	.0330
% of Population Under 15	46.4	41.8	41.8	46.2	48.8	46.6	43.6

Malays - Assumption III

Year	1970	1975	1980	1985	1990	1995	2000
Age Group							
0-4	22,242	22,205	30,975	38,554	44,286	43,853	46,662
5-9	26,038	22,216	22,179	30,939	38,509	44,235	43,802
10-14	23,126	26,001	22,135	22,148	30,895	38,455	44,172
15-19	17,951	23,076	25,945	22,137	22,100	30,829	38,372
20-24	13,607	17,899	23,010	25,971	22,074	22,037	30,740
25-29	8,749	13,557	17,834	22,926	25,776	21,993	21,956
30-34	10,343	8,706	13,490	17,745	22,812	25,648	21,883
35-39	8,201	10,267	8,642	13,391	17,615	22,644	5,460
40-44	6,810	8,105	10,147	8,541	13,234	17,409	22,379
45-49	5,090	6,683	7,954	9,958	8,381	12,987	17,084
50-54	3,598	4,941	6,487	7,720	9,605	8,135	12,006
55-59	2,779	3,429	4,709	6,132	7,358	9,212	7,754
60-64	2,045	2,560	3,159	4,338	5,695	6,778	8,485
65-69	1,043	1,769	2,215	2,733	3,753	4,927	5,864
70-74	698	809	1,373	1,718	2,120	2,912	3,823
75+	640	529	515	822	1,078	1,324	1,799
TOTAL	152,960	172,753	200,017	235,723	275,352	313,387	352,843
Crude Birth Rate	.0289	.0260	.0313	.0332	.0327	.0285	.0269
% of Population Under 15	46.4	40.8	37.7	39.3	41.8	41.0	38.7

Indians - Assumption I.

Year	1970	1975	1980	1985	1990	1995	2000
Age Group							
0-4	7,764	8,895	9,204	10,472	10,213	9,152	8,916
5-9	9,607	7,755	8,885	9,193	10,460	10,202	9,141
10-14	9,065	9,593	7,744	8,872	9,180	10,445	10,187
15-19	6,983	9,046	9,573	7,727	8,853	9,161	10,422
20-24	5,618	6,963	9,020	9,545	7,705	8,828	9,134
25-29	3,617	5,597	6,937	8,986	9,510	7,677	8,795
30-34	4,101	3,599	5,570	6,903	8,942	9,463	7,639
35-39	3,227	4,071	3,573	5,529	6,852	8,876	9,394
40-44	2,667	3,189	4,023	3,531	5,464	6,772	8,772
45-49	1,869	2,617	3,130	3,948	3,465	5,362	6,646
50-54	1,172	1,814	2,540	3,038	3,832	3,363	5,205
55-59	891	1,117	1,729	2,421	2,895	3,653	3,205
60-64	465	821	1,029	1,593	2,230	2,667	3,364
65-69	310	402	710	890	1,378	1,930	2,307
70-74	167	241	312	551	691	1,069	1,497
75+	133	122	148	194	328	433	649
TOTAL	57,656	65,842	74,126	83,395	92,000	99,052	105,276
Crude Birth Rate	.0218	.0229	.0217	.0227	.0207	.0177	.0166
% of Population Under 15	37.4	33.5	30.4	30.9	30.1	26.7	26.2

98.

Indians - Assumption II

Year Age Group	1970	1975	1980	1985	1990	1995	2000
0-4	7,764	10,118	11,075	21,250	21,172	20,721	23,885
5-9	9,607	7,755	10,107	11,062	21,226	21,147	20,697
10-14	9,065	9,593	7,744	10,092	11,047	21,196	21,118
15-19	6,933	9,046	9,573	7,727	10,071	11,023	21,150
20-24	5,618	6,963	9,020	9,545	7,705	10,042	10,991
25-29	3,617	5,597	6,937	8,986	9,510	7,677	10,005
30-34	4,101	3,599	5,570	6,903	8,942	9,463	7,639
35-39	3,227	4,071	3,573	5,529	6,852	8,876	9,394
40-44	2,667	3,189	4,023	3,531	5,464	6,772	8,772
45-49	1,869	2,617	3,130	3,948	3,465	5,362	6,646
50-54	1,172	1,814	2,540	3,038	3,832	3,363	5,205
55-59	891	1,117	1,729	2,421	2,895	3,653	3,205
60-64	465	821	1,029	1,593	2,230	2,667	3,364
65-69	310	402	710	800	1,378	1,930	2,307
70-74	167	241	312	551	691	1,069	1,497
75+	133	122	148	194	323	433	649
TOTAL	57,656	67,065	77,219	97,263	116,809	135,394	156,525
Crude Birth Rate	.0212	.0256	.0252	.0401	.0343	.0297	.0301
% of Population Under 15	37.4	34.5	32.8	39.9	43.2	45.0	41.3

Indians - Assumption III

Year	1970	1975	1980	1985	1990	1995	2000
Age Group							
0-4	7,764	9,016	12,167	15,146	16,233	16,310	17,935
5-9	9,607	7,755	9,006	12,153	15,128	16,219	16,291
10-14	9,065	9,593	7,744	8,993	12,136	15,107	16,196
15-19	6,983	9,046	9,573	7,727	3,974	12,110	15,074
20-24	5,613	6,963	9,020	9,545	7,705	9,948	12,075
25-29	3,617	5,597	6,937	8,966	9,510	7,677	8,915
30-34	4,101	3,599	5,570	6,903	8,942	9,463	7,639
35-39	3,227	4,071	3,573	5,529	6,852	8,876	9,394
40-44	2,667	3,189	4,023	3,531	5,464	6,772	8,772
45-49	1,869	2,617	3,130	3,948	3,465	5,362	6,646
50-54	1,172	1,814	2,540	3,030	3,832	3,363	5,205
55-59	891	1,117	1,729	2,421	2,895	3,653	3,205
60-64	465	621	1,029	1,593	2,230	2,667	3,364
65-69	310	402	710	890	1,378	1,930	2,304
70-74	167	241	312	551	691	1,069	1,497
75+	133	122	146	194	328	433	649
TOTAL	57,656	65,963	77,210	91,150	105,769	119,959	135,165
Crude Birth Rate	.0218	.0232	.0277	.0303	.0289	.0262	.0261
% of Population Under 15	37.4	33.6	32.8	36.2	38.6	38.2	36.6

88.

Selected Bibliography

- Arumainathan, P. 1970. Census of Population 1970 - Singapore, Interim Release. Singapore: Department of Statistics.
- Census, 1957. Singapore Government Printing Office.
- Chang, C. T. and Yeh, S. 1972. "A Study of Singapore's National Family Planning Programme." The Malayan Economic Review. Vol. XVII. No. 1. (April).
- Chang, C. T. 1972. "Economics of Fertility in Singapore." A proposal to UNILLO.
- Chang, C. T. 1970. "Factors Influencing the Declining Birth Rate in Singapore." The Malayan Economic Review. Vol. XV No. 1. (April) 83-100.
- Chee, Stephen. 1973. "Malaysia and Singapore: Separate Identities, Different Priorities." Asian Survey 13 (February) 151-161.
- Chen, Peter S. J. 1972. "A Comparative Study of Husband-Wife Communication and Family Planning in Four Asian Countries." National Report: Singapore. Population Division, ECAFE, United Nations, Bangkok.
- Coale, Ansley J. 1971. "Age Pattern of Marriage." Population Studies. 25, 2: 193-214.
- Coale, Ansley J. and Demeny, Paul. 1966. Regional Model Life Tables and Stable Populations. Princeton, New Jersey: Princeton University Press.
- Grossholtz, J. 1966. "An Exploration of Malaysian Meanings." Asian Survey 6 (April): 227-240.
- Hassan, Riaz. 1970. "Class, Ethnicity and Occupational Structure in Singapore." Civilisations. 20 (April): 496-514.
- Hassan, Riaz. 1971. "Interethnic Marriage in Singapore: A Sociological Analysis." Sociology and Social Research. 55: 305-323.
- Hean, Gwee Yee. 1969. "Education and the Multi-Racial Society." pp. 203-215 in Jooi Jin-Bee (ed) Modern Singapore. Singapore: University of Singapore.

49

- Hunter, Guy. 1966. South-East Asia - Race, Culture, and Nation. New York: Oxford University Press.
- International Journal of Sociology of the Family. 1971. Special issue on "Intermarriage in a Comparative Perspective." January.
- Khatena, Joseph. 1970. "Relative Integration of Selected Ethnic Groups in Singapore." Sociology and Social Research 4: 460-465.
- Lee, Che-Fu and Chao, John C. 1973a. "A Comparative Investigation of Asian Fertility Transition: Varying Patterns of Nuptiality and Marital Fertility." Paper prepared for presentation at IUSSP General Conference August 27-September 1, 1973. Liege, Belgium.
- Lee, Che-Fu and Chao, John C. 1973b. "A New Look at Marital Fertility Change in Some European Countries Before and After World War II." A paper prepared for presentation at the Annual Meeting of the Population Association of America. April 16, 1973. New Orleans, Louisiana.
- Lee, Che-Fu and Lin, Kung Hua. 1973. "Entry Into First Marriage and the 'Marriage Market.'" Unpublished paper for National Institute of Child Health and Human Development.
- Lee, Che-Fu and Verdick, Mary Jeanne. 1973. "Interethnic Marriage As An Index of Assimilation: The Case of Singapore." Unpublished manuscript.
- Levine, Joel H. 1967. "Measurement in the Study of Inter-generational Status Mobility." Ph.D. thesis, Department of Social Relations, Harvard University.
- McFarland, David D. 1971. "A Model of the Marriage Market, With Implications For Two-Sex Population Growth." Unpublished Ph.D. dissertation, Department of Sociology, University of Michigan.
- Milne, R. S. 1966. "Singapore's Exit From Malaysia; The Consequences of Ambiguity." Asian Survey. 6 (March): 175-184.

- Monahan, Thomas P. 1972. "Interracial Marriage in the United States: Some Data on Upstate New York." International Journal of Sociology of the Family. 2: 94-105.
- Mosteller, Frederick. 1969. "Association and Estimation in Contingency Tables." Journal of the American Statistical Association. 83: 1-28.
- Neville, Warwick. 1969. "The Distribution of Population in the Post-War Period." pp. 52-68 in Ooi Jin-Bee (ed) Modern Singapore. Singapore: University of Singapore.
- Parmer, J. Norman. 1966. "Malaysia: Changing a Little to Keep Pace." Asian Survey. 2 (February): 131-137.
- Romney, A. Kimball. 1971. "A Model For the Analysis of Endogamy." in Paul Kay (ed) Explorations in Mathematical Anthropology. Cambridge: M.I.T. Press.
- Saw, Swee-Hock. 1970. Singapore Population in Transition. Philadelphia: University of Pennsylvania Press. 1970.
- Schermerhorn, E. A. 1970. Comparative Ethnic Relations. New York: Random House.
- Singapore Household Sample Survey, 1966. Singapore Government Printing Office.
- Wan, F. K. and Lee, A. S. 1973. "Singapore." Studies in Family Planning. Volume 4. No. 5 (May): 117.
- Wan, F. K. and S. T. Quah. 1973. "Singapore." Studies in Family Planning. Volume 4. No. 5 (May): 3-11.
- Yeh, Stephen. 1967. "The Size and Structure of Households in Singapore 1957-1966." Malayan Economic Review. Volume XII. No. 2. (October).
- Yeh, Stephen. 1971. "Trends and Issues in Singapore's Social Development." Poh Seng You and Chong Yah Lin (eds.) The Singapore Economy. Singapore: Eastern Universities Press (November): 263-291.
- Yeh, Stephen H. K. and Lee, Yoke San. 1968. "Housing Conditions in Singapore." Malayan Economic Review. 13 (April): 11-30.

You, Poh Seng. 1963. "The Falling Birth Rate in Singapore."
Paper for the 7th International Conference on Planned
Parenthood. Singapore, February, 1963.

92

SN

301.32072

L477

Summary

A Demographic Analysis of Interethnic
Assimilation and Its Implication For
Population Change in Singapore

by
Che-Fu Lee

Summary

The objective of this study is to investigate changes in the number and type of inter-ethnic marriages, patterns of nuptiality and marital fertility in Singapore, and to analyze the impact of such changes on overall population trends. Insight into the dynamics of these processes is especially crucial to the understanding of modernization given the following paradox: a) from the limited perspective of political conflict, in the early stages of modernization one is often led to observe intensified differentiation along ethnic lines as ethnicity becomes a base for mobilization by political parties; b) on the other hand, modernization implies a broadening of limited horizons and expanded participation on a national level with increasing education and urbanization. This study, by an investigation of ethnic patterns and trends of the selected demographic behaviors, may shed some light on the relative importance of the two factors of the paradox.

Students of comparative ethnic relations tend to focus on power conflict and socio-ethnic stratification. This type of analysis leads one to observe intensified differentiation along ethnic lines in the process of modernization. For a more

complete picture of the situation, the countervailing factor of ethnic assimilation which is also occurring, has to be considered. It is the working assumption of this study that population change and socio-economic development are concomitant phenomena of a society undergoing modernization. Population change, however, must be understood by its demographic components. Nuptiality and fertility were selected for this study. Changes in each of these demographic components vary from one ethno-cultural group to another. A trend toward similarity in these demographic behavior patterns serves as an indicator as well as a consequence of modernization.

Another important demographic aspect of interethnic relationships is found in interethnic marriage. In almost every country in Southeast Asia stricter regulation of immigration has been introduced since the establishment of an independent sovereignty. The consequence has been an increasing balance in sex composition of each ethnic group residing in a multi-ethnic society favoring intra-group marriage. On the other hand, one may also hypothesize that the barrier to interethnic marriage may be weakened when nationalization and modernization leads to assimilation. These considerations suggest the following question: whether or not a trend toward an increased interethnic marriage is discernible from marriage data for Singapore? The interethnic marriage analyzed in this study is meant to gauge the extent of direct



intermingling between ethno-cultural groups in Singapore.

The main thrust of this research report consists of three distinguishable sections: an analysis of interethnic marriage as observed in the 1960's; an investigation of the differential processes of nuptiality and fertility transition among the major ethnic groups; and an analysis of the growth prospects for the three ethnic populations in Singapore.

1) Registration data on interethnic marriages for 1962-69 were analyzed to measure interethnic distance and its changing trends in Singapore. Attempts were made to overcome some of the methodological difficulties involved in using intermarriage as a gauge of inter-group relationship. No substantial trends of change were discovered for interethnic marriage in Singapore during the decade of 1960. However, the stronger likelihood to out-marry among the smaller minority ethnicities (Eurasians, Europeans and "Others," including mainly Arabs and Ceylonese) with marriage partners in the majority ethnic groups (Chinese, Malays, and Indians-Pakistanis) is clearly indicated, when the index of likelihood of intermarriage is controlled for unequal sex compositions and group sizes. This suggests that obstacles in intergroup assimilation may be greater between the major ethnic groups, especially between Chinese and Malays. Thus, a direct policy designed to bring some reduction of differences among these major groups and a vigorous assessment of the consequences

of any other policies, whether advertent or inadvertent, on socio-economic differentials between the groups are called for.

2) The literature of population studies in general and the on-going analysis of Singapore's population in particular, reveal a gap between the demographic targets set by development policies and the action programs for family planning. There is a lack of meaningful studies on the implications of changing aggregate birth and marriage rates for behavioral change in the family-building process occurring to average households. On the other hand, there is also a lack of studies on the implications for aggregate demographic prospects of certain behavioral changes observed for the acceptors of family planning programs. Both situations often have arisen from a lack of a comprehensive methodology that links the two types of analyses.

A demographic method has been developed by the researchers of this study project which attempts to make recorded demographic data relevant to an understanding of underlying behavioral changes. We are enabled by this method to analyze concomitant changes in the pattern of entry into marriage and in the tempo of child-bearing within marriage as both interact to generate an age-schedule of birth rates. The latter is usually available from Census and Registration data. This method is applied to an investigation of the differential processes of fertility decline among the Chinese, Malays and Indian-Pakistanis.

There is evidence of both a "Malthusian" (from an early to a late pattern of marriage) and a "Neo-Malthusian" control of fertility among all three major ethnic groups in Singapore. The Chinese have been leading in both the rapidity and extent of this transition. The Malays seem to be slower in this transition while the Indian-Pakistanis rank between two other groups in the modification of their marital fertility, but remain "early" in their age at marriage. These findings are consistent with a previous study by Chang (1970) who employed different methods of analysis. In our present effort additional insights were gained by translating these changes into meaningful behavioral indices. Marital fertility patterns are seen in the average number of births at different stages of married life and are described by the speed of having the first child after marriage, and by how the length of time between conceptions is increased as the number of births increases. By these we can judge the behavioral modification in fertility limitation by either spacing or reducing the family size or both. Although some control by limiting the accumulated family size is observable for all three ethnic groups, prolonging the time for early conceptions within marriage is apparent only among the Chinese women and is prominent only as late as 1970.

3) These observations enable us to draw some differential prospects of further fertility change in the near future for the

three ethnic groups. If the current Second Five-Year Plan (1971-1976) is to work successfully, reasonable targets and appropriate program efforts should be differentiated according to the different subject populations such as ethno-cultural groups and should be realistically planned according to such differentiation. On the basis of most recent patterns of marriage and marital fertility for the three ethnic groups, we have projected behavioral patterns for the Chinese, Malays, and Indian-Pakistanis along actual cohorts (or age groups) who would be subject to the current family planning programs.

Population projection is not primarily an exercise to generate a precise vision of future numbers, which differ rather insignificantly for a short-run projection. However, crucial differences in the age structure among the three ethnic groups may result from alternative routes of fertility transition followed by the currently reproducing age cohorts. If the ethnic differences in marriage and childbearing patterns are maintained, the Malays and Indians are expected to have a much higher dependency-ratio (as measured by the proportion under age 15) than the Chinese in the coming generation. Whereas, if the incoming reproductive cohorts are to converge to the Chinese pattern of marriage and childbearing, the proportion of the population under age 15 will be reduced to a level lower than 30% in the year 2000.

As revealed in the population projection, it is rather

difficult to expect a crude birth rate lower than 20.0 per thousand in the decade of 1970, even under the most optimistic assumption on the prospective fertility change. This is the case for all three ethnic groups due to the large number of young cohorts as a consequence of the post-war baby boom in Singapore. Moreover, effective programs for family-size limitation are necessary during the 1970's in order to bring fertility of those who are currently aged 35 and over down to a very low level, if the demographic target is set to reach a low level of 20.0 in the next decade. For the younger age cohorts, especially among the Malays and Indians, a rigorous campaign for a small family-size orientation is a precondition for a reduced birth rate. Otherwise, the apparent slowing-down of the pace of family-building, as may have been the impact of present planning programs, would have only a temporary effect. The 1980's overall fertility rate may bulge again as it is contributed to by a "making-up" process in the later stage of reproduction among those who are experiencing a depressed fertility at the beginning. This analysis, more than incidentally, supports the advocates of reorienting the Second Five-Year Plan toward a campaign of small-family norms, rather than simply providing clinical services for fertility control.

This research as a whole, though technically different in analysis as presented in separate sections, seems to indicate

that direct intermingling between the ethnic groups in Singapore is not evident as measured by intermarriages. However, there are signs of behavioral convergence among the three major ethnic groups as far as the demographic analysis of marriage and marital fertility can reveal. It is possible that the "natural" course of inter-group assimilation to the extent of intermarrying must be preceded by a gradual elimination of other differences which create the general social inequality between ethno-cultural groups. In this perspective, conscious policy planning and public program designs may be necessary to help implement a goal of intergroup integration.

Although this study project has attempted to break through limitations set by data which are less than direct, we must urge, in conclusion, that a balanced social development policy demands systematic collection of direct measurements of individuals' behavioral changes in the general populace over time. Singapore has recently made some headway in this direction, however, it is worth reiterating that in-depth survey studies should also be designed to supplement the gap of information in macro-scale analysis. Otherwise studies of either type may lose sight of each other.