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**Robert D. Retherford
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PREFACE

This paper is one of several issuing from a joint project of the National Statistical Office of Thailand and the East-West Population Institute to estimate refined measures of fertility and mortality from the 1970 Census of Thailand. Support for the research was jointly provided by the National Statistical Office, the East-West Population Institute, and the United States Department of Commerce. The authors are grateful to Ms. Victoria Ho, Mr. Pichai Saiyasombati, and Ms. Robin Loomis for programming and research assistance.

ABSTRACT Own-children estimates of fertility levels, trends, and differentials for Thailand over the decade of the 1960s, based on the 1970 Census, appear broadly consistent with other published estimates. Total fertility for the whole country declined slightly from about 6.5 to 6.2 children per woman between 1960-64 and 1965-69. All four regions—North, Northeast, Central, and South—showed total fertility rates between six and seven children per woman for 1960-64. By 1965-69 total fertility had fallen by somewhat over half a child in the North and Central regions, remained almost unchanged in the South, and increased slightly in the Northeast.

For the country as a whole, rural total fertility declined slightly from about 6.7 in 1960-64 to about 5.5 in 1965-69. Urban total fertility, which was about 1.5 children lower than rural total fertility to begin with in 1960-64, fell substantially from approximately five to four children by 1965-69. Rural women with more than a primary education showed a substantial fertility decline, but they were too small a proportion of all rural women to have much impact on overall rural fertility. Among urban women, fertility declined considerably in all educational strata. Age at marriage changed little over the 1960s, so that trends in marital fertility closely paralleled trends in overall fertility.

In recent years there has been in Thailand, as in many other developing countries around the world, a rapidly growing awareness of the importance of demographic factors in economic and social development. The need for accurate demographic information about the population has been accentuated by the government's growing involvement in economic and social planning. Such planning requires as essential ingredients accurate estimates and projections of population size, distribution, and composition; projections in turn require accurate information about present levels and recent trends of birth, death, and migration rates.

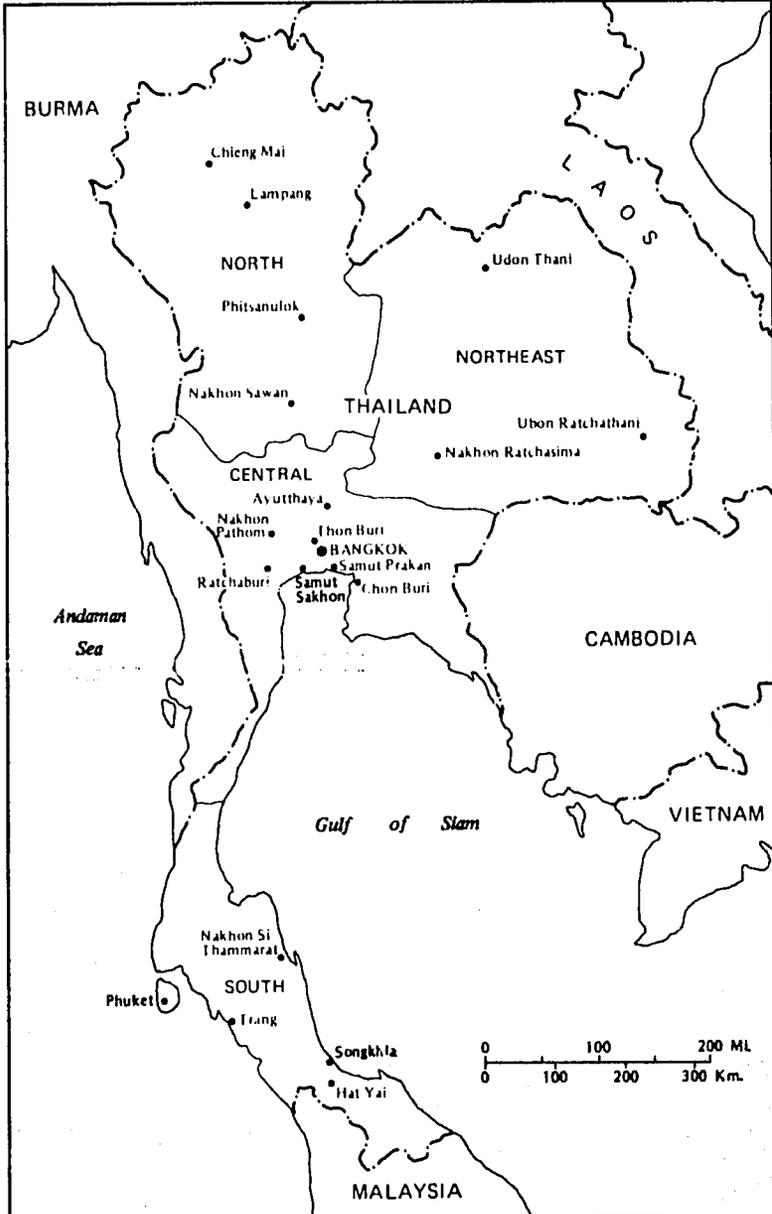
Accurate estimates of levels and trends of birth rates are also needed to evaluate the government's family planning program. Thai government involvement in family planning began informally in 1968 under the direction of the Ministry of Health. In 1970 the government promulgated an official national population policy supporting national family planning. In 1972 the Third Five-Year Economic and Social

Development Plan called for reduction of the rate of population growth from over 3 percent to about 2.5 percent by 1976, a goal that appears to have been approximately achieved. The Fourth Five-Year Plan calls for a continued reduction in fertility to achieve a growth rate of 2.1 percent by 1981. The rapid growth of a large-scale family planning program in response to these new population policies has intensified the need for local as well as national fertility estimates in order to monitor the program and ensure efficient operation and optimal allocation of family planning funds among the different geographic areas of the country.

The government has responded to the pressing need for accurate fertility statistics by supporting a variety of data collection efforts. Compulsory birth and death registration has been in effect in Thailand since 1917 but is still characterized by considerable underregistration. Therefore, principal reliance has been placed on fertility estimates derived from census and survey data, including a 1 percent sample from the 1960 Census (S. Goldstein, A. Goldstein, and Piampiti, 1973; Goldstein, 1970, 1972, 1973), the 1964-67 and 1974-76 Surveys of Population Change (Thailand, National Statistical Office, 1969, 1976, 1978), the 1969-73 Longitudinal Study of Social, Economic, and Demographic Change (Knodel and Pitaktepsombati, 1973, 1975; Knodel and Prachuabmoh, 1973; Institute of Population Studies, 1971), and the 1975 Survey of Fertility in Thailand, which is part of the World Fertility Survey (Institute of Population Studies and National Statistical Office, 1977; Arnold and Pejaranonda, 1977; Knodel and Debavalya, 1978). A number of indirect estimates have also been made, but these are summarized elsewhere and are not recapitulated here (Arnold, Retherford, and Wanglee, 1977).

This paper presents fertility estimates for Thailand based on application of the own-children method of fertility estimation to an approximately 2 percent sample of households from the 1970 Census. Following a discussion of data and methodology, the first part of the paper presents own-children estimates of total fertility rates and age-specific birth rates for Thailand and the four regions of North, Northeast, Central, and South (Figure 1) by rural-urban residence for the periods 1961-65 and 1966-70. Estimates of standardized marital general fertility rates and age-specific marital birth rates are presented for the same geographic subdivisions and time periods. A decomposition technique is then applied to analyze how much of the change in the total fertility rate between 1961-65 and 1966-70 is due to changes in age-specific proportions married and how much is due to

FIGURE 1 The four regions and the 20 largest municipal areas:
Thailand, 1970



SOURCE: Thailand, National Statistical Office (1973, table 1B).

changes in age-specific fertility. Finally, estimates of total fertility rates and age-specific birth rates by women's education, occupation, and religion are presented for the periods 1961-65 and 1966-70 for the country as a whole and by rural-urban residence.

DATA AND METHODOLOGY

In this paper the own-children method of fertility estimation is applied to an approximately 2 percent census sample of Thailand's 34.4 million population on 1 April 1970. The sample is of enumeration districts, with a sampling ratio of 10 percent for municipal areas and 1 percent for nonmunicipal areas. The weighted sample is representative by rural-urban residence at the level of the four regions—North, Northeast, Central, and South—but not at the level of the 71 provinces. Therefore, province-level fertility estimates based on this sample are not possible. A more detailed description of the sample has been given by Arnold and Boonpratuang (1975).

The own-children method of fertility estimation has been described in detail elsewhere (see, for example, Cho, Grabill, and Bogue, 1970; Cho, 1971, 1973; Retherford and Cho, 1978; Retherford, 1978; Retherford, Choe, and Wanglee, 1978) and need only be recapitulated briefly here. In essence, the method is a census- or survey-based reverse-survival technique for estimating age-specific fertility for years previous to a census or household survey. Enumerated children are first matched to mothers within households, usually on the basis of answers to questions on age, sex, marital status, relation to head of household, and number of children still living (Ho, 1977). Matching may be accomplished more simply if line number of mother, if present, is coded for each child in the household (this was not done in Thailand). These matched (i.e., own) children, classified by own age and mother's age, are reverse-survived to estimate numbers of births by age of mother in previous years. Reverse-survival is also used to estimate number of women by age in previous years. After adjustments are made for incorrect enumeration and unmatched (non-own) children, age-specific birth rates are calculated by dividing the number of births by the number of women. Typically the technique is applied to census data, and estimates are calculated for each of the previous ten to fifteen years. In the present application to Thailand, estimates are computed for each of the previous ten years.

The own-children method has the great advantage of not requiring pregnancy histories or other special questions on past fertility behavior. Its application to census data already collected for other purposes

makes large samples economical; large samples in turn allow a level of detail in cross-tabulations of birth rates by geographic subdivision and socioeconomic characteristics that is not feasible in fertility surveys based on substantially fewer respondents. Age-specific rates may be tabulated by whatever characteristics are asked for on the census questionnaire. It must be noted, however, that age-specific rates for previous years can normally be tabulated only according to characteristics at the time of enumeration, not at the time the births occurred.

Reverse-survival requires annual life tables for the $n-1$ year period previous to the census, specified by the same geographic subdivisions and socioeconomic characteristics for which fertility estimates are desired. At first sight, Feeney's (1976, 1977, 1979) method of estimating mortality trends from child survivorship data seems ideally suited to the task of estimating the necessary life tables. Feeney's method is an extension of Brass's (1975:50 ff.) method of estimating mortality from child survivorship data. Brass's method estimates the level of mortality for an indeterminate period in the recent past; Feeney's method—based on the same census data on age-specific numbers of children ever born and children still living per woman, estimates the trend as well as the level of mortality, with time reference points precisely specified.

But Feeney's and Brass's methods are not without problems. One difficulty is that they often substantially underestimate mortality owing to the omission of dead children in reported numbers of children ever born. Differential rates of omission can result also in serious distortion and even reversal of mortality differentials among geographic subdivisions and socioeconomic characteristics. Furthermore, the mortality estimates are sensitive to the choice of underlying model life table family that is presumed to fit approximately the previous mortality experience of the population under consideration.

Unfortunately, estimates of mortality for Thailand derived by applying Feeney's method to the 1970 Census appear too high, in both level and rate of decline (Retherford, Chamrathirong, and Wanglee, 1980). Therefore, own-children fertility estimates in this paper are based instead on a single set of changing life tables by sex for the whole country. These life tables are computed under the assumption that national life tables by sex from the 1964-65 Survey of Population Change are correct for that date (Thailand, National Statistical Office, 1969; see also Appendix Tables A1 and A2), and that age-sex-specific probabilities of dying changed between 1960 and 1970 at the pace indicated by Rungpitarangsi's (1974:61-64) national life tables by sex for 1960 and 1970.

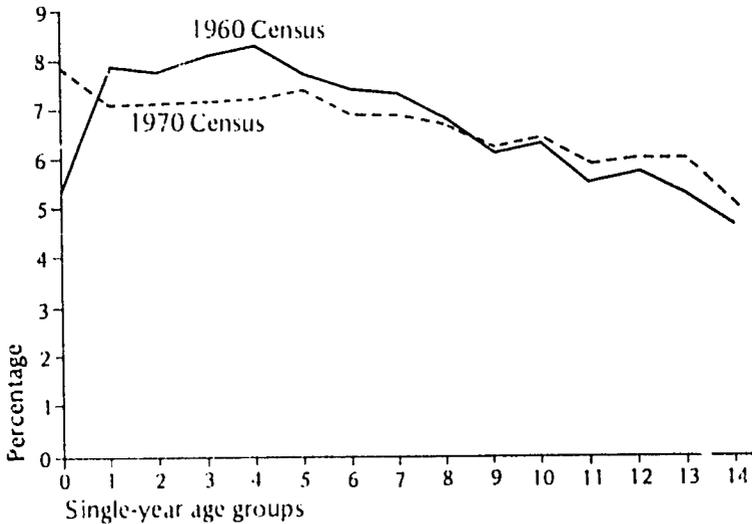
Mortality trends so estimated sacrifice specificity by geographic subdivision and socioeconomic characteristics, but they seem reasonably accurate as far as they go; moreover, the error in own-children fertility estimates for geographic subdivisions and socioeconomic characteristics that is introduced by the use of reverse-survival factors lacking such specificity is generally small. Because reverse-survival factors are not specified as finely as they should be, fertility differentials among regions and socioeconomic characteristics are somewhat understated. (For a more detailed discussion of the impact of alternative mortality assumptions on own-children fertility estimates for Thailand, see Retherford, Chamrathirong, and Wanglee, 1980.)

To yield accurate estimates of age-specific fertility for single calendar years, the own-children method requires accurate age reporting. As shown in Figure 2, the quality of age reporting in Thailand's 1970 Census appears quite good. The deficit of children under one year of age, which is very noticeable in the 1960 Census, is not readily apparent in the 1970 Census. A deficit in the census count of this age group is quite common, particularly in developing countries. It may have been largely avoided in the 1970 Census because of an instruction to enumerators to probe on the presence of infants in the household.

The high quality of age reporting in Thailand's 1970 Census is also indicated by Myers's index of digit preference (Myers, 1940), which in 1970 was 1.4 for females and 1.7 for males. These values can be compared with the value of the index in the United States, which for both sexes combined was 2.2 in the 1950 Census and 0.8 in the 1960 Census. As noted elsewhere (Arnold, Retherford, and Wanglee, 1977: 8), Thailand's age distribution is unusually good in comparison with that of other Asian countries. Ueda (1976) reported that Thailand has the lowest score (highest accuracy) on the U.N. sex-age accuracy index among 28 countries in Asia and the Pacific. In the same study, Thailand was also shown to have relatively little digit preference according to both Myers's index and Whipple's index.

Although the quality of age reporting is good in Thailand, it is not perfect; moreover, there is some evidence of undercount. Were the percentage underenumerated or misreported the same at all ages, own-children fertility estimates would be unaffected; the numerator and denominator of a given rate would be diminished by the same factor, which would cancel itself. But in fact both underenumeration and misreporting are age-selective. Therefore, it is appropriate to ask what effect errors in the reported age distribution have on own-children

FIGURE 2 Single-year age distribution as percentage of total population aged 0–14: Thailand, 1960 and 1970



fertility estimates. To answer this question, we examine the effect of applying alternative sets of adjustment factors to correct the reported age distribution.

Two sets of adjustment factors by sex are available, an official set prepared by Arnold and Phananimamai (1975), which relies heavily on fertility and mortality estimates derived from the 1964–65 Survey of Population Change, and another set prepared by Fulton (1975), which involves the use of model life tables. The two sets of adjustment factors are shown in Table A3 in the Appendix.

Table 1 shows the effect of these adjustments on the own-children fertility estimates. The Arnold and Phananimamai adjustments have little impact on fertility estimates for 1960–64, compared with estimates based on no adjustments, but they reduce the pace of subsequent fertility decline. The Fulton adjustments eliminate the fertility decline entirely. We have opted for the official adjustments for two reasons, first because we accept mortality and fertility estimates based on the 1964–65 Survey of Population Change as the best estimates from which to compute adjustments, and second, because own-children fertility estimates based on the Arnold and Phananimamai adjustments are consistent with independent evidence that fertility in Thailand had

TABLE 1 Own-children estimates of total fertility rates and age-specific birth rates with and without adjustments for underenumeration and age misreporting: Thailand
(Rates per thousand)

Adjustment and period	TFR	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Arnold and Phananimai adjustments (A&P)								
1960-64	6,483	86	274	313	281	215	106	20
1965-69	6,191	89	267	299	260	206	100	19
Fulton adjustments (F)								
1960-64	6,034	81	257	291	262	199	98	19
1965-69	6,008	84	256	289	256	202	97	18
No adjustments (N)								
1960-64	6,475	88	275	312	280	215	105	20
1965-69	5,763	80	246	277	245	193	94	17
A&P/N								
1960-64	1.00	0.98	1.00	1.00	1.00	1.00	1.01	1.00
1965-69	1.07	1.11	1.09	1.08	1.06	1.07	1.06	1.12
F/N								
1960-64	0.93	0.92	0.93	0.93	0.94	0.93	0.93	0.95
1965-69	1.04	1.05	1.04	1.04	1.04	1.05	1.03	1.06

NOTE: In own-children fertility estimation, calendar years are measured backwards from the census date, which in the present application is 1 April 1970. Therefore, own-children estimates for a given year, say 1969, refer to the period 1 April 1969 to 1 April 1970. Throughout this paper 1960-64 refers to the period 1 April 1960 to 1 April 1965, and 1965-69 refers to the period 1 April 1965 to 1 April 1970. Fertility estimates in the remainder of this paper are based on the Arnold and Phananimai adjustments.

already begun to decline by the late 1960s (Pardthaisong, 1978). (For a more complete discussion of adjustment factors, see Retherford, Choe, and Wanglee, 1978.)

It is worth noting that errors in the age distribution of women introduce less error in own-children fertility estimates than do errors in the age distribution of children. For example, if, owing to age heaping, the census or survey shows unusually large numbers of women aged 30, which is to some extent true of the Thai data, it also shows unusually large numbers of own children to mothers aged 30. Because women aged 29 and 31 have about the same child-woman ratios as women aged 30, heaping on age 30 has little impact on the child-woman ratio for women aged 30. In general, the age patterns of child-woman ratios and derived own-children birth rate estimates for a given year are affected little by age misreporting of women, even when the misreporting is severe.

Age heaping of children has more serious consequences, because it produces overestimates of fertility in some calendar years and underestimates in others. Heaping on age five, for example, inflates birth rate estimates for the sixth year previous to the census. This problem can be circumvented for the most part by aggregating reverse-survived births and women over groups of calendar years before dividing to obtain estimates of age-specific rates.

In applications of the own-children method in developing countries, fertility estimates for the first two years previous to enumeration, based on enumerated children aged 0 and 1, are generally discarded, because they usually reflect underenumeration and age overstatement of children under age 2, which produces an apparent but spuriously large fertility decline during those two years. Instead, aggregated estimates are computed for the two preceding five-year periods, based on children aged 2-6 and 7-11. These age groups have the additional advantage of largely encompassing and thus eliminating the effects of heaping on ages 5 and 10. In the present application to Thailand, however, estimates for the first two years previous to enumeration are retained, because coverage of children under age 2 is reasonably good, age reporting is reasonably accurate, and a set of age adjustment factors is available.

Table 2 shows total fertility rates and age-specific birth rates for Thailand based on two alternative aggregations of calendar years, the first consisting of three periods, 1960-63, 1964-66, and 1967-69, and the second consisting of two periods, 1960-64 and 1965-69. Results based on three periods show little fertility change between the

TABLE 2 Own-children estimates of total fertility rates and age-specific birth rates, based on alternative aggregations of calendar years: Thailand
(Rates per thousand)

Aggregation	TFR	15--19	20--24	25--29	30--34	35--39	40--44	45--49
4--3--3 grouping								
1960--63	6,486	86	273	314	280	217	107	20
1964--66	6,514	95	278	310	281	213	105	20
1967--69	5,977	83	261	291	247	200	96	18
5--5 grouping								
1960--64	6,483	86	274	313	281	215	106	20
1965--69	6,191	89	267	299	260	206	100	19

first and second periods followed by a substantial fall of fertility between the second and third periods. Results based on two five-year periods show a moderate fall. The decline of over half a child in the total fertility rate over the short span of only three years between 1964-66 and 1967-69 in the first set of estimates is implausible. In the remainder of this report, therefore, we present estimates only for the two five-year time periods, 1960-64 and 1965-69.

We compute age-specific marital birth rates under the assumption that all births occur within marriage, by dividing own-children estimates of age-specific birth rates by corresponding age-specific proportions currently married. These are obtained for each region by linearly interpolating age-specific proportions married from the 1960 and 1970 Censuses. Specification by rural-urban residence is not possible, because the rural-urban distinction was not included in the 1960 Census.

Age-specific proportions married for 1970 are taken with no adjustments from the 1970 Census, but those for 1960 are adjusted. In the 1970 Census, age was computed as the difference between the census date and the birth date in completed years. The 1960 Census, on the other hand, simply contained a question on current age, which resulted in a good deal of age misstatement. Chamrathirong (1976) suggests that persons enumerated in the 1960 Census generally rounded their ages, so that age group 22, for example, ranged approximately from 21.5 to 22.5 instead of the usual 22.0 to 23.0. Therefore, we have shifted the proportions married by 0.5 year of age.

The adjustment is computed as follows: First age-specific proportions currently married are computed for 1960 in the usual five-year age groups. The adjusted proportion for ages a to $a+5$ is then obtained as

$$P_a^* = P_a + 0.1(P_{a+5} - P_a), \quad (1)$$

where lack of an asterisk indicates unadjusted proportions.

The age-specific proportions married include women of unknown marital status in the denominator. It is not clear that excluding such women improves the estimates, as it seems likely that a disproportionate number of unknowns are single, divorced, or widowed, in which case it is proper to include them in the denominator. In any event, the number of unknowns is very small.

The 1960 and 1970 Censuses were taken on April 25 and April 1, respectively. These dates are converted to decimal form as 1960.31 and 1970.25. Because calendar years for own-children fertility estimates are measured backward from the 1970 census date, a year such as 1969 runs from 1 April 1969 to 1 April 1970. Hence the midpoints

of the periods 1960–64 and 1965–69, for which own-children estimates of age-specific birth rates are computed, are 1962.75 and 1967.75. Interpolated values of proportions married are obtained for these midpoints.

To avoid an unduly cumbersome analysis, summary measures of marital fertility and nuptiality are computed, in addition to age-specific marital birth rates and age-specific proportions married. The standardized marital general fertility rate (SMGFR) is the summary measure of marital fertility, and the singulate mean age at first marriage (SMAM) is the summary measure of nuptiality.

The standardized marital general fertility rate is calculated as

$$\text{SMGFR} = \frac{\sum P_a^m F_a^m}{\sum P_a^m} \quad (2)$$

where the summation ranges over ages 15–49 in five-year age groups, F_a^m denotes estimated age-specific marital fertility, and P_a^m denotes currently married women by age in the standard population, taken here as married women by age for all of Thailand (Thailand, National Statistical Office, 1973:17).

The singulate mean age at marriage is calculated as

$$\text{SMAM} = \frac{5 \sum S_a + 15 - 25(S_{45} + S_{50})}{1 - .5(S_{45} + S_{50})} \quad (3)$$

where S_a denotes the proportion single for women aged a to $a+5$ as given in the census and where the summation in the numerator spans ages 15–49 in five-year age groups (Shryock and Siegel, 1973:295). The singulate mean age at marriage reflects the life history of a hypothetical cohort who experience proportions single at each age as given in a survey or census, in this case the 1970 Census. For intermediate years we calculate SMAM using age-specific proportions single interpolated in the same way as age-specific proportions married, described above.

Decomposition of the change in the total fertility rate (TFR) between 1960–64 and 1965–69, with one set of additive components from changes in age-specific proportions married and a second set from changes in age-specific marital fertility, is calculated using an adaptation of a method developed by Kitagawa (1955), as follows:

Consider a change in $\text{TFR} = 5 \sum_a F_a$, where F_a is the age-specific birth rate for a five-year age group beginning at age a . Assuming that all births occur within marriage, we can also write $\text{TFR} = 5 \sum_a k_{am} F_{am}$, where k_{am} is the proportion of women currently married in the age

group a to $a+5$ and F_{am} is the marital fertility rate in the same age group. Then

$$\Delta TFR = 5 \sum_a \bar{F}_{am} \Delta k_{am} + 5 \sum_a \bar{k}_{am} \Delta F_{am} , \quad (4)$$

where the symbol Δ denotes change and where \bar{F}_{am} and \bar{k}_{am} are average values over the period, obtained by summing beginning and end values and dividing by 2. We thus obtain a sum of two principal contributions to ΔTFR , the first of which can be interpreted as stemming from changes in age-specific proportions married and the second from changes in age-specific marital fertility. Each of these two principal contributions can in turn be classified by age if so desired.

ESTIMATES

Fertility for Thailand and regions by rural-urban residence

Table 3 shows own-children fertility estimates for 1960–64 and 1965–69 compared with other fertility estimates for years since 1960. The trend in total fertility rates is remarkably consistent, indicating that fertility fell slowly over the 1960s, then swiftly after 1970. Estimates of age-specific rates do not show as consistent a trend as do estimates of the TFR, but the picture is still broadly clear.

Figure 3 graphs the trend in age-specific fertility as given by own-children estimates for 1960–64 and 1965–69, cohort-parity-increment (CPI) estimates based on data on children-ever-born from the 1960 and 1970 Censuses (Hill, 1978), and Survey of Population Change (SPC) estimates for 1964–65 and 1974–76. The five sets of estimates, all based on large samples, show little change during the early 1960s, moderate change during the late 1960s, and rapid change during the first half of the 1970s. The age pattern of fertility derived from the Longitudinal Study (LS) for 1971–72 is somewhat irregular and not shown in Figure 3. The age pattern of fertility derived from the Survey of Fertility in Thailand (SOFT) for 1970–74 shows an unusually low proportion of total fertility between ages 20 and 30 and is not shown either. Fertility estimates from the LS and SOFT surveys are based on small samples and are probably not as accurate as the own-children and SPC estimates.

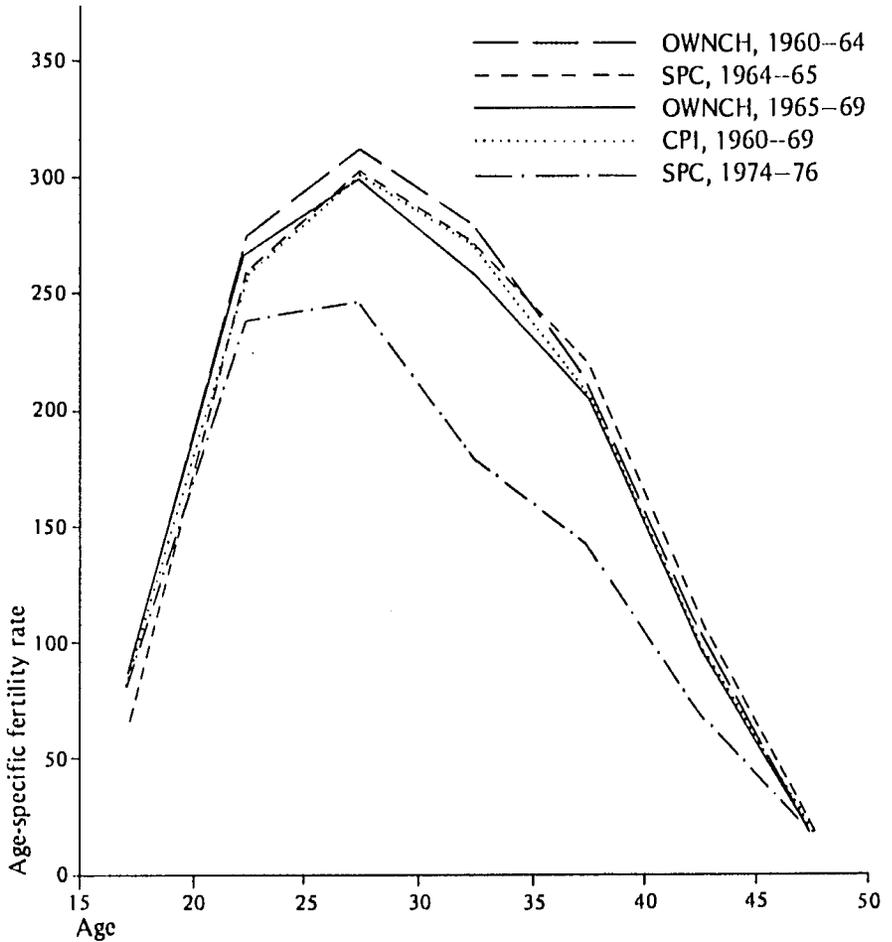
Table 4 shows own-children and SPC estimates of total fertility rates and age-specific birth rates for the four regions of Thailand—North, Northeast, Central, and South. Fertility decline is most dramatic in the North, where the TFR fell from somewhat over six chil-

TABLE 3 Total fertility rates and age-specific birth rates: Thailand, various dates and sources
(Rates per thousand)

Source	TFR	15–19	20–24	25–29	30–34	35–39	40–44	45–49
NESDB, 1960	6,416	53	261	316	278	232	115	28
OWNCH, 1960–64	6,483	86	274	313	281	215	106	20
SPC, 1964–65	6,299	66	259	303	273	222	112	24
CPI, 1960–69	6,170	80	253	301	272	208	101	19
SOFT, 1965–69	6,460	90	260	300	260	210	140	30
OWNCH, 1965–69	6,191	89	267	299	260	206	100	19
LS, 1968–69	6,100	70	260	290	230	200	150	30
NESDB, 1970	5,598	60	226	256	254	202	96	26
LS, 1971–72	5,350	70	230	290	180	170	120	30
SOFT, 1970–74	5,090	80	230	230	190	170	80	30
SPC, 1974–76	4,895	81	239	247	182	143	70	18

SOURCES: OWNCH values refer to own-children estimates based on the 1970 Census as reported in this paper. NESDB refers to the National Economic and Social Development Board, SPC to the Survey of Population Change, CPI to Hill's (1978) cohort parity increment method as applied to the 1960 and 1970 Censuses, SOFT to the Survey of Fertility in Thailand, and LS to the Longitudinal Study conducted by the Institute of Population Studies at Chulalongkorn University. NESDB values are taken from Thailand, National Economic and Social Development Board (1975). SPC values are taken from Thailand, National Statistical Office (1976, 1978)—the SPC for 1964–65 omitted Bangkok-Thonburi. LS values are taken from Institute of Population Studies and National Statistical Office (1977); values are given to only two significant figures. SOFT values are taken from Thailand, National Statistical Office (1978); values are given to only two significant figures. Total fertility rates are calculated from more exact values of age-specific fertility rates than those shown.

FIGURE 3 Age-specific birth rates for Thailand based on the Surveys of Population Change for 1964–65 and 1974–76 and on application of the own-children method to the 1970 Census



SOURCE: Table 3.

TABLE 4 Total fertility rates and age-specific birth rates for regions of Thailand: comparison of estimates based on the own-children method to estimates based on the Survey of Population Change
(Rates per thousand)

Region and source	TFR	15-19	20-24	25-29	30-34	35-39	40-44	45-49
North								
OWNCH, 1960-64	6,364	96	291	306	270	200	91	17
SPC, 1964-65	6,475	94	282	305	278	221	96	18
OWNCH, 1965-69	5,712	93	264	273	236	185	77	15
SPC, 1974-76	3,744	70	178	195	151	100	46	8
Northeast								
OWNCH, 1960-64	6,971	86	287	334	303	236	122	27
SPC, 1964-65	6,605	62	259	318	292	232	123	35
OWNCH, 1965-69	7,204	99	307	340	304	246	121	24
SPC, 1974-76	6,249	99	320	297	228	191	92	23
Central								
OWNCH, 1960-64	6,055	75	253	297	266	203	100	17
SPC, 1964-65	5,902	47	241	305	238	219	108	22
OWNCH, 1965-69	5,324	66	222	266	225	178	91	16
SPC, 1974-76	4,113	74	202	206	150	116	62	13
South								
OWNCH, 1960-64	6,524	102	268	310	279	218	109	19
SPC, 1964-65	6,014	72	257	256	280	208	120	10
OWNCH, 1965-69	6,480	114	269	309	272	208	106	18
SPC, 1974-76	6,124	95	309	307	229	172	88	25

NOTE: The SPC figures in this table exclude Bangkok-Thonburi from the Central region.

dren per woman in 1960-64 to somewhat under four children per woman in 1974-76. Fertility decline was especially rapid after about 1965, as noted also by Pardthaisong (1978). The Central region, which includes Bangkok, shows a similar, if somewhat less dramatic, pattern of fertility decline.

Fertility decline is much less noticeable in the Northeast and South. According to the own-children estimates, fertility actually increased slightly over the 1960s in the Northeast. The SPC 1974-76 estimates indicate that by the mid-1970s fertility had begun to fall rapidly in the Northeast. Since the fertility decline in the Northeast started from a very high initial level, close to seven children per woman, its rapid decline to approximately six children per woman during the first half of the 1970s still left it at a level achieved by the North and Central regions already in the early 1960s. Fertility in the South was between six and six and a half children per woman in the early 1960s and was still at about that level in the mid-1970s.

Table 5 shows the age pattern of fertility decline for each region over the 1960s, as given by the percentage change in each age-specific birth rate estimated by the own-children method. The North, Northeast, and South regions and Thailand as a whole approach the expected pattern, with relative declines for the most part larger at the older reproductive ages. In the Northeast and South, where total fertility hardly changed at all, age-specific fertility increased in the younger reproductive ages and fell at the older reproductive ages, a pattern frequently seen in developing countries. The Central region, on the other hand, shows a very different pattern, with the largest declines occurring at the younger and middle reproductive ages. By the mid-1970s, however, fertility in this region was falling rapidly at the older ages, too, as shown previously in Table 4.

Table 6 shows own-children estimates of total fertility rates for rural and urban areas of the four regions for 1960-64 and 1965-69. Rural-urban fertility differentials were already large in the early 1960s. In Thailand as a whole, urban women were already having about one and a half fewer children than rural women. This was also true of the Central region, where most of the country's urban population is concentrated. In the other three regions urban women were having about one child fewer than rural women.

It was shown in Table 5 that total fertility fell by about 5 percent between the first and second halves of the 1960s. Table 6 shows that this fertility decline was heavily concentrated in urban areas. In Thailand as a whole, the rural TFR fell by less than 3 percent over this

TABLE 5 Own-children estimates of total fertility rates and age-specific birth rates: Thailand and regions, 1960–64 and 1965–69
(Rates per thousand)

Region and period	TFR	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Thailand								
1960–64	6,483	86	274	313	281	215	106	20
1965–69	6,191	89	267	299	260	206	100	19
% change	-4.5	2.9	-2.7	-4.5	-7.5	-4.4	-6.6	-8.3
North								
1960–64	6,364	96	291	306	270	200	91	17
1965–69	5,712	93	264	273	236	185	77	15
% change	-10.2	-3.9	-9.1	-10.9	-12.9	-7.7	-15.6	-12.4
Northeast								
1960–64	6,971	86	287	334	303	236	122	27
1965–69	7,204	99	307	340	304	246	121	24
% change	3.3	15.7	6.9	1.9	0.3	4.2	-1.0	-10.1
Central								
1960–64	6,055	75	253	297	266	203	100	17
1965–69	5,324	66	222	266	225	178	91	16
% change	-12.1	-12.2	-12.1	-10.2	-15.3	-12.5	-9.2	-4.1
South								
1960–64	6,524	102	268	310	279	218	109	19
1965–69	6,480	114	269	309	272	208	106	18
% change	-0.7	12.3	0.5	-0.1	-2.4	-5.0	-3.4	-5.9

NOTE: Percentage changes are computed from more exact rates than are shown in this table.

TABLE 6 Own-children estimates of total fertility rates by rural-urban residence: Thailand and regions, 1960–64 and 1965–69
(Rates per thousand)

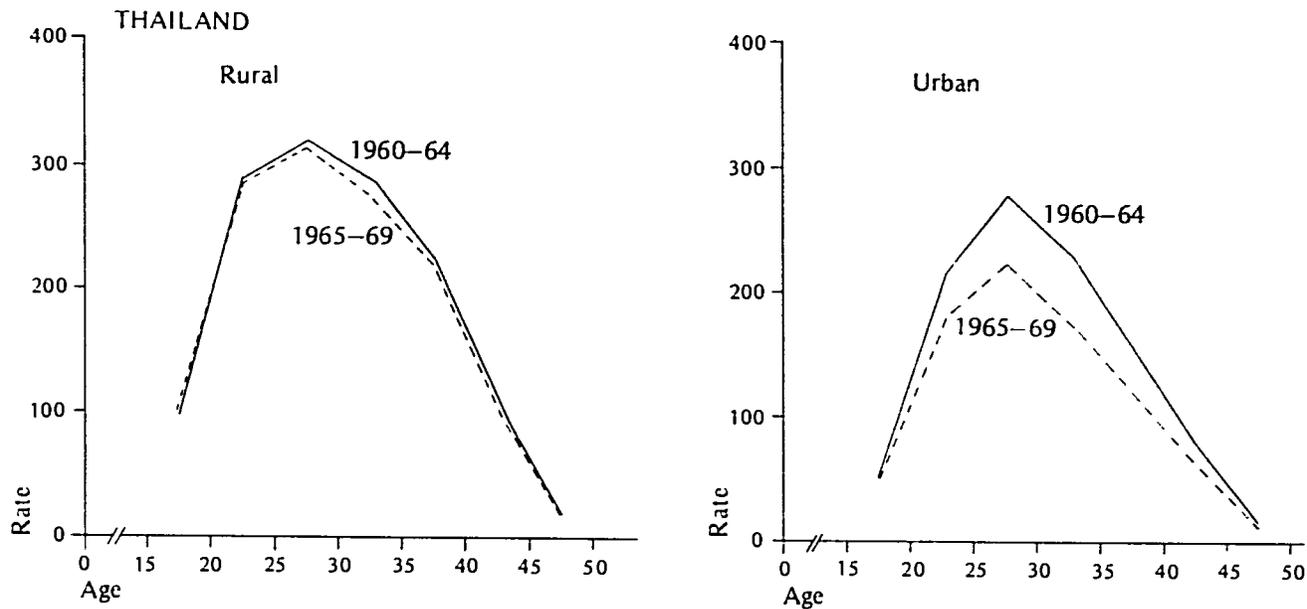
Region and period	Rural	Urban
Thailand		
1960–64	6,700	5,167
1965–69	6,545	4,146
% change	-2.3	-19.7
North		
1960–64	6,412	5,263
1965–69	5,793	4,201
% change	-9.7	-20.2
Northeast		
1960–64	6,968	6,036
1965–69	7,235	5,439
% change	3.8	-9.9
Central		
1960–64	6,651	4,968
1965–69	6,130	3,881
% change	-7.8	-21.9
South		
1960–64	6,611	5,783
1965–69	6,677	4,904
% change	1.0	-15.2

period, whereas the urban TFR fell by about 20 percent. In the North and Central regions, the rural TFR fell by almost 10 percent and the urban TFR by about 20 percent. In the Northeast and South, the rural TFR increased slightly and the urban TFR fell by 10–15 percent. Thus urban fertility was falling in all parts of the country during the 1960s, and rural fertility was starting to fall in the North and Central regions. The age pattern of fertility decline in rural areas in the four regions, based on estimates presented in Table A4, is shown in Figure 4.

Marital fertility and proportions married for Thailand and regions

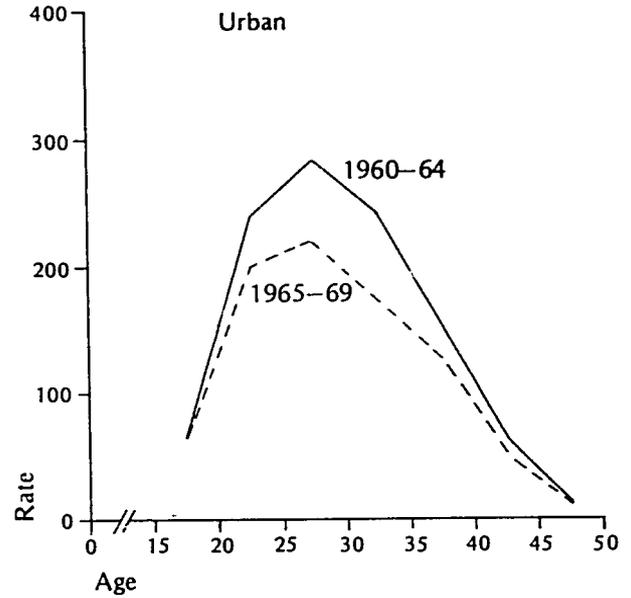
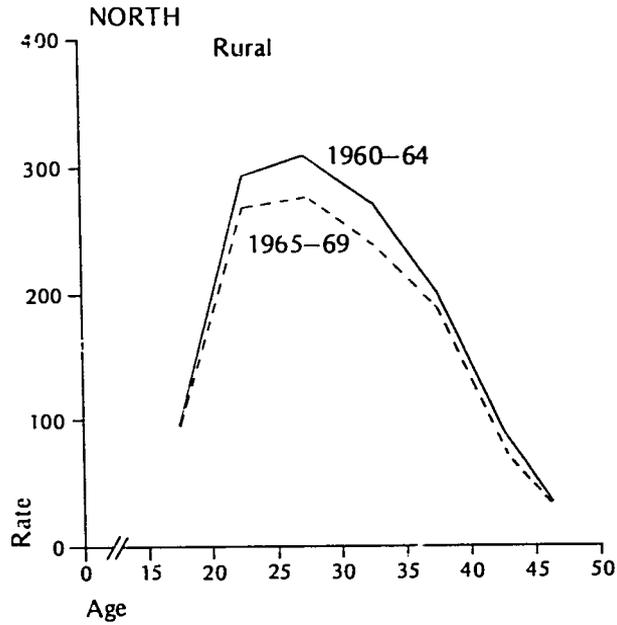
Table 7 shows own-children estimates of standardized marital general fertility rates (SMGFRs) and age-specific marital birth rates for

FIGURE 4 Own-children estimates of age-specific birth rates by rural-urban residence: Thailand and regions, 1960–64 and 1965–69 (Rates per thousand)



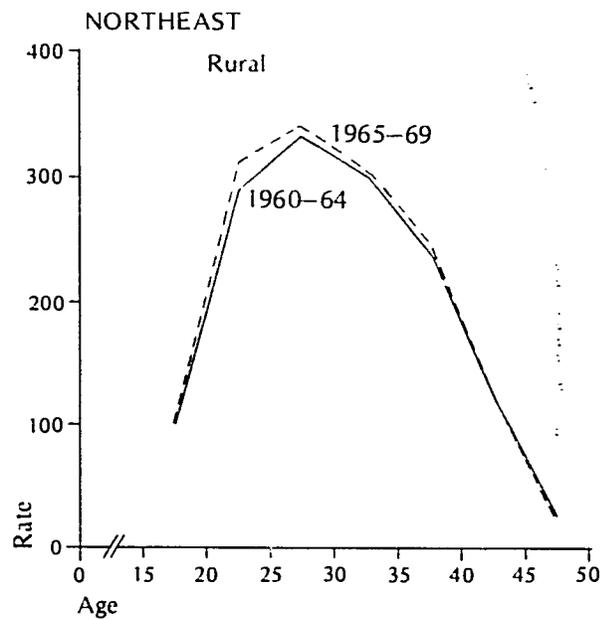
SOURCE: Table A.4.

FIGURE 4 (continued)



SOURCE: Table A4.

FIGURE 4 (continued)



SOURCE: Table A4.

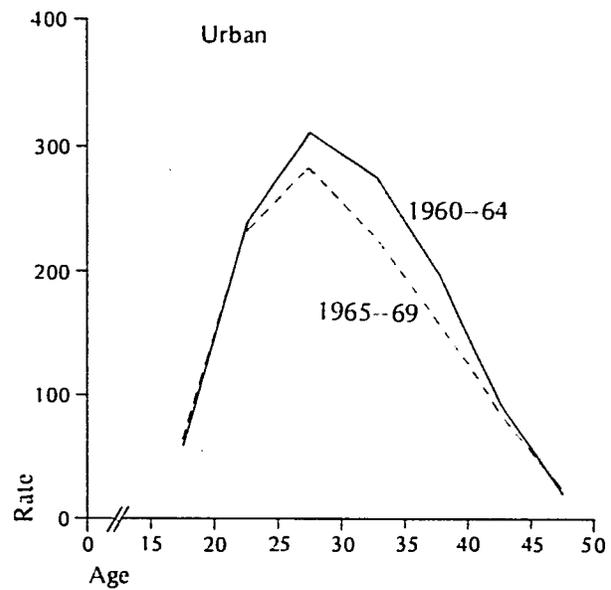
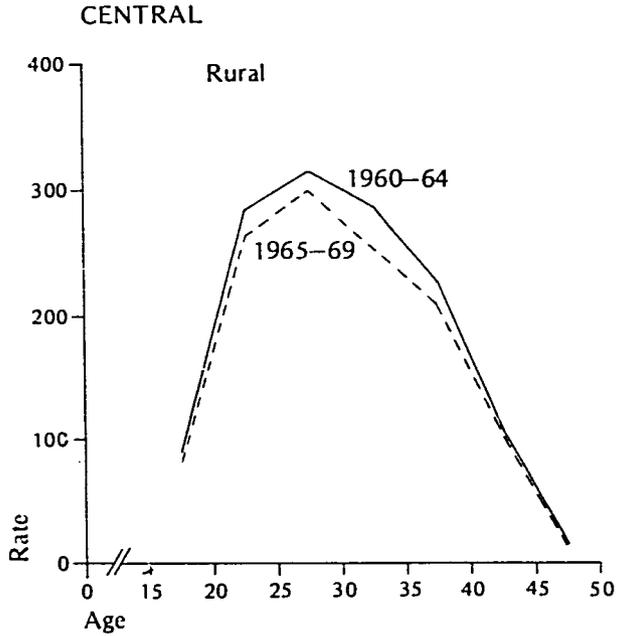


FIGURE 4 (continued)



SOURCE: Table A4.

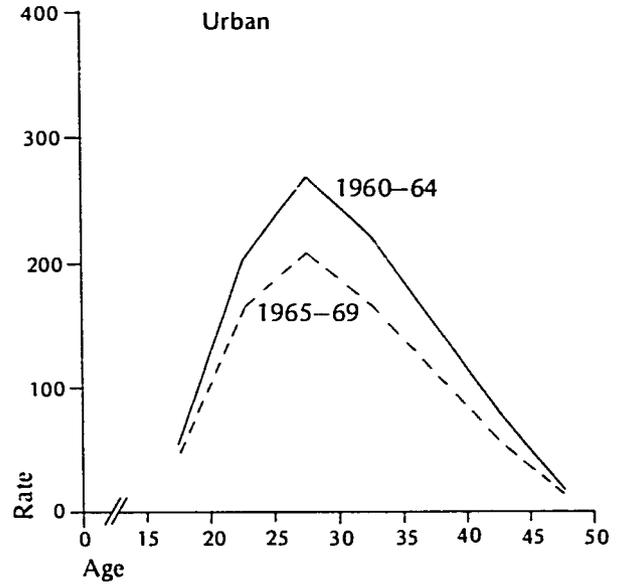
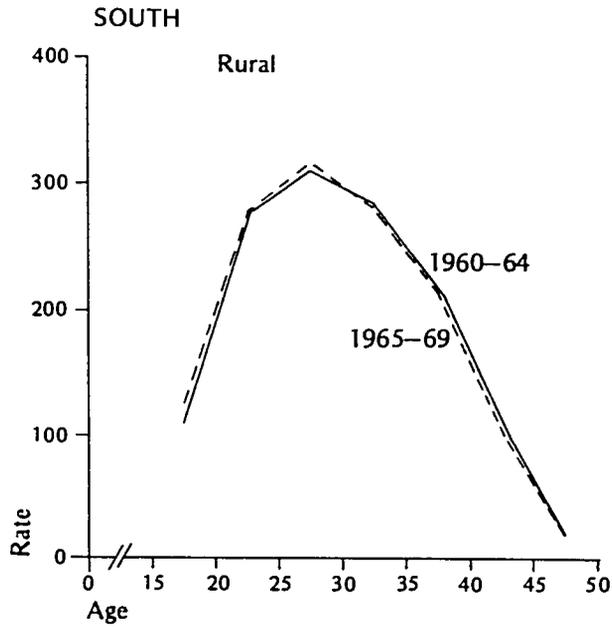


FIGURE 4 (continued)



SOURCE: Table A4.

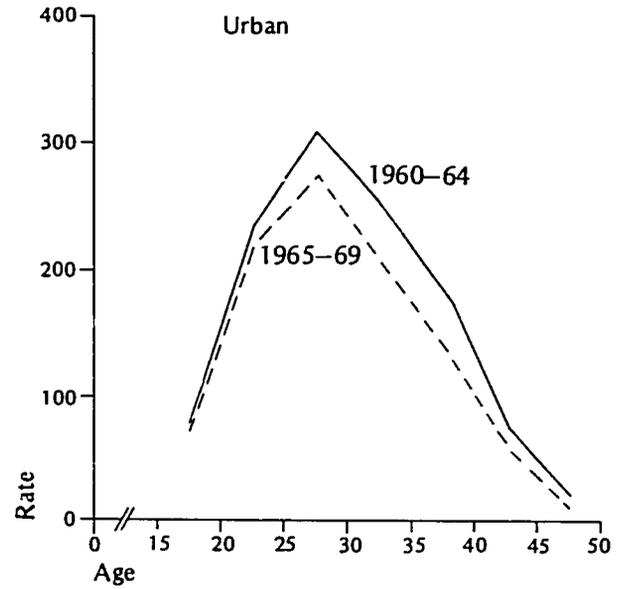


TABLE 7 Own-children estimates of standardized marital general fertility rates and age-specific marital birth rates: Thailand and regions, 1960–64 and 1965–69
(Rates per thousand)

Region and period	SMGFR	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Thailand								
1960–64	305	507	470	392	327	250	129	26
1965–69	293	513	460	376	303	238	119	24
% change	-4.0	1.2	-2.0	-4.0	-7.4	-4.9	-8.1	-9.9
North								
1960–64	284	467	447	366	307	229	109	22
1965–69	256	457	411	327	267	209	90	18
% change	-9.7	-2.2	-8.1	-10.8	-13.2	-8.6	-17.1	-14.4
Northeast								
1960–64	324	543	476	410	351	274	148	35
1965–69	329	570	489	414	350	283	144	31
% change	1.5	5.1	2.7	0.9	-0.4	3.4	-2.7	-11.8
Central								
1960–64	310	544	502	398	320	242	124	22
1965–69	281	503	470	367	274	212	111	21
% change	-9.3	-7.4	-6.4	-7.7	-14.3	-12.4	-10.3	-6.7
South								
1960–64	288	439	428	375	316	246	128	23
1965–69	288	493	434	377	308	234	123	22
% change	0.2	12.4	1.6	0.4	-2.3	-5.2	-4.4	-8.1

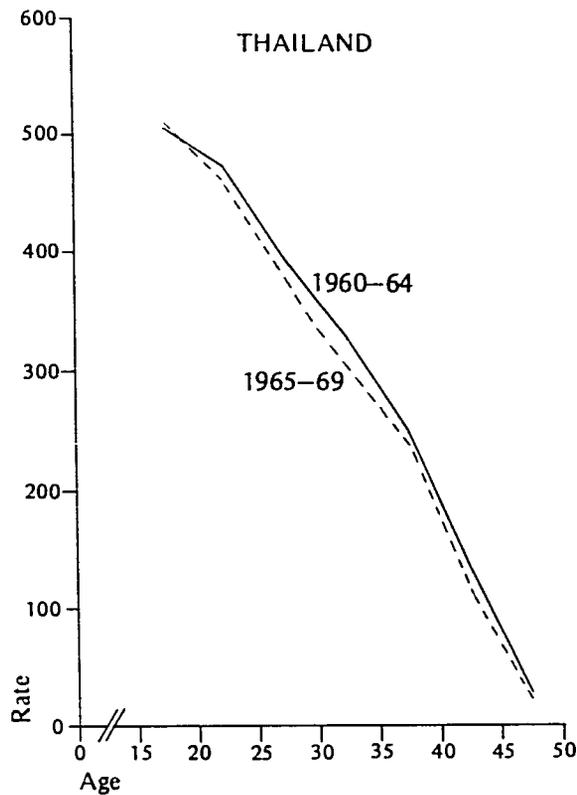
Thailand and regions. The SMGFR, like the TFR in Table 5, fell by about 4 percent over the 1960s in Thailand as a whole. In the North and Central regions, it fell about 10 percent, and in the Northeast and South it rose very slightly. The age pattern of marital fertility change generally shows larger relative declines with increasing age, but again the Central region is a minor exception. The age pattern of change in marital fertility is very much like the age pattern of change in overall fertility, because, as we shall see momentarily, nuptiality changed little over the 1960s. The age pattern of marital fertility change is shown graphically in Figure 5.

Age-specific marital birth rates in Table 7 are computed by dividing age-specific birth rates in Table 5 by age-specific proportions married in Table 8, as described in the previous section on data and methodology. (Computations are based on more exact values than shown in the latter two tables.) Table 8 confirms that changes in nuptiality over the 1960s were extremely small. Mean age at marriage was already fairly late, by Asian standards, at the beginning of the decade and remained approximately static. The age profile of proportions married is shown graphically in Figure 6.

Table 9 shows decompositions of the change in the total fertility rate between 1960-64 and 1965-69 for Thailand and regions, computed according to the methodology described earlier. The decompositions show the percentage of the change due to changes in age-specific proportions married and the percentage due to changes in age-specific marital fertility. Each of these two contributions is in turn decomposed by age. The total unpercentaged change in the TFR per thousand women is shown in parentheses at the lower right of each of the five panels.

For Thailand as a whole, virtually all the change in the TFR is due to changes in marital fertility. Contributions from changes in age-specific proportions married are slightly positive at the younger ages (i.e., positively contributing to the decline) and negative at the older ages, with the net effect close to zero. The North shows a rather similar pattern. On the other hand, the Central region, which experienced a fall in the TFR similar in magnitude to that of the North, shows close to 20 percent of the change in the TFR due to changes in proportions married. The reason for the regional difference in decompositions is that in the Central region, but not in the North, the small declines in proportions married are most pronounced at 20-24 and 25-29, ages of very high marital fertility. Because contributions to change in the TFR from changes in age-specific proportions married

FIGURE 5 Own-children estimates of age-specific marital birth rates: Thailand and regions, 1960–64 and 1965–69 (Rates per thousand)



SOURCE: Table 7.

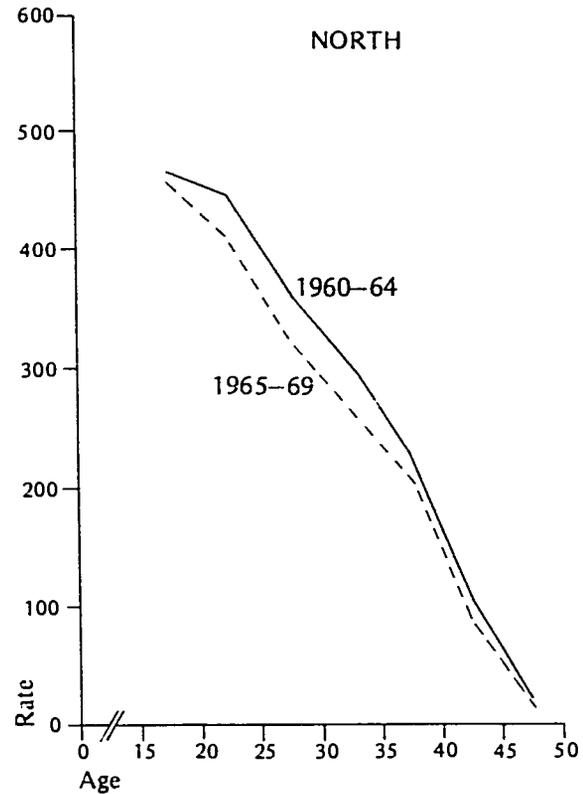
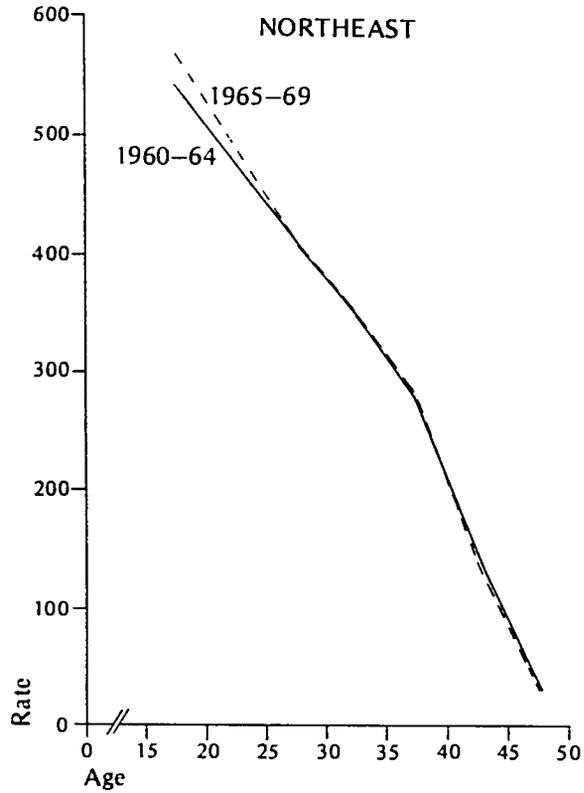


FIGURE 5 (continued)



SOURCE: Table 7.

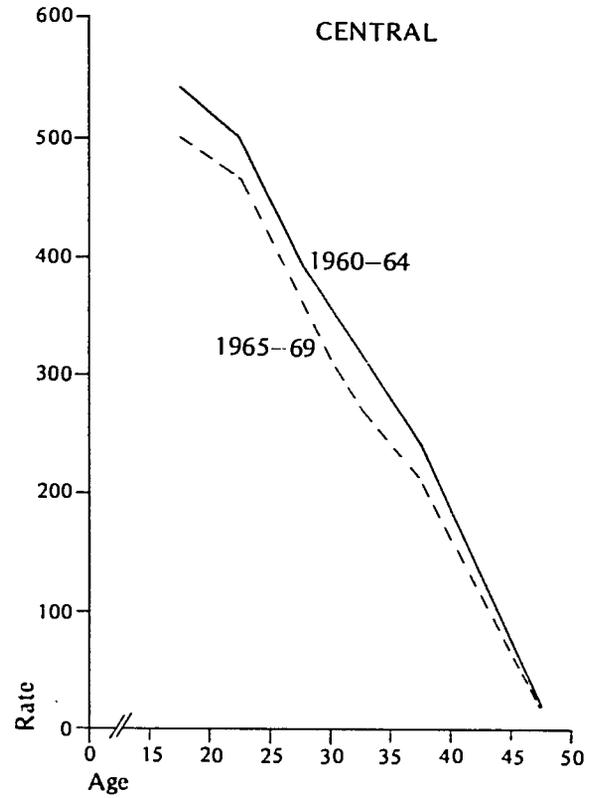
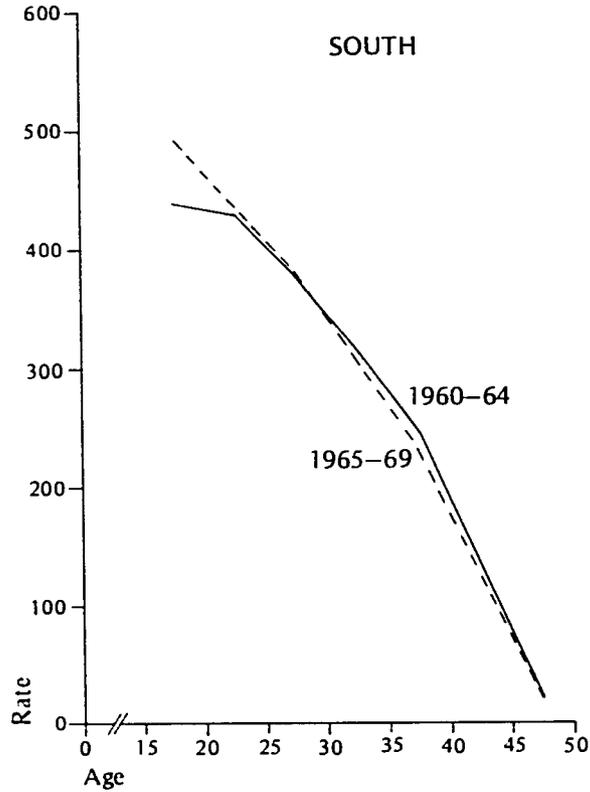
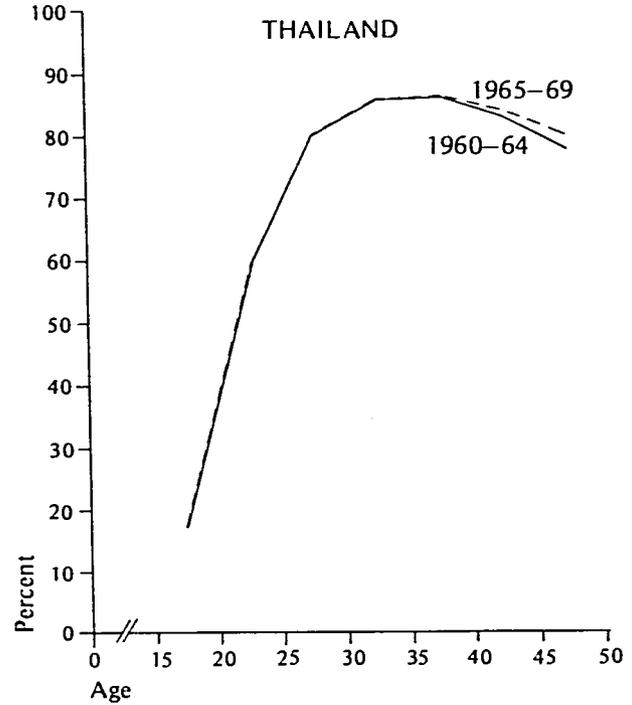


FIGURE 5 (continued)



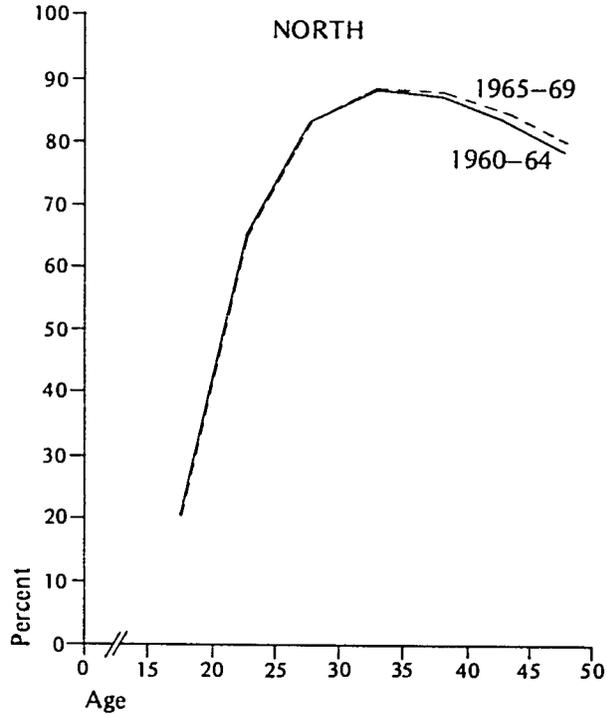
SOURCE: Table 7.

FIGURE 6 Age-specific proportions married:
Thailand and regions, 1960-64 and
1965-69 (In percentages)



SOURCE: Table 8.

FIGURE 6 (continued)



SOURCE: Table 8.

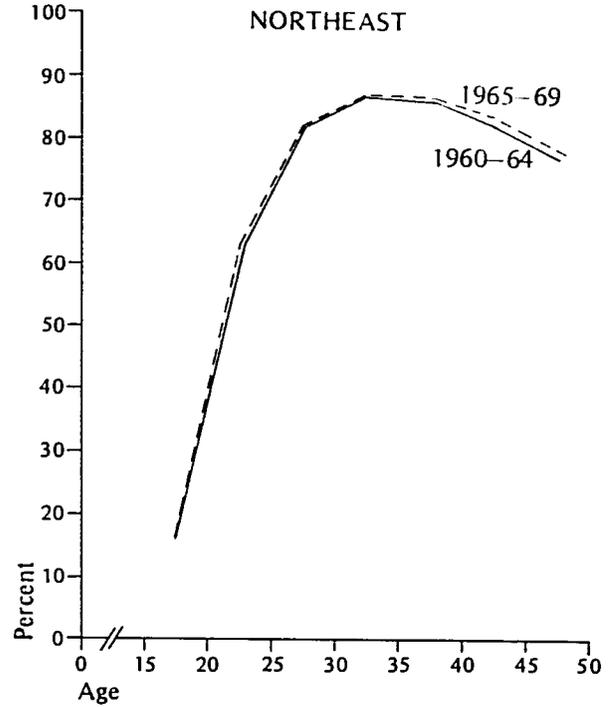
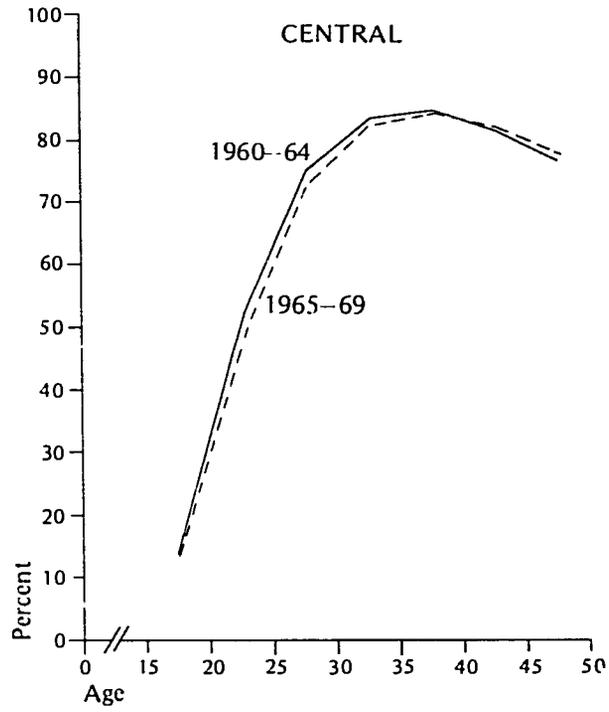


FIGURE 6 (continued)



SOURCE: Table 8.

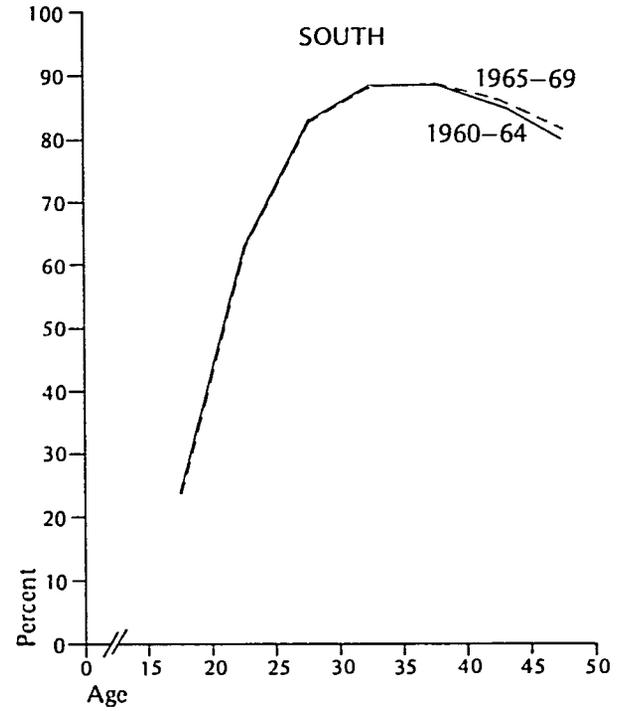


TABLE 8 Singulate mean age at marriage (SMAM) and age-specific proportions currently married (in percentages): Thailand and regions, 1960–64 and 1965–69

Region and period	SMAM	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Thailand								
1960–64	21.7	17.0	58.4	79.9	85.9	86.1	82.6	77.5
1965–69	21.8	17.3	58.0	79.4	85.8	86.5	83.9	79.2
North								
1960–64	20.8	20.6	65.0	83.7	88.1	87.4	83.9	78.7
1965–69	21.0	20.3	64.3	83.6	88.4	88.2	85.4	80.6
Northeast								
1960–64	21.4	15.8	60.3	81.3	86.4	86.1	82.2	77.0
1965–69	21.3	17.4	62.8	82.1	87.0	86.8	83.6	78.5
Central								
1960–64	22.5	13.8	50.4	74.6	83.0	84.1	81.2	76.3
1965–69	22.5	13.1	47.3	72.6	82.0	84.0	82.1	78.1
South								
1960–64	21.1	23.2	62.6	82.6	88.4	88.7	85.2	79.8
1965–69	21.2	23.2	61.9	82.2	88.3	88.8	86.2	81.6

TABLE 9 Percentage decomposition of the change in the total fertility rate between 1960–64 and 1965–69: Thailand and regions

Region and change component	15–19	20–24	25–29	30–34	35–39	40–44	45–49	All age groups
Thailand								
Proportions married	-2.5	3.0	3.3	0.5	-1.7	-2.7	-0.7	-0.8
Marital fertility	-1.8	9.5	21.0	35.7	18.1	14.8	3.5	100.8
Both components	-4.3	12.5	24.3	36.2	16.4	12.1	2.8	100.0 (-292)
North								
Proportions married	1.2	2.4	0.4	-0.7	-1.4	-1.2	-0.3	0.6
Marital fertility	1.6	17.9	25.3	27.4	13.2	12.1	1.9	99.4
Both components	2.9	20.3	25.7	26.7	11.9	10.9	1.6	100.0 (-652)
Northeast								
Proportions married	19.1	25.4	7.4	4.7	3.9	4.4	1.1	65.9
Marital fertility	10.0	17.0	6.2	-2.6	17.2	-7.0	-6.8	34.1
Both components	29.1	42.4	13.6	2.1	21.2	-2.6	-5.8	100.0 (233)
Central								
Proportions married	2.6	10.1	5.3	2.0	0.2	-0.8	-0.3	19.1
Marital fertility	3.7	10.8	15.4	25.8	17.2	7.1	0.8	80.9
Both components	6.3	20.9	20.7	27.9	17.4	6.3	0.5	100.0 (-730)
South								
Proportions married	0.8	33.8	18.4	3.2	-4.4	-14.8	-4.5	32.5
Marital fertility	-142.4	-48.0	-15.6	71.9	128.5	56.1	17.1	67.5
Both components	-141.6	-14.2	2.8	75.1	124.1	41.3	12.5	100.0 (-44)

are weighted by mean age-specific marital birth rates at the same ages (equation [4] of the previous section), small changes in proportions married at ages 20 -24 and 25 -29 translate into somewhat larger contributions to the change in the TFR.

In the Northeast the TFR increased by about two-tenths of a child; changes in proportions married contributed about two-thirds of the increase, and changes in marital fertility about one-third. The percentage contribution from proportions married is large because proportions married rose, albeit slightly, at all ages, instead of rising at some ages and falling at others, and because marital fertility hardly changed. In the South the TFR fell very slightly, by less than one-twentieth of a child, with about one-third of the decline due to changes in proportions married, and two-thirds due to changes in marital fertility. Since the change in the TFR on which components are percentage is so small, there are large offsetting effects in the percentage contributions, which are sensitive to small variations in the input data. Because of this sensitivity, not much significance can be attached to precise numerical magnitudes of contributions for the South.

Fertility by characteristics

As mentioned earlier, an advantage of the own-children method is that it allows tabulation of birth rates by characteristics asked on the census form. In this paper we consider three women's characteristics known generally to have a strong influence on fertility--namely education, occupation, and religion.

Table 10 shows estimates of total and age-specific fertility by education and rural-urban residence for Thailand during 1960 -64 and 1965 -69. Results are presented for four education categories --no education, some primary, some secondary, and some college. Birth rates for rural women with some college are omitted from the table, because births to these women at the extremes of the reproductive age span are too few in number to yield reliable estimates of age-specific rates. Fertility differentials by education are extremely large, ranging from slightly over two children per woman for urban women with some college, to almost seven children per woman for rural women with some primary education. The latter women are just beginning fertility transition, whereas the former have virtually completed it and show little fertility change over the decade.

Overall, women with some primary education have slightly higher total fertility than women with no education, although this difference

TABLE 10 Own-children estimates of total fertility rates and age-specific birth rates by education and rural-urban residence: Thailand, 1960-64 and 1965-69
(Rates per thousand)

Education, rural-urban residence, and period	TFR	15-19	20-24	25-29	30-34	35-39	40-44	45-49
NO EDUCATION								
Rural and urban								
1960-64	6,563	133	282	302	269	206	101	19
1965-69	6,469	144	279	297	266	197	92	18
% change	-1.4	8.3	-0.8	-1.9	-1.0	-4.4	-8.9	-5.2
Rural								
1960-64	6,568	135	282	299	269	208	102	19
1965-69	6,579	149	282	299	272	201	94	18
% change	0.2	10.8	0.0	0.0	1.3	-3.0	-8.2	-5.7
Urban								
1960-64	6,395	116	276	329	270	181	90	18
1965-69	5,373	88	248	274	220	152	74	18
% change	-16.0	-23.7	-10.3	-16.5	-18.2	-15.7	-17.7	-2.8
SOME PRIMARY								
Rural and urban								
1960-64	6,777	87	284	322	292	227	118	25
1965-69	6,466	91	283	308	264	216	110	21
% change	-4.6	4.9	-0.6	-4.2	-9.3	-5.1	-7.3	-15.3
Rural								
1960-64	6,961	89	290	327	298	236	126	26
1965-69	6,715	94	290	318	276	227	116	22
% change	-3.5	5.3	0.2	-2.8	-7.5	-3.9	-7.2	-16.0
Urban								
1960-64	5,537	72	242	287	239	167	81	19
1965-69	4,621	74	223	240	179	128	65	15
% change	-16.5	1.9	-7.8	-16.5	-25.2	-23.4	-19.4	-19.0

TABLE 10 (continued)

Education, rural-urban residence, and period	TFR	15-19	20-24	25-29	30-34	35-39	40-44	45-49
SOME SECONDARY								
Rural and urban								
1960-64	3,327	19	137	212	139	110	42	6
1965-69	2,754	16	125	184	110	69	43	4
% change	-17.2	-16.8	-8.3	-13.3	-21.0	-37.6	1.4	-28.6
Rural								
1960-64	5,095	20	177	282	173	229	138	0
1965-69	3,886	18	164	231	133	118	112	0
% change	-23.7	-8.2	-7.4	-17.9	-22.9	-48.5	-18.7	0.0
Urban								
1960-64	3,002	20	123	200	137	80	32	8
1965-69	2,471	16	110	171	109	58	24	5
% change	-17.7	-20.5	-10.8	-14.2	-20.2	-27.9	-24.0	-33.3
SOME COLLEGE								
Rural and urban								
1960-64	2,231	3	48	149	125	89	31	2
1965-69	2,002	1	21	131	150	59	34	5
% change	-10.3	-76.9	-57.5	-11.8	20.0	-33.1	8.8	206.7
Rural ^a								
Urban								
1960-64	2,245	2	31	145	148	84	37	2
1965-69	1,921	1	22	127	150	61	18	6
% change	-14.4	-66.7	-30.9	-12.7	1.9	-26.5	-51.5	143.5

a Figures for college educated women in rural areas are omitted because of insufficient numbers.

disappears by the latter half of the decade. When rural and urban women are disaggregated, however, a somewhat different picture emerges. In rural areas, fertility increased slightly over the decade for those with no education and fell slightly for those with some primary education. The changes were small enough, however, that women with some primary education preserved consistently higher total fertility than women with no education. In urban areas, on the other hand, women with some primary education show consistently lower total fertility than women with no education.

These findings suggest that in rural areas neither of the two educational groups, no education or some primary, practiced birth control to any significant extent over the 1960s, although birth control apparently took hold among women with more than a primary education. In the absence of birth control, those with some primary education, who are generally better off, better nourished, and more fecund than those with no education, have more children than those with no education. In urban areas, on the other hand, fertility fell rapidly over the decade among both those with no education and those with some primary. Evidently both educational groups had recourse to birth control; in the presence of birth control, those with more education are further down the road of fertility decline, as expected. The higher educational groups, some secondary and some college, which also had recourse to birth control and lowered their fertility over the decade, are consistently characterized by the usual inverse relationship between education and fertility in both rural and urban areas.

Table 10 throws light on earlier findings in Table 6. In Table 6 we saw that rural total fertility hardly fell at all during the 1960s, whereas urban total fertility, already about 1.5 children per woman lower than rural total fertility to begin with, fell substantially, by about one child per woman. Table 10 shows that rural fertility rose for those with no education, fell slightly for those with some primary education, and fell substantially for those with some secondary education. Since women with some secondary education were a very small proportion of all rural women, however, the substantial fall in their fertility had only a slight impact on the average fertility of all rural women. In urban areas, on the other hand, fertility fell in all educational strata over the decade, adding up to a very substantial overall urban fertility decline.

Specification of birth rates by education adds to our understanding of rural-urban differences in fertility decline, but it does not explain away those differences in any simple sense. Some threshold effects appear to be operating which led to rapid adoption of birth control in

urban areas in the 1960s but not in rural areas until the 1970s. Education plays an important role in these threshold effects, but that role is complex and mediated by other factors (Retherford, 1979).

Own-children estimates of total and age-specific fertility by women's occupation are shown in Table 11. Rural-urban distinctions are omitted, because most rural persons are included in the farmers and miners category. Fertility differentials and trends by occupation are generally consistent with fertility differentials and trends by education, discussed earlier. Professional, technical, and administrative workers, with the most education, have the lowest fertility, between two and three children per woman. Farmers and miners, with the least education, have the highest fertility, close to seven children per woman. Clerical and sales workers, who include large numbers of street vendors, also have high fertility, about four to five children per woman. The fertility of skilled, unskilled, and service workers is somewhat lower, about three to four children per woman. Farmers and miners show little change in fertility over the decade, whereas the other three occupational groups, primarily urban in character, show substantial fertility decline, ranging from 0.5 to 1.3 children per woman. These differences in fertility trends by occupation are consistent with the earlier finding that rural fertility fell little and urban fertility fell substantially over the decade.

Table 12 shows estimates of total and age-specific fertility by religion and rural-urban residence. Buddhists show the highest fertility, followed by Muslims and Christians, whose average fertility over the decade was about the same. Buddhist fertility declined slightly over the decade, and Muslim fertility changed virtually not at all. Christian fertility increased. When each religious group is separated into rural and urban subgroups, it is found that rural fertility changed little or increased, and urban fertility, starting from considerably lower levels declined substantially. Rural Buddhist fertility declined very slightly, and rural Muslim fertility remained unchanged. Rural Christian fertility anomalously increased by more than one child, to almost eight children. Why this should be so is unclear, but the increase is consistent over all age groups except the last. Urban fertility fell in all three religious groups, but less so for Muslims, for whom it was high to begin with, than for the others. TFR differentials by religion for rural and urban combined narrowed over the decade.

CONCLUSION

Own-children estimates of fertility levels, trends, and differentials

TABLE 11 Own-children estimates of total fertility rates and age-specific birth rates by occupation:
Thailand, 1960–64 and 1965–69
(Rates per thousand)

Occupation and period	TFR	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Professional, technical, and administrative								
1960–64	2,986	10	102	177	148	103	52	5
1965–69	2,442	11	70	162	119	82	43	2
% change	-18.2	11.5	-31.7	-8.9	-19.4	-20.0	-17.3	-66.7
Clerical and sales								
1960–64	5,321	60	221	278	239	171	80	16
1965–69	4,052	56	155	204	179	136	71	10
% change	-23.8	-5.9	-30.2	-26.5	-25.1	-20.6	-11.1	-35.0
Skilled, unskilled, and service								
1960–64	4,673	50	188	240	212	152	73	18
1965–69	3,366	37	129	165	147	121	59	15
% change	-28.0	-26.1	-31.1	-31.4	-30.6	-20.9	-19.6	-19.6
Farmers and miners								
1960–64	6,839	92	289	321	293	230	119	24
1965–69	6,674	96	290	318	281	223	107	20
% change	-2.4	3.2	0.5	-1.1	-4.1	-2.8	-10.1	-14.3

TABLE 12 Own-children estimates of total fertility rates and age-specific birth rates by religion and rural-urban residence: Thailand, 1960–64 and 1965–69
(Rates per thousand)

Religion, rural-urban residence, and period	TFR	15–19	20–24	25–29	30–34	35–39	40–44	45–49
BUDDHIST								
Rural and urban								
1960–64	6,514	84	276	316	283	217	107	20
1965–69	6,213	86	269	300	261	208	100	19
% change	-4.6	2.5	-2.5	-4.9	-7.7	-4.4	-7.0	-6.0
Rural								
1960–64	6,740	90	287	322	291	226	111	20
1965–69	6,579	94	287	315	275	221	105	19
% change	-2.4	3.7	-0.2	-2.4	-5.4	-2.2	-5.1	-4.9
Urban								
1960–64	5,147	54	210	239	231	158	80	18
1965–69	4,108	50	177	222	176	121	60	15
% change	-20.2	-6.9	-15.7	-20.3	-23.7	-23.5	-24.8	-16.3
MUSLIM								
Rural and urban								
1960–64	6,068	132	268	268	247	188	85	26
1965–69	6,005	146	253	273	242	177	91	20
% change	-1.0	10.9	-5.6	1.9	-2.1	-6.0	6.6	-24.0

Rural								
1960-64	6,104	135	269	267	248	191	85	26
1965-69	6,113	154	256	275	247	180	92	19
% change	0.1	13.9	-4.8	3.0	-0.4	-5.8	7.7	-26.8
Urban								
1960-64	5,784	107	256	276	243	165	83	27
1965-69	5,193	93	230	255	203	150	82	26
% change	-10.2	-13.7	-10.1	-7.4	-16.5	-8.9	-2.0	-2.9
CHRISTIAN								
Rural and urban								
1960-64	5,864	64	258	296	224	174	128	29
1965-69	6,196	90	232	353	250	190	115	9
% change	5.7	40.1	-9.8	19.1	12.1	9.3	-10.4	-70.2
Rural								
1960-64	6,463	80	290	309	227	194	154	39
1965-69	7,695	126	300	411	296	233	162	10
% change	19.1	57.1	3.5	33.2	30.5	20.2	5.7	-74.6
Urban								
1960-64	5,151	45	207	291	230	156	93	8
1965-69	4,141	37	155	261	186	128	54	7
% change	-19.6	-18.3	-25.2	-10.2	-18.8	-18.2	-41.7	-16.0

over the decade of the 1960s, based on the 1970 Census, appear broadly consistent with other published estimates. Total fertility for the whole country declined slightly from about 6.5 to 6.2 children per woman between 1960-64 and 1965-69. All four regions showed total fertility rates between six and seven children per woman for 1960-64. By 1965-69 total fertility had fallen by somewhat over half a child in the North and Central regions, remained almost unchanged in the South, and increased slightly in the Northeast.

Levels and trends differ greatly between rural and urban areas. For the country as a whole, rural total fertility was close to seven children per woman in 1960-64 and declined very slightly to about 6.5 by 1965-69. Urban total fertility, which was about 1.5 children lower than rural total fertility to begin with in 1960-64, fell substantially by about one child, from approximately five to four children. Rural total fertility fell by about one-half child in the North and Central regions and rose slightly in the Northeast and South. Urban fertility fell substantially in all four regions, from about five to four children in the North and Central regions, and from about six to five children in the Northeast and South.

Nuptiality patterns changed little over the decade. Age at marriage was already high, about 22 years for women, and showed little tendency to increase further. Therefore, trends in marital fertility closely parallel trends in overall fertility. Decomposition of the decline in the total fertility rate for the whole country between 1960-64 and 1965-69 allocates almost all of the change to marital fertility decline and almost nothing to changes in age-specific proportions married. Exceptions to this allocation pattern occur for geographic subdivisions where fertility change was small; in such cases, larger relative contributions from changes in proportions married can and do occur.

Among rural women, those with no education slightly raised their fertility between 1960-64 and 1965-69, perhaps because of improved nutrition and fecundity, and those with primary education slightly reduced their fertility. Rural women with more than a primary education showed a substantial fertility decline, but they were too small a proportion of all rural women to have much impact on overall rural fertility. Among urban women, fertility declined substantially in all educational strata.

A complementary pattern emerged in fertility estimates by occupation, which showed slight fertility decline among farmers and miners, with total fertility close to seven children per woman, and large fertility declines in the urban occupational groups. The lowest fertility

levels were found among professional, technical, and administrative workers, whose total fertility was between two and three children per woman.

Fertility differentials by religion show Buddhists with the highest fertility, followed by Muslims and Christians slightly lower at about the same level. Buddhist fertility declined slightly over the decade, Muslim fertility remained unchanged, and Christian fertility increased. In rural areas, Buddhist fertility fell slightly, Muslim fertility stayed constant, and Christian fertility, for some unexplained reason, rose substantially, to almost eight children. In urban areas, fertility fell in all three religious groups, but more for Buddhists and Christians than for Muslims.

Overall, it appears that fertility transition in Thailand was well under way in urban areas in the 1960s, with sizable fertility declines occurring in all major socioeconomic groups. But by the latter half of the decade fertility control was just beginning in rural areas, most noticeably in the North and Central regions. Rural women with more than primary education reduced their fertility over the decade, but the mass of rural women did not.

APPENDIX TABLES

TABLE A1 Abridged life table for males in Thailand: Survey of Population Change, 1964–65

Age group	nq_a	l_a	$n'd_a$	nL_a	T_a	e_a
0	.09539	100,000	9,539	93,323	5,593,806	55.9
1–4	.04109	90,461	3,717	339,452	5,500,483	60.8
5–9	.01898	86,744	1,646	429,765	5,161,031	59.5
10–14	.01168	85,098	994	422,979	4,731,266	55.6
15–19	.01238	84,104	1,041	418,072	4,308,287	51.2
20–24	.01731	83,063	1,438	412,034	3,890,215	46.8
25–29	.02021	81,625	1,650	404,412	3,478,181	42.6
30–34	.02339	79,975	1,871	395,560	3,073,769	38.4
35–39	.03095	78,104	2,417	384,873	2,678,209	34.3
40–44	.04815	75,687	3,644	369,949	2,293,336	30.3
45–49	.04791	72,043	3,452	352,245	1,923,387	26.7
50–54	.06478	68,591	4,443	332,560	1,571,142	22.9
55–59	.07526	64,148	4,828	309,487	1,238,582	19.3
60–64	.10807	59,320	6,411	281,555	929,095	15.7
65–69	.16143	52,909	8,541	244,728	647,540	12.2
70–74	.27643	44,368	12,265	191,941	402,812	9.1
75 and over	1.00000	32,103	32,103	210,871	210,871	6.6

NOTE: Revised by National Statistical Office, 26 January 1978.

TABLE A2 Abridged life table for females in Thailand: Survey of Population Change, 1964–65

Age group	nq_a	l_a	nd_a	nL_a	T_a	e_a
0	.07534	100,000	7,534	94,726	6,203,892	62.0
1–4	.03975	92,466	3,676	347,448	6,109,166	66.1
5–9	.01490	88,790	1,323	441,000	5,761,718	64.9
10–14	.01337	87,467	1,169	434,573	5,320,718	60.8
15–19	.00931	86,298	803	429,412	4,886,145	56.6
20–24	.01991	85,495	1,702	423,631	4,456,733	52.1
25–29	.01805	83,792	1,512	415,385	4,033,102	48.1
30–34	.02163	82,280	1,780	407,323	3,617,717	44.0
35–39	.01716	80,500	1,381	399,133	3,210,394	39.9
40–44	.02871	79,119	2,272	390,378	2,811,261	35.5
45–49	.03245	76,847	2,494	378,452	2,420,883	31.5
50–54	.03109	74,353	2,312	366,403	2,042,431	27.5
55–59	.05813	72,041	4,188	350,460	1,676,028	23.3
60–64	.07842	67,853	5,321	326,843	1,325,568	19.5
65–69	.12246	62,532	7,658	294,652	998,725	16.0
70–74	.23893	54,874	13,111	242,706	704,073	12.8
75 and over	1.00000	41,763	41,763	461,367	461,367	11.0

NOTE: Revised by National Statistical Office, 2 October 1974.

TABLE A3 Adjustment factors for underenumeration and age misreporting in the Thailand 1970 Census

Age group ^a	Arnold and Phananimamai	Fulton
0--4	1.113	1.096
5--9	1.015	0.986
15--19	1.017	1.017
20--24	1.187	1.086
25--29	1.082	1.041
30--34	0.933	1.070
35--39	0.968	1.039
40--44	1.032	1.070
45--49	1.121	1.063
50--54	1.048	1.060
55--59	1.057	1.080

a Adjustment factors for ages 0--4 and 5--9 pertain to children of both sexes. Adjustment factors for subsequent age groups pertain only to women.

SOURCE: Arnold and Phananimamai (1975) and Fulton (1975).

TABLE A4 Own-children estimates of total fertility rates and age-specific birth rates by rural-urban residence: Thailand and regions, 1960–64 and 1965–69
(Rates per thousand)

Region, rural-urban residence, and period	TFR	15–19	20–24	25–29	30–34	35–39	40–44	45–49
THAILAND								
Rural								
1960–64	6,700	92	286	319	288	224	110	21
1965–69	6,545	96	284	312	273	218	105	19
% change	-2.3	4.1	-0.4	-2.1	-5.2	-2.4	-4.6	-7.2
Urban								
1960–64	5,167	55	211	279	232	158	80	18
1965–69	4,146	51	178	224	177	122	61	15
% change	-19.7	-7.2	-15.6	-19.6	-23.4	-22.8	-24.2	-15.1
NORTH								
Rural								
1960–64	6,412	98	293	307	271	203	93	17
1965–69	5,793	94	268	275	239	188	79	15
% change	-9.7	-4.1	-8.5	-10.3	-11.8	-7.4	-15.3	-11.1
Urban								
1960–64	5,263	62	238	284	241	150	64	14
1965–69	4,201	64	199	222	168	126	51	10
% change	-20.2	2.6	-16.2	-21.7	-30.4	-15.4	-19.8	-32.9
NORTHEAST								
Rural								
1960–64	6,968	87	287	332	302	236	122	27
1965–69	7,235	101	309	340	305	247	121	24
% change	3.8	16.0	7.4	2.4	0.9	4.9	-0.7	-11.2

TABLE A4 (continued)

Region, rural-urban residence, and period	TFR	15-19	20-24	25-29	30-34	35-39	40-44	45-49
NORTHEAST (continued)								
Urban								
1960-64	6,036	58	238	313	278	204	98	18
1965-69	5,439	64	231	284	230	164	88	25
% change	-9.9	10.8	-2.8	-9.1	-17.1	-19.7	-9.3	35.7
CENTRAL								
Rural								
1960-64	6,651	90	283	315	289	227	109	17
1965-69	6,130	79	261	300	255	208	105	17
% change	-7.8	-12.4	-7.7	-4.6	-11.7	-8.4	-3.6	0.6
Urban								
1960-64	4,968	52	202	270	222	150	81	18
1965-69	3,881	46	163	210	169	114	59	15
% change	-21.9	-11.2	-19.0	-22.1	-23.8	-24.0	-27.3	-14.9
SOUTH								
Rural								
1960-64	6,611	106	272	310	282	222	112	18
1965-69	6,677	121	276	315	280	215	110	18
% change	1.0	14.2	1.4	1.5	-0.6	-3.0	-1.8	-1.1
Urban								
1960-64	5,783	76	231	308	254	187	81	20
1965-69	4,904	70	217	272	206	140	64	11
% change	-15.2	-8.3	-6.0	-11.5	-18.6	-25.0	-21.2	-44.1

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