CONTRIBUTIONS TO NEPALESE STUDIES
CNAS, TRIBHUVAN UNIVERSITY

Vol. 12, No. 3
(August 1985)

Fertility and its Proximate Determinants in a Tamang Village of North Central Nepal

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Introduction

The analysis of fertility is critical to any discussion of a community's environmental adaptation. Fertility and mortality schedules together determine the major characteristics of a population closed to migration—such as age distribution and growth rate—that have a direct bearing on household economy and the balance between community size and available resources. In addition, community level fertility data is lacking in Nepal and, although the situation is improving, it is still necessary to accumulate studies from a range of districts (cf. Macfarlane 1978).

Although the value of fertility data is not in doubt, the small size of the populations that anthropologists typically study raises questions about how far analysis can go. One major concern is unique to small populations: that of random fluctuations in vital rates or other population characteristics through time. While minor disruptions in more general trends can be masked by the sheer weight of numbers in large groups, chance events will have a more visible impact in smaller groups. If the special explanations for anomalous rates or distributions aren't known, the analysis of data can be seriously affected. Other problems can be more easily dealt with. For example, defining the population and finding methods appropriate to the data are concerns peculiar to small populations (Carroll 1975:3; Feeney 1975: 21). Otherwise, demographic analysis presents much the same set of difficulties for any size unit. As Feeney (1975: 44-45) cautions:

> In practice, all data are in error. The issue is never whether or not error is present, but what the magnitude and the direction of the error are and the significance of this magnitude and direction for any particular analysis.

Thus, there is no *a priori* reason to believe that the demographic analysis of anthropological populations is without value. A growing body of technical literature (Howell 1974, 1976; Weiss 1973, 1975) suggests just the opposite and substantive studies have been carried out in populations of very small size: a Thai village of 1,718 people (Lauro 1979), a Malaysian group of 733 people (Fix 1977), and a !Kung population of 569 (Howell 1979).

The following is a discussion of fertility and its determinants within a single village population in Nepal.[1] Recent demographic analyses of communities (for example: Goldstein 1976; Ross 1981; Levine 1982; Dahal 1983) have considered the important institutional determinants of fertility within various regions of Nepal. In this paper I take a formal demographic look at data from a Tamang village in Northern Dhading District. The application of models indicates that procedures developed for larger population aggregates can be used at the community level while important suggestions for future research arise from the discussion. My procedure is to establish the lack of trends in fertility within this population by examining the fertility of women over age 45. This is followed by an analysis of fertility information from all women and an examination of the proximate determinants.

Timling: context and data

Data for this analysis come from the marriage and fertility histories of 150 Tamang women in the village of Timling. In addition, I have included the experiences of two sterile women, one of whom was never married and the other who was married but left the village prior to my residence. Situated on the upper Ankhu Khola at an altitude ranging from about 6500 to 7000 feet (see Fig. 1), Timling is inhabited by 132 households of western Tamang pursuing an agro-pastoral adaptation typical of the middle hills (Alirol 1976).[2] The population of 639 includes 325 females and 314 males distributed on an age pyramid that indicates an intermediate growth rate similar to the Gurung of Thak (Macfarlane 1976: 282; Fricke 1984: 68-72). While the population for the whole of Nepal is characterized by a distribution with 52% younger than age 20 (Banister and Thapa 1981: 22), the Tamang of Timling have only 43.8% below this age.[3] Thus analysis of this community's fertility is a useful illustration of an atypical pattern within the Nepali context.

The methods of field collection of fertility data included interviews of all ever-married or ever-pregnant women within the village. Information on the timing of all birth events was gathered in addition to data for pregnancies that resulted in miscarriages and stillbirths. An ununusual feature of this data for an illiterate population is the high reliability of event timing in Timling. The Tamang of this area actively use the Tibetan *lho* calendrical system which involves a 12 year cycle. Each year in the cycle and individuals born in that year

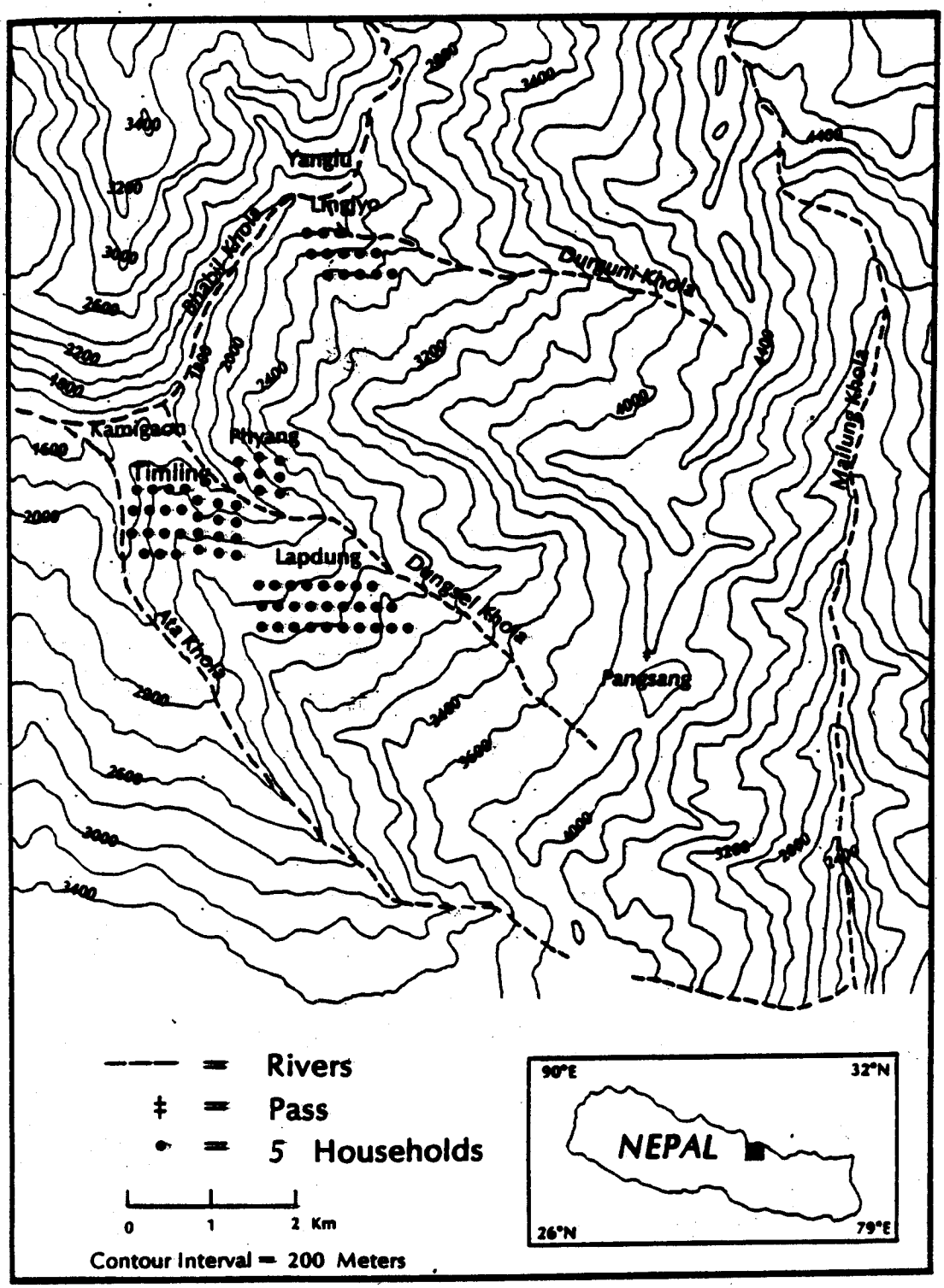

Figure 1 Map of Timling and its daughter villages. The traditional territory is bounded by the Ata and Mailung Kholas and the ridgeline above the Bhabil Khola.

are designated by a particular animal and virtually all Tamang in Timling knew their animal year of birth and the number of cycles they have lived through. In addition, they often knew this information for a wide circle of relatives and friends. Age is a popular topic of conversation throughout the village and age distinctions are built into kinship terminology. The quality of data for event timing is further supported by independent cross checks of reported ages on pregnancy history forms with a village census conducted at an earlier stage of fieldwork.[4]

Finally, sexuality is an easy topic of conversation in Timling and no woman was embarassed to discuss these events with a male researcher. Even obvious pre-marital pregnancies were openly discussed.

The experience of women of complete fertility

If rates are not drastically changing in Timling, then the experience of women who have completed their fertility is the best indicator of the present and future fertility performance for all women in the village. The 56 women in the Tamang sample who have completed their fertility represent an age span of 31 years from age 46 to age 76 at the time of fieldwork. At one extreme, this means that one 5 year cohort is still technically in the fecund period since a small number of births do occur between 45 and 50; at the other extreme is a group of women who have been past the fecund period for at least 25 years. Within this kind of range it would be assumed that the reported experience of older cohorts suffers from the effects of memory bias.

Table 1: Parity distributions for 5 year cohorts of women 45 years old and older.

		Number of births												
Age	(N)	0	1	2	3	4	5	6	7	8	9	10	11	$\bar{X}$
45-49	(13)	0	1	2	1	1	2	2	2	1	1	0	0	5.00
50-54	(11)	0	0	0	1	2	3	2	2	0	1	0	0	5.55
55-59	(7)	0	1	3	0	1	0	1	0	1	0	0	0	3.57
60-64	(9)	0	0	1	1	2	1	0	2	0	1	0	1	5.78
65-69	(8)	0	0	1	0	0	4	2	0	1	0	0	0	5.25
70+	(8)	0	0	0	1	2	0	1	2	1	0	1	0	6.13
Total	(56)	0	2	7	4	8	10	8	8	4	3	1	1	5.25

Source: Timling Marriage and Fertility History.

Table 1 presents parity distributions for these 5 year cohorts. Although this breakdown creates extremely small groups, it provides a manageable way to examine the completed fertility record for trends in the total number of births per woman.

We can see in this table that there is no evident trend in total births. In fact, the largest average number of births has been reported by the oldest cohort--evidence to contravene suggested memory bias. The cohort experiencing the low average of 3.57 births per woman is anomalous in relation to the others, but there is no way to make the case that inconstant memory is the cause of this aberration. Other than this, the total number of births to women of completed fertility has remained fairly constant over the 30+ years of experience represented

Table 2: Age-specific fertility rates for women 45 years old and older.

	Parity												At	
Age	1	2	3	4	5	6	7	8	9	10	11	Total	Risk	ASF
15-19	7	2	0	0	0	0	0	0	0	0	0	9	280	.032
20-24	34	15	4	0	0	0	0	0	0	0	0	53	280	.189
25-29	13	27	19	8	1	1	0	0	0	0	0	69	280	.246
30-34	2	8	15	17	10	2	1	0	0	0	0	55	280	.196
35-39	0	1	8	13	16	13	5	2	1	0	0	59	280	.211
40-44	0	1	1	5	8	8	8	5	3	1	0	40	280	.143
45-49	0	0	0	0	0	1	3	2	1	1	1	9	274	.033
Total	56	54	47	43	35	25	17	9	5	2	1			

Total women..... 56

Total births..... 294

Mean parity..... 5.25

Source: Timling Marriage and Fertility History.

Table 2 presents the age-specific rates for these 56 women as if they represented a single cohort's experience. The rationale for this aggregation follows Howell (1979). Information is given for age of mother at birth parity x in addition to age-specific rates. The slightly reduced number of years in the 45-49 year group accounts for the small number of woman-years remaining before all women move out of the theoretical fecund period.

Considering the small sample size, we are presented with a remarkably regular picture of fertility in Timling. The low rates at the beginning of the fecund period followed by swift ascent and slow decline in age-specific fertility is consistent with the record for third world and natural fertility populations in general. The unusual pattern of higher age-specific rates in the 35-39 age group than the 30-34 age group is minor and easily the result of random events in a population of this size.

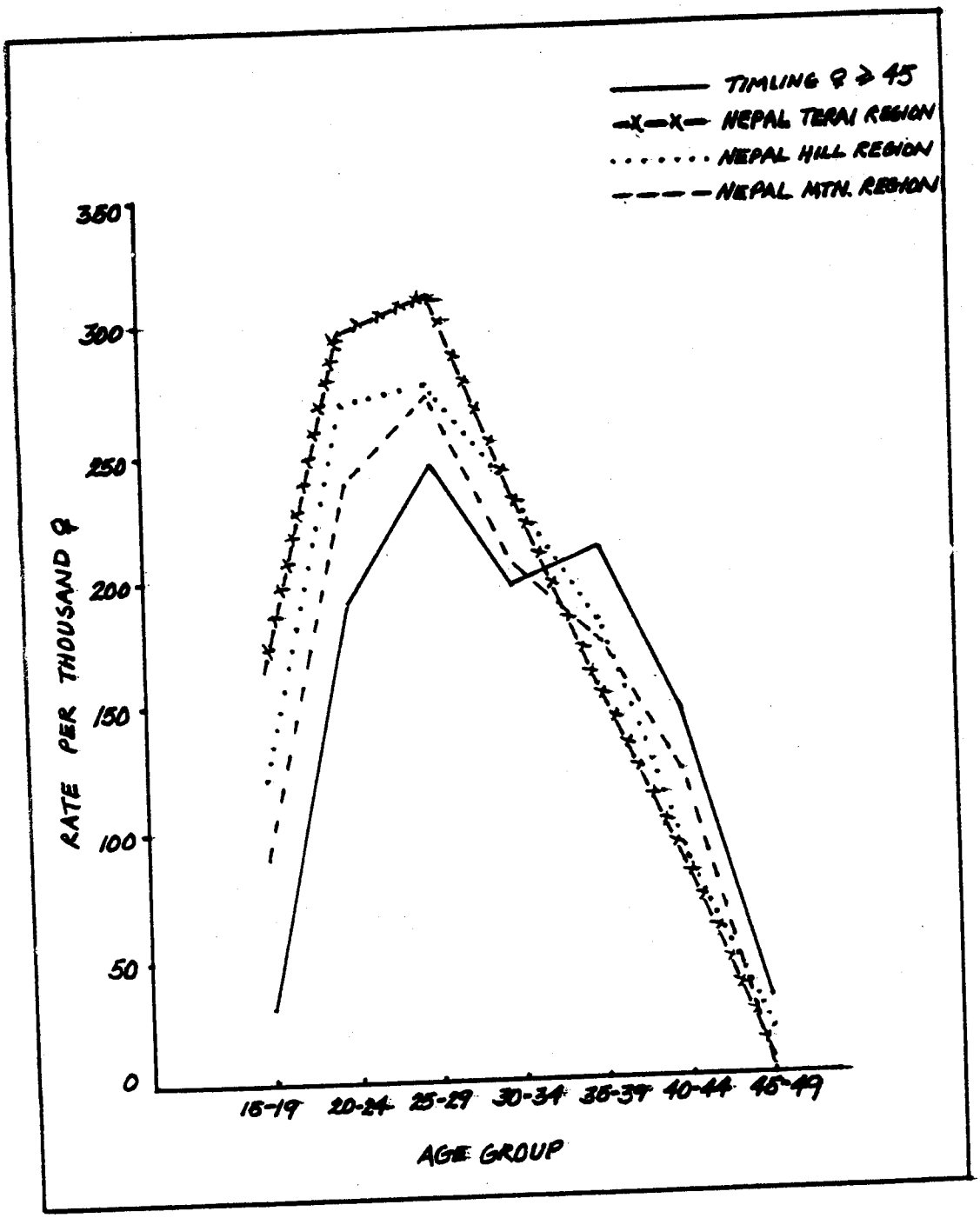

Figure 2: Age-specific fertility for Timling and three regions of Nepal compared.

Figure 2 graphs these rates and compares them to the various regional rates within Nepal (Banister and Thapa 1981). Of particular interest is the close correspondance between Timling's rates and those of the mountain region in comparison with those of other regions in Nepal. It is worth noting here that Timling's cultural and economic history aligns it more closely with the mountain than with hill regions. An especially interesting contrast exists between peak age-specific rates for the Terai and Timling.

Another way to look at this information is to compare the average fertility experience of Timling women at a given age with the experience of other Nepali women. Table 3 shows who many children a woman can be expected to bear on the average by the end of the age period. The similarity between Timling and the mountain region is again borne out in these figures. The final column presents a hypothetical cumulative experience for the average woman in Timling if the age-specific rates for the earliest five years were to match the mountain region rates. The resulting closer correspondance suggests that Timling's fertility is dampened relative to that of the mountain region at a time when age-specific rates are more susceptible to the affect of marriage rates. This will be returned to later.

Table 3: Cumulative fertility for Timling and selected Nepali populations.

Age	Timling[a]	Terai[b]	Hills[b]	Mtns.[b]	Timling*
15-19	.160	.815	.600	.450	.450
20-24	1.105	2.290	1.985	1.640	1.395
25-29	2.335	3.840	3.380	3.005	2.625
30-34	3.315	5.000	4.605	4.020	3.605
35-39	4.370	5.765	5.475	4.870	4.660
40-44	5.085	6.180	5.885	5.475	5.390
45-49	5.245	6.220	5.975	5.625	5.550

Sources: [a]Timling Marriage and Fertility History.
[b]Banister and Thapa 1981.

*Assuming the same ASFR in the 15-19 group as in the mountain region.

Table 4: Average age at first and last birth and length of reproductive span for women 45+.

Age	1st Birth X	1st Birth SD	Last Birth X	Last Birth SD	Reproduc. Span X	Reproduc. Span SD
45-49	22.85	2.97	38.69	7.16	15.85	7.97
50-54	22.91	3.83	40.00	4.29	17.09	2.51
55-59	24.86	1.78	36.71	6.08	11.86	10.24
60-64	21.78	2.33	38.78	7.23	17.00	7.60
65-69	23.25	2.82	40.38	5.29	17.13	6.56
70+	21.63	3.38	40.88	4.16	19.25	4.03
Total	22.82	2.92	39.27	5.79	16.45	6.82

Source: Timling Marriage and Fertility History.

Finally Table 4 presents average ages for the first and last births and average reproductive spans for the women of Timling who have completed their fertility experience. Once again, no obvious trend may be inferred although age at first birth is slightly later in the youngest cohort compared to the oldest.

The main point from these 56 reproductive histories is that there is no trend toward either higher or lower fertility over the 30+ years encompassed in these women's reproductive careers. The average number of births per woman is 5.25, a low number for a natural fertility population but one which invites comparison with the 5.63 births attributed to the average woman in the mountain region in the Nepal Fertility Survey. Age-specific fertility rates for these women also follow the expected pattern although their magnitude tends to be lower than those of other natural fertility populations. Most of the measures of fertility for women of completed fertility show a strong consistency that argues well for the quality of the Timling data.

Fertility performance over time: measures of period fertility

An alternative way of picturing Tamang fertility in Timling is to use reproductive histories to look at women's experience during different periods. This allows us to analyze fertility during the particular years or groups of years while forcing us to confront data reliability in other ways.

By checking the TFR for the five-year periods for which women occupy every age group, it is possible to gain a longer perspective on the data. The TFR for the 1957-61 period, an average of 6.35, effectively shatters the notion of a long trend toward increasing fertility. For the next five-year period, an average TFR of 5.05 suggests, if anything, a dominant pattern of a fertility peak at the end of decades with slightly lower fertility at the beginning.

Goldman, et. al. (1979) suggest that Nepal Fertility Survey data accuracy can be checked through the assumption of unchanging cumulative fertility in different cohorts. By establishing rates for the most recent period and comparing those of the other periods, the extent of omission in particular years can be determined. One major and reasonable assumption here is that events in the most recent period are more accurately reported because they are the least likely to be affected by loss of memory. This applies to errors of omission, which lower the TFR, as well as those of displacement, which can shift age-specific rates to higher and lower numbers in different age categories.

Table 5: Timling age-specific fertility rates for all women by period.

	Period							
Age	42-46	47-51	52-56	57-61	62-66	67-71	72-76	77-81
15-19	.000	.027	.014	.051	.022	.025	.022	.037
20-24	.303	.071	.164	.282	.172	.220	.138	.207
25-29	.212	.182	.286	.274	.155	.313	.330	.263
30-34	.211	.212	.182	.214	.178	.197	.232	.275
35-39	.412	.184	.173	.242	.258	.205	.197	.273
40-44		.176	.132	.154	.030	.143	.137	.141
45-49			.059	.053	.038	.030	.000	.027
TFR			5.05	6.35	4.27	5.67	5.28	6.12

Source: Timling Marriage and Fertility History.

Fertility measures for Timling have already been shown to fluctuate through time. A closer look at period age-specific rates should allow us to say more about how these changes work. Table 5 presents age-specific and total fertility rates for five-year periods in the past by age-group. Columns in this table present period rates while diagonal cells give cohort experience. If adjacent cells are compared horizontally, the experiences of different cohorts can be compared. Thus the same group of women who have an ASFR of .273 in 1977-81 when they were between 35-39 experienced an ASFR of .232 when they were five years younger.

Depending on our opening assumptions, these data permit a number of interpretations. While Goldman, et. al.'s assumption that the most current period will most accurately reflect actual fertility is reasonable, especially for the Nepal Fertility Survey data, it would force a strained interpretation of the Timling material. Following this assumption, one would expect rates to decline in the earlier years through the effects of omission. Since there is no such decline, we would have to conclude that the TFR for the 1957-61 period was even higher than the most recent period than it already is. Further, the more recent

periods would not be adjusted upward as much as the earlier ones, increasing the fluctuation in TFR's. The result would be an even more jagged picture than presently suggested by the data. Both the lack of clear trend together with a lengthy data collection period argues against strong memory bias effects.

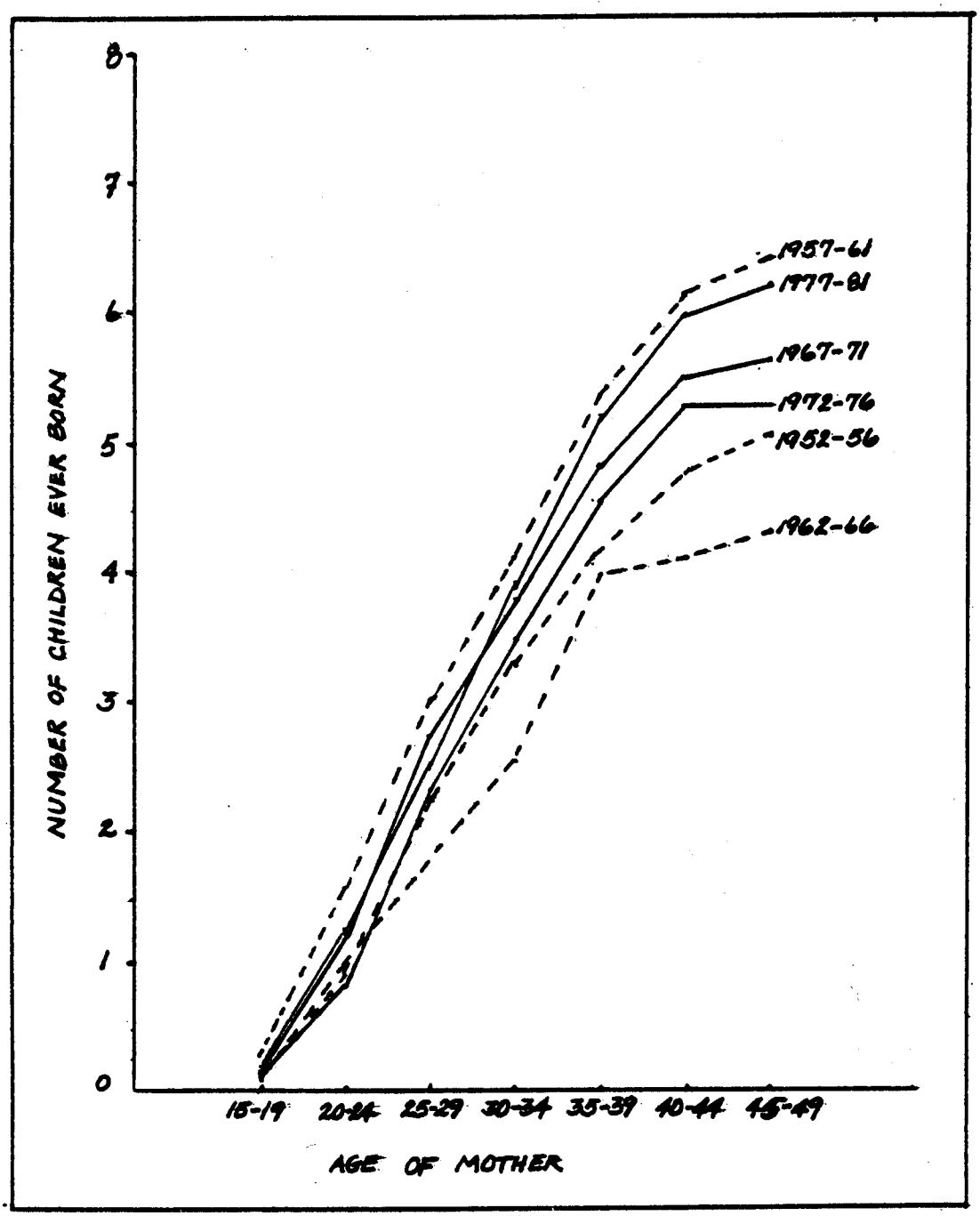

Figure 3: Cumulative fertility for 5 year periods--synthetic cohorts.

Figure 3 gives a graphic idea of the trends in total fertility rates throughout the five-year periods for which the data exists in all age groups. It clearly demonstrates the lack of patterned change in rates over five-year periods while also showing the general consistency in the timing of births over these same periods. Once again, the 1962-66 period is the most depressed in relation to the others. Although the shape of the graph for this period would be consistent with event displacement to the 35-39 year age group for reported births, the lack of any evidence for such displacement in other years coupled with a method of aging and placing events that should be largely free of age heaping point to some more specific cause for the pattern.

The 1962-66 column, like all others with a complete set of age groups represented, gives the experience of seven five-year cohorts of women. By comparing these rates with those on either side we are able to compare the experience of different cohorts as they pass through the same ages. Such a comparison reinforces the attempt to lay the cause of dampened fertility on factors specific to this period. Four of the seven cohorts experienced markedly reduced fertility for their age class during this period. If the age-specific fertility rates of women of completed fertility are taken as a yardstick, the rate for the 20-24 year old group during 1962-66 is .017 below the average; for the 25-29 year old group 0.91 lower; for the 30-34 year old group .018 lower; and for the 40-44 year old group .113 lower than the average. This would mean a total fertility of 1.20 children fewer than the average. That the reduced fertility during this period was not a function of lower fecundity levels is suggested by a return to near average rates for their age groups during the next period.

Returning to Table 5, no further trends are revealed. Each cohort experiences roughly similar rates at a particular age range, with some unpatterned fluctuation. The irregular patterns for period ASFR in more recent years are related to the smaller number of woman-years in the past. Where a total of 560 women-years is represented in the 1977-81 column, the 1942-46 period includes only 182 woman-years. Not surprisingly, the earliest years on the record are the most open to the effects of random variation.

Figure 4 presents the mean age of childbearing in 1977-81, the most recent five-year period, along with the mean ages of childbearing for five-year cohorts of women between 25-49 years old at the time of the survey. The averages for age groups with incomplete fertility careers are based on the completed ranges up to the time of the survey and thereafter on synthetic rates from the last five-year period. For this reason, the youngest two cohorts are omitted since their schedules are most heavily influenced by the period rates, resulting in a mean age of childbearing equal to that of the 1977-81 period. If the timing of events were displaced toward the date of the survey, the mean age of childbearing for the older cohorts should be higher than the average for the last period. Since this is not the case and the variation in mean age is not large, the data once again suggest a high degree of consistency and little change through time.

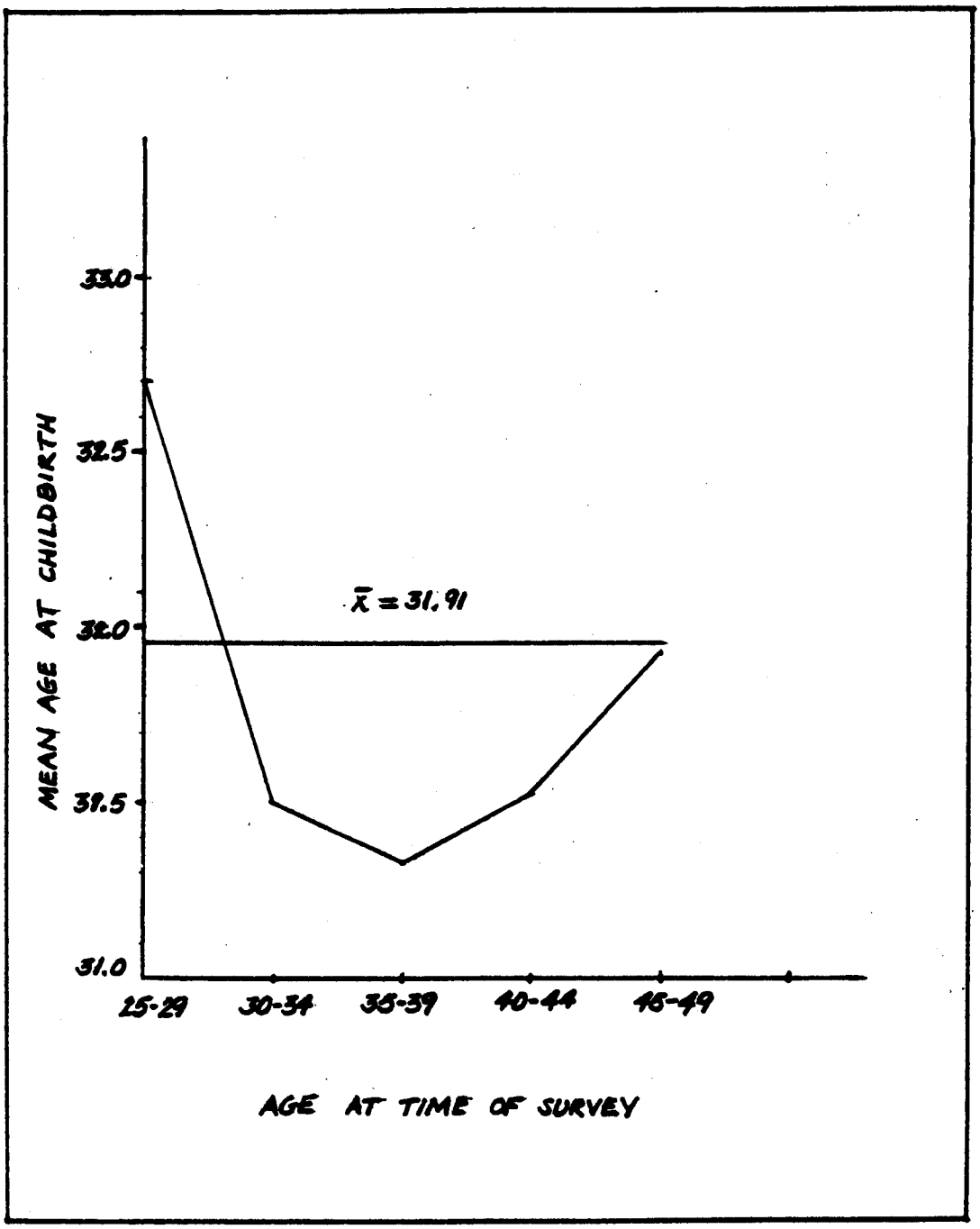

Figure 4: Mean age at childbearing for most recent 5 year period and for 5 year cohorts. Most recent cohorts based on synthetic rates (see text).

The crucial issue of changing rates seems to be answered with little evidence of any trend. Without this evidence, the small fluctuations that do occur can be explained as random fluctuations of the kind that we would expect to be most apparent in small populations such as Timling's. Thus the best indicator of the underlying fertility pattern in the village is the pooled experience of all women. Table 6 presents this information for 152 Tamang women who have ever been exposed to the risk of childbirth.

Table 6: Age-specific fertility rates for 152 Tamang women.

	Parity																At	
Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	Risk	ASFR
15-19	18	4	0	0	0	0	0	0	0	0	0	0	0	0	0	22	751	.029
20-24	78	43	10	3	1	1	1	1	0	0	0	0	0	0	0	138	702	.197
25-29	33	54	42	19	5	2	1	0	1	1	1	1	0	0	0	160	615	.260
30-34	5	15	24	28	23	8	4	2	0	0	0	0	1	0	0	110	530	.208
35-39	2	3	15	17	21	19	8	5	2	1	0	0	0	1	1	95	439	.216
40-44	0	1	2	6	9	9	9	5	5	1	0	0	0	0	0	47	330	.142
45-49	0	0	0	0	0	1	3	2	1	1	1	0	0	0	0	9	269	.033

Total woman-years.....3636

Total births..... 581

TFR..... 5.43

Source: Timling Marriage and Fertility History.

Finally, we arrive at a picture of fertility that will allow us to make generalizations about the effects of childbearing on other features of Timling's human ecology and to make comparisons with other populations. Timling's demographic history is characterized in this most recent period by a high degree of consistency across time despite expected random fluctuations in small populations. The average woman gives birth to just over five children in her reproductive career and the pattern of childbearing follows the general experience of natural fertility populations. By the time the average woman reaches age 25, she has borne at least one child and continues to have them at a high rate for the next 20 years. The 35 year reproductive period between 15-49 results in an average of 5.43 births per woman, but the years of highest fertility are between 20-39 when 4.36 of these children are born.

The causes for this particular pattern remain to be determined. An especially important feature is the low number of births that occur in the absence of contraception. The next section will deal with this problem in terms of Davis and Blake's framework (1956) and more recent statements about fertility determinants (Leridon 1977; Bongaarts 1975, 1978).

Proximate determinants of fertility in Timling

Faced with a total fertility rate of slightly over 5 children, a figure on the lower end of the range for natural fertility populations (cf. Leridon 1977: 106-110), our next task is to explain why fertility is expressed at this level. The crude birth rate for 1981 in Timling was 41 births per thousand people, while for the 1976-81 period it was about 37 (assuming a base population of 600 for every year of the period and that those births on the reproductive histories were the only ones to occur). These figures again suggest that Timling's fertility falls at the lowest end of the range for high fertility levels. Bongaarts (1975: 290-91) places the range of highest observed crude birth rates at from 40 to 50 per thousand and writes that populations at the upper end of this range have an almost complete absence of contraception and induced abortion while crude birth rates closer to 40 usually imply some form of birth control. Yet the people of Timling reported no use of birth control. The question we must ask ourselves is: why is the result of natural fertility so low among the Tamang ?

The biological limits of the reproductive span are usually taken to be the years from 15 to 49. But as Leridon notes:

> ...the total length of the reproductive life could be longer than 35 years, if we consider the interval between puberty and menopause; actually, however,...the fecund period is on the average 27-28 years, and in addition both the beginning and the end of fertility seem to be progressive processes (1977: 10-11).

The highest level of natural fertility within that period is reported for Hutterite women married between 1921-30. These women bore an average of 9.5 children each (Leridon 1977: 107). Even in Timling we have examples of women who have given birth from 10 to 15 times. As Bongaarts (1975: 289) writes, if one were to take the minimum interval between births as 9 months, a woman would theoretically bear as many as 40 births in her 30 reproductive years.

Clearly, the expression of fertility must be influenced by factors outside the simple 9 month gestation requirement. Given an average reproductive span of 30 years and a total of 5.43 births to the average Tamang woman, only 48.2 months or 13.4% of the reproductive period is spent in the pregnant state (cf. Bongaarts 1975: 294-295, where the states that women in typical natural fertility populations are pregnant for about 16.6% of their reproductive years).

The factors that reduce the hypothetical limit to a woman's fertility are both physiological and behavioural. First, certain biological requirements and probabilities limit the number of children a woman can actually bear. Interacting with these are a number of behavioural components that can either maximize or further reduce fertility.

For a complete discussion of the measures used to describe these variables the reader should refer to the original article by Bongaarts (see also Bongaarts 1975, 1976). The following discussion is confined to an application of the indices and measures to the Tamang and I will be able to make use of a much simpler version of the model. For example, Bongaarts has created measures to get at the effects of marriage, contraception, abortion, and lactational infecundability; since the Tamang report no use of contraception or abortion in Timling, we can simply ignore these variables.

The most important variable affecting fertility in a non-contracepting population is exposure to the risk of pregnancy. In practice, this is most easily determined by looking at the number of women married at each age of the reproductive period. Thus exposure is a function of (a) age at marriage, (b) age at cohabitation, and (c) separation due to divorce or death of husband. Bongaarts' measures subsume all of these affects into one index which he calls the index of proportion married (C_m). This is calculated as the weighted mean of the age-specific proportions married. Weights are given by the age-specific marital fertility rates (Bongaarts 1978: 109).

We have seen that fecundability changes with a woman's age. It follows that non-exposure to the risk of pregnancy will have a different impact on a woman's final fertility experience depending on the ages at which she is not exposed. The index of proportion married simply takes account of this differential and gives us the proportional reduction in fertility due to exposure factors by themselves.

Some features of Tamang society and culture must cause us to modify the meaning of this index. At one end, the index assumes that marriage marks the beginning of sexual intercourse while a related assumption is that a woman does not engage in sexual relations in the absence of her spouse. These assumptions break down somewhat when applied to the Tamang. First, premarital sex, while not actively encouraged by Tamang parents, is not severely disapproved of and is even expected. Boys and girls have frequent opportunities to get together during all-night shaman rituals or during dances near the Gompo. Here, a boy and girl will silently drop out of the circle of dancers to slip into the trees surrounding the Gompo and stone mane. Their friends will continue to dance and sing and make amused comments about their whereabouts for the half hour or so they are gone.

Likewise, spouses are frequently separated at other times during their married lives and I am aware of at least two cases in which children were conceived when the women's husbands were at least two or three-week treks from Timling. In one of these cases, the husband returned to find that he had a new son, an event that he quietly and happily accepted. The other case involved a more complicated settlement, but the problems did not revolve around the woman's infidelity.

Nevertheless, while premarital intercourse is condoned, pregnancy nearly always leads to a swift marriage with the child's father or some other agreeable male. The Tamang place great stress on knowing a person's clan membership and this can be determined only through the father. Very strong pressure is brought on a pregnant unmarried girl to name the father of a child. Subsequent pressure on the father almost guarantees marriage or support.

I have used the experience of all Tamang women to calculate the Bongaarts measures since it includes the greatest range of data and should be the best reflection of the typical village pattern. Table 7

Table 7: Age-specific fertility, age-specific marital fertility and woman-years of exposure for all Tamang women.

	Age Group						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
ASFR	.029	.197	.260	.208	.216	.142	.033
ASMFR	.144	.301	.295	.222	.236	.163	.046
Woman-years							
Total	751	702	615	530	439	330	269
Exposed	153	458	542	496	402	288	196
Exposed/Total	.204	.652	.881	.936	.916	.873	.729

Source: Timling Marriage and Fertility History.

provides a summary of the relevant fertility measures by age for all woman years in the reproductive period and for exposed woman years only. Other information for calculating the index of proportion married is also given. We can see from the figures for age-specific fertility and age-specific marital fertility how greatly exposure can affect a woman's childbearing. These figures also indicate that marriage behaviour in Timling has the effect of moving the peak reproductive rates from the biologically most fecund 20-24 year period to the next, slightly less fecund, period. Looking again at Fig. 2 we can see that the much lower ASFR for the 20-24 year age group in Timling compared to the Terai and Middle Hills regions would disappear were it not for the exposure effects of marriage practices.

Fig. 5 gives a more graphic presentation of these exposure effects. The gap between lines for age-specific marital fertility and age-specific fertility show that the most dramatic exposure effects occur in the first ten years of the reproductive period. Were all women exposed to the risk of pregnancy throughout these years some 1095 additional children would be born per thousand women in those years. Far smaller exposure effects are felt in the last 25 years when only 515 additional births per thousand women would occur. A breakdown of Bongaarts' index will make this more obvious.

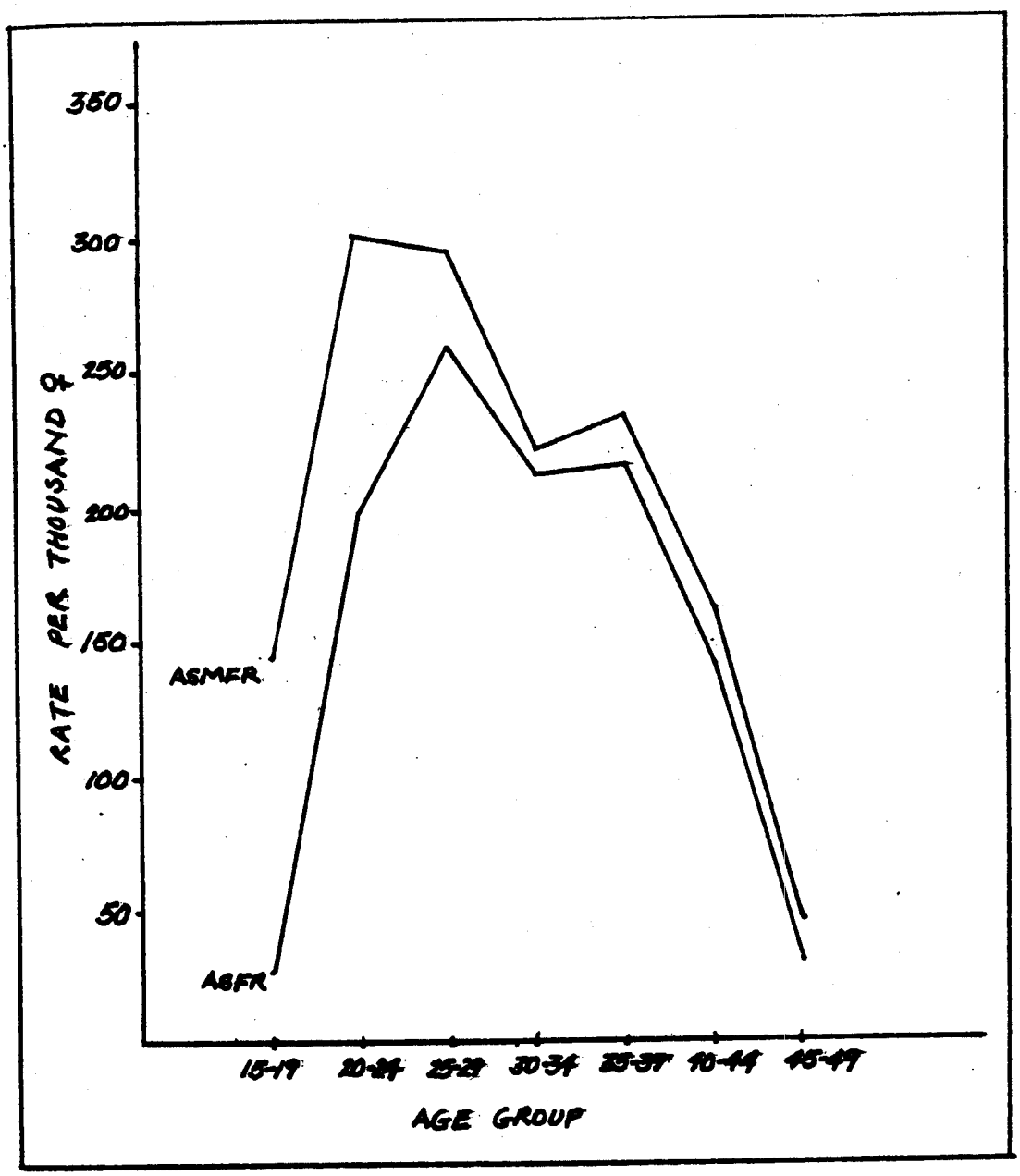

Figure 5: Age-specific fertility and age-specific marital fertility for 152 Tamang women.

The index of proportion married is easily computed from the information in Table 7. We simply multiply the proportion of exposed to total woman years in each age class by the corresponding ASMFR and divide these by the sum of the ASMFR alone. The resulting proportion, .771, tells us that average fertility is reduced 22.9% because Tamang women are not exposed during parts of their fecund period. For these women of completed fertility, this translates into the difference between having an average of 5.43 births and an average of 7.04 births per woman. Because I have used the age at cohabitation rather than the age at marriage, the interpretation is slightly different than straightforward "marriage" effects, but it is more accurate given the possibility of delaying actual cohabitation after arranged marriages.

A further breakdown distinguishes between the effects of age at cohabitation and of separation from spouse due to his death.[5] Table 8 presents the woman-years of exposure that would result using three assumptions.

Table 8: Years of exposure and proportions of total woman-years exposed under differing assumptions about marriage and death.

	Age Group						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Woman-years							
Total	751	702	615	530	439	330	269
Assumption 1	168	512	557	498	433	325	264
Assumption 2	751	698	597	522	424	310	196
Assumption 3	751	680	570	481	399	276	178
Ratios							
1/Total	.224	.729	.906	.940	.986	.985	.981
2/Total	1.000	.994	.971	.985	.966	.939	.729
3/Total	1.000	.969	.927	.908	.908	.836	.662

Source: Timling Marriage and Fertility History.

In the first assumption, I take the given age pattern of cohabitation and ignore the deaths of husbands. The second assumption does the reverse and takes it that all women are married at the beginning of the reproductive period with unexposed years resulting from the given pattern of widowhood and remarriage. I have included a third assumption to discover the kind of pattern that would result were the Tamang to marry at the beginning of the reproductive years and not practice widow remarriage. A glance at the proportions of years exposed to the risk of

pregnancy under the different assumptions suggests that the pattern of cohabitation has the greatest impact on fertility; this is borne out when we calculate Bongaarts' index of proportion married following the same procedure as above. When we assume that exposure is affected only by the age at cohabitation, we get an index of .829. The first mortality assumption produces an index of .969. Even when we assume the current pattern of mortality without widow remarriage, this is only slightly reduced with an index of .922. Thus the exposure effects of Tamang marriage and cohabitation patterns are to reduce potential fertility almost 20%, while the effects of widowhood and remarriage reduce it an additional 3%

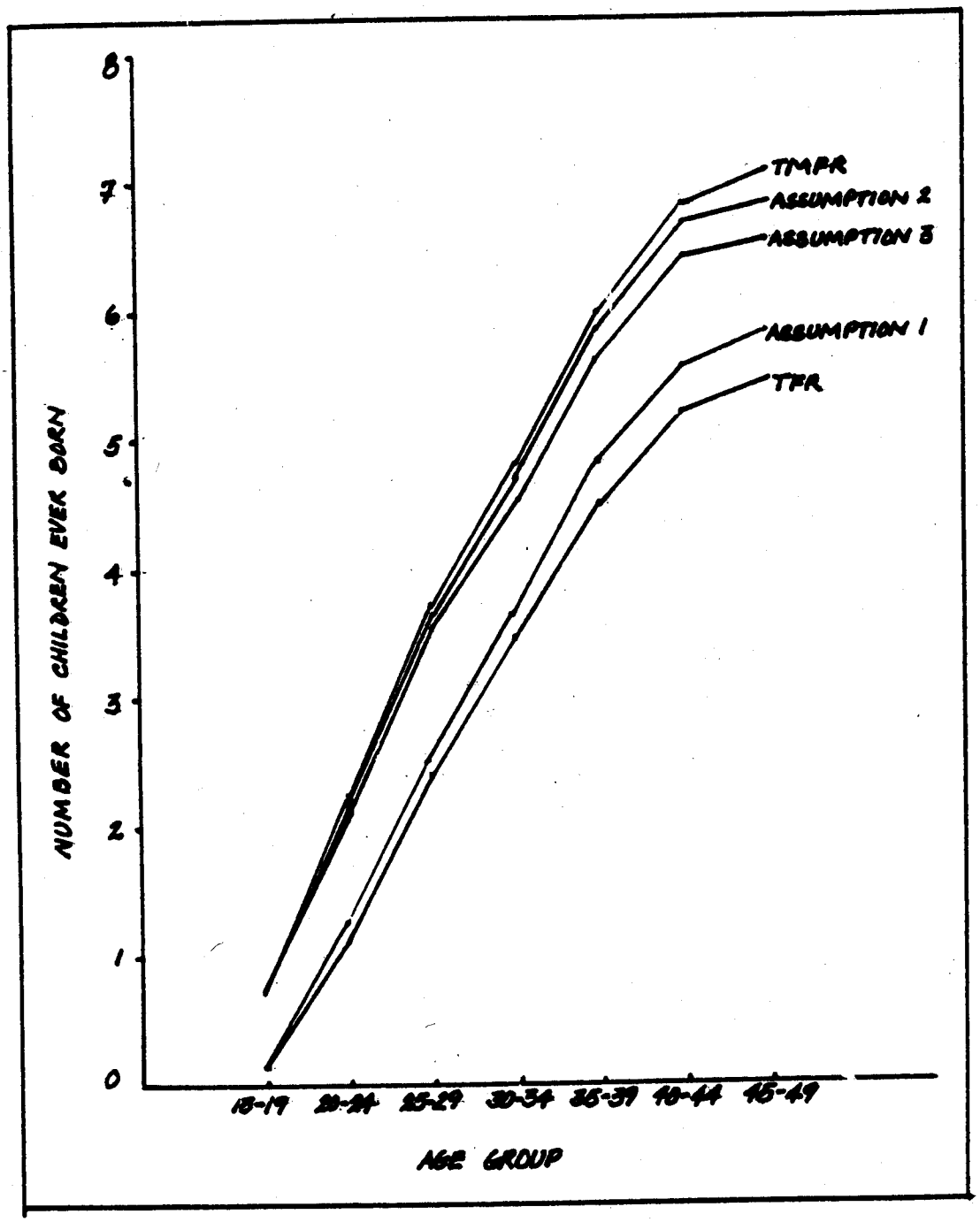

Figure 6: Cumulative fertility for 152 Tamang women under different exposure assumptions.

Fig. 6 shows the childbearing experience of the average Tamang woman given the different assumptions. The top line shows how many children would be born per woman were she exposed throughout the reproductive years; the bottom line traces the actual course of fertility in Timling. The total number of births per woman demonstrates the large fertility dampening effects of exposure variables:

Total Marital Fertility ..... 7.0 births

Widowhood with remarriage ..... 6.8 births

Widowhood, no remarriage ..... 6.5 births

Cohabitation affects alone ..... 5.8 births

Actual fertility ..... 5.4 births

While these exposure factors reveal some of the reasons why Tamang fertility is so low, the total is still vastly less than the potential for natural fertility populations. Yet no woman in Timling reported contraceptive use or resource to abortion. Even if some women concealed abortions in their past, we can be confident that the fertility dampening affects would be trivial since the only reason to abort would be to escape the consequences of premarital pregnancy. Tamang attitudes toward premarital sex and pregnancy are not especially oppressive. For this reason there is no need to consider the Bongaarts index of non-contraception or his discussion of abortion affects.

The next major index that Bongaarts has developed is the index of lactational infecundability (1978: 116). Because detailed data on breastfeeding were not gathered, my use of this index must rely more heavily on the assumptions of the Bongaarts model than in the discussion above. This is not a strong blow to the discussion, however, since the model incorporates the typical effects of fertility dampening variables from known populations. Having discussed the impact of known exposure variables on fertility, the remaining intermediate variables include the effect of (1) the infecundable period immediately following a birth, (2) waiting time to conception, (3) time added by intrauterine mortality, and (4) the nine month gestation period (Bongaarts 1978: 115). In the absence of breastfeeding, the time added by these factors is 1.5, 7.5, 2 and 9 months respectively, for a total of 20 months. Bongaarts' model simply assumes that any additional time in the infecundable period is a function of breastfeeding. The index of lactational infecundability (C_i) is the ratio of this minimal 20 month interval to the same period plus additional time in the infecund state. We assume, then, the length of the infecund period to be the only changeable factor on the average. The index of lactational infecundability then tells us to what extent fertility is dampened by breastfeeding behaviour.

Tamang breastfeeding practices are consistent with those found in other less developed countries (Bongaarts 1978: 116). That is, the breastfeeding period is much longer than that of most industrialized

settings. The Tamang themselves feel that it is proper to breastfeed a child until the next pregnancy and I have observed children as old as 5 and 6 taking their mother's breast. Women generally reported that they nursed their children for at least three years or until the next birth. Children are nursed on demand, even after solid food is introduced into their diet in the form of pre-masticated grain at the age of about 6 months. Thus we would expect a long period of lactational infecundability.

Figuring for the Tamang case, then, we need only to work backward from the Bongaarts estimate of the interval between births: 3.38 years for all closed intervals. Subtracting the invariant times added by waiting time to conception, intrauterine mortality, and the gestation period we then arrive at a mean duration of lactational infecundability of 22 months.[6] In spite of the problems of small sample size and the crude estimate of months in the birth interval that we get by converting years into months, the mean duration is amazingly close to that observed in Bangladesh (18.9 months) where very similar breastfeeding practices prevail (Bongaarts 1978: 116). The index of lactational infecundiability for the Tamang works out to .493, indicating that breastfeeding reduces fertility to about half of what it would be in the absence of breastfeeding. Thus the total fecundity rate, defined as maximum fertility in the absence of these dampening factors is equal to the total natural marital fertility rate divided by the index (7.0/.49), or 14.3 births per woman.

We can conclude that the lower natural fertility estimates reported by this survey can be explained by age and rate of cohabitation, lessened exposure due to separation, and periods of infecundability due to lengthy breastfeeding practices. Timling's population has not been faced with the conscious need to limit births up to the present time since there has been no compelling limitation in the amount of new land left open. The fertility level is the unreflected consequence of behaviour not specifically directed toward fertility control. Indeed, Tamang women report a desire for as many children as possible, yet they reduce their potential childbearing by more than one birth through marriage and cohabitation effects alone. Caldwell's point about pre-transition societies being "seamless" (1976: 343) has some indirect support here. One indication of a breakdown in the supports for high fertility would be consciously relating intermediate variables to the number of children born and then directing behaviour to control that number.

Conclusions and implications

Taken by itself, this analysis indicates that methodologies designed for application to much larger data sets can be effectively used for community level analysis. A number of advantages are obvious. First, once the absence of major trends in fertility behaviour can be established analyses based on the experience of all women dramatically increases the woman-years on which we can base are discussions of vital rates. One of the severest problems community-level analysis faces is the problem of random fluctuation in small samples. Further, typical

summary statistics for completed fertility are based on the experience of women beyond the reproductive years. This is often the least well represented group in an already small population; furthermore, it is the most subject to the effects of memory bias. Analysis that pools the experience of all women greatly enhances the reliability of estimates and permits higher confidence in inter-community comparisons.

Second, the detailed examination of age-specific events allows for a processual description of fertility. Events are more easily related to other processes in the individual lifecourse, the household developmental cycle, and the expansion of kin networks. For example, a processual look at childbirth in the household can allow us to relate the different ages of children to parents throughout the lifecourse to discuss changing household composition and its implications for household labour requirements and links to other households. This type of analysis is essential for a dynamic explication of typical family processes at the community level.

Third, the application of Bongaarts' methods for measuring the affect of proximate fertility determinants allows us to quantify these impacts and provides summary measures for comparison between communities. The extent of fertility variation between communities is obvious from even a cursory look at published reports. Completed fertility based on reports for women beyond the childbearing period vary from 4.7 reported for a Bhotiya population (Schuler 1981: 91-92) to 6.6 for another such population in Northwest Nepal (Levine 1982: 7). Goldstein, et. al. (1983: 40-41) provide a summary table for the range of completed fertility in Himalayan community studies. Their suggestion that hypoxic effects do not explain the variation in these figures may be examined in more detail with a comparison based on Bongaarts' measures.

This relates to the importance of institutional analyses of fertility determinants in Nepal. With over 20% of potential fertility in Timling dampened by marriage and cohabitation effects alone, there is strong support for investigation of the roles and status of women and the functions of marriage as part of our understanding of community demography. In populations lying at the determined (Nardi 1981) end of the fertility spectrum, childbirth is related to a variety of other goals (Lesthaeghe 1980).

A programme for new research is called for that focusses on the collection of detailed demographic data in addition to important institutional and cultural information. March (1984) has suggested that symbolic representations of women that ramify through Tamang society stress their exchange and binding roles. We need to relate these values to marriage behaviour and subsequent fertility. Comparisons are called for with standardized data sets across ethnic groups in Nepal. In addition, the these measures can be used to compare communities populated by the same ethnic groups. Timling's low fertility in relation to rates for the whole of Nepal and the high variation between communities for which data now exist suggests that community studies need to be carried

out in the whole range of regions, both for a full understanding of the supports for high fertility and in order to relate population policy to the real complexity in Nepal.

NOTES

1. Fieldwork in Timling was carried out in 1981 with funding from a Fulbright-Hays Dissertation Research Abroad Fellowship. Tselthapa Tamang and Lama Mingmar Ghale assisted in data collection for this project. This analysis has benefitted from the comments of Fred Arnold, Dilli Ram Dahal, Deborah Freedman, Robert Jones, Doris Slesinger, and Christine Stier, none of whom are responsible for errors in it.

2. Toffin (1976) provides a general description of ethnic groups found in the upper Ankhu Khola region. See Fricke (1984) for a more complete description of Timling's population.

3. Compare this to the Gurung of Thak with 39.6% below this age (Macfarlane 1976: 292) and the Dhingaba of Northwest Nepal with 45% (Ross 1981: 37). Other analysis indicates that Timling's implied rate of natural increase is 1.2% annually (Fricke 1984: 299) compared to the 2.1% rate for Nepal as a whole (Banister and Thapa 1981: 25). This is consistent with a doubling time of about 60 years for Timling's population.

4. A complete discussion of methods and questionnaires may be found in Fricke (1984).

5. We could do the same for separation due to divorce, too, but only three divorces occurred in this group. In one case, the woman remarried in the same year. In the other two cases, the women divorced their husbands before cohabiting with them; these effects are thus included in the age at first cohabitation.

6. That is: 40.55 months - 7.5 months - 2 months - 9 months = 22.05 months.

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