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Application of the Own-Children Method of Fertility Estimation to an Anthropological Census of a Nepalese Village

Introduction

ANTHROPOLOGISTS interested in comparative approaches to population are handicapped by the paucity of demographic data in anthropological field studies. Yet, many of these studies contain population counts in which individuals can be classified by age, sex, and kin relation to other household members. The own-children method of fertility estimation* provides a means for employing such data to obtain estimates of age-specific birth rates and related fertility measures.

To date, the own-children method has been applied only to censuses and surveys of large populations, usually national populations. The present application to an anthropological census of Batuiechaur, a small Hindu peasant village situated in the middle hills of Nepal near the town of Pokhara, illustrates that it may also be applied successfully to small populations. The census of Batulechaur was conducted by Robert Schroeder in September 1974, without fertility estimation in mind, as part of anthropological field work in the village.

*(Cho, 1968, 1969, 1970, 1971a, 19716, 1971c, 1973, 1975; Grabill and Cho, 1965; Cho and Hahm, 1968; Cho *el al.,* 1970; Cho *et al.,* 1976; Engracia *et al.,* 1976; Retherford and Bennett, 1977; Retherford, 1978; Retherford *et al,* 1978; Retherford and Cho, 1978).

Methodology

The own-children method is a reverse-survival technique for estimating age-specific fertility in years previous to a census or survey. Enumerated children are first matched to mothers within households by means of questions on age, sex, marital status, and kin relation to other household members. Given an appropriate set of life tables describing age-specific mortality in the population, these matched (i.e., "own") children, classified by own age and mother's age, are reverse-survived to obtain births by age of mother in previous years, and women by age are reverse-survived to obtain women at earlier ages in previous years. After adjustments are made for incorrect enumeration and unmatched ("non-own") children, age-specific birth rates are calculated by dividing the first figure by the second. Typically the technique is applied to census data and estimates are calculated for each of the previous ten to fifteen years or for groups of years. Technical details are available in the publications cited earlier.

For the own-children method to give accurate results, five basic data requirements must be met : (l) accurate age classification, particularly of children; (2) moderately low proportion of non-own children in the household; (3) clearly specified kin relationships among household members; (4) moderately low mortality during the estimation period prior to enumeration; and (5) either low rates of migration during the estimation period or similar age-specific fertility for migrants and nonmigrants.

Not all these requirements are well met in the present application. Age classification in Batulechaur is inaccurate. This is not especially serious for adult women, because own children are generally matched to the same mothers whether or not the latter state their ages correctly. For example, if, owing to age heaping on digits ending in five, the census shows an unusually large number of women age 25, it also shows an unusually large number of own children to mothers aged 25. Since women aged 24 and 26 have about the same child-woman ratios as women aged 25, heaping on age 25 has little impact on the child-woman ratio for women aged 25. In general, the age pattern of child-woman ratios and derived own-children birth rate estimates for a given year is 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 calandar years and underestimates in others.

For example, if there is severe heaping on age five, as in Batulechaur, the age specific birth rate estimates for the sixth year previous to the census are greatly inflated. A related problem is that underenumeration and age overstatement of children under age two often produce an apparent but spurious decline in birth rates during the last year or two previous to the census. Such a decline is very noticeable in Batulechaur.

We have dealt with these problems by deleting the first two years previous to the census from the analysis and aggregating the previous nine years to produce a single set of estimates for the period 1964-72, corresponding to children aged t\vo to ten at the time of the census. Given that there were only 785 women aged 15-65 at the time of the census, the aggregation has the additional advantage of greatly reducing sampling variability of the fertility estimates. (Although the census was a complete count, we may still think of the village as a sample from a larger universe.)

The second requirement, that the proportion of non-own children in the household be moderately low, is satisfied quite well in the Batulechaur study, owing to the careful hand-matching efforts of Robert Schroeder, who personally conducted the census. Non-own children were less than five percent of all children aged two to ten at the time of the census.

The third requirement, that kin relationships between household members be clearly specified, facilitates matching of own children to mothers and is thus related to the second requirement that the proportion of non-own children in the household be moderately low. The information collected on kin relationships permitted the matching of children to mothers in almost all cases.

In some of the 43 polygamous households, however, matching was difficult. Cases where exact matching could not be done occurred where the ages of cowives were close together. In these cases, children were randomly assigned to one or the other of the cowives. Since the ages of the cowives were close, it was felt that this procedure was superior to the usual own-children procedure of incorporating such children into the adjustment factors for non-own children at each age, which distribute non-own children among women of all ages between 15 and 65. In all, 92 children out of a total of 958 aged 2 to 10 were matched in this way,

The fourth requirement, that mortality be moderately low, posed somewhat

of a problem, as mortality estimates for Batulechaur do not exist, acd those for Nepal as a whole, used in their place, indicate a fairly high level of mortality, with female life expectancy around 40 years. Fortunately, as will be demonstrated later, the own-children method is fairly robust to errors in mortality estimation, even at this level of life expectancy.

The fifth requirement, that rates of migration during the estimation period prior to enumeration be low, poses no problem in the analysis of the Batulechaur data. Rural-urban migration is proceeding at a relatively slow pace in Nepal, and rural village populations such as this one tend to be relatively immobile.

Results

Table 1 shows the outcome of applying the own-children method to the Batulechaur data to estimate age-specific birth rates, genera! fertility rates and total fertility rates for the period 1964-72. Two sets of fertility estimates are presented, each based on a different set of mortality estimates. The mortality estimates are in the form of abridged life tables by sex, which provide the means for reverse-surviving women and children by age. The first set of life tables, prepared by the Nepal Central Bureau of Statistics, shows a male life expectancy of 37.04 years and a female life expectancy of 39.90 years (Nepal, Central Bureau of Statistics, 1977, pp. 98-100). The second set, prepared by Gubhaji (1974, p. 6), shows a male life expectancy of 42.9 years and a female life expectancy of 38.9 years. As shown in Table 1, the choice of one or the other of these two sets of *mortality* estimates affects the fertility estimates very little. The TFR estimates of 4794 and 4788., for example, differ by less than 0.2 percent.

A difficulty is that the level of mortality in Batulechaur may differ from that of Nepal as a whole. One reason for suspecting this is that Batulechaur is a village, whereas the country-wide life tables pertain to both rural and urban areas, between which substantial mortality differentials may exist. This particular difficulty is not serious, however, because the country is overwhelmingly rural, with only about three percent of its population living in cities (Taludhar and Stoeckel, 1976), suggesting that the country-wide estimates rather closely approximate the rural situation.

There remains the possibility that Batulechaur's mortality differs from that

TABLE 1—OWN-CHILDREN ESTIMATES OF AGE-SPECIFIC BIRTH RATES AND TOTAL FERTILITY **RATES** FOR THE PERIOD 1964-1972 UNDER TWO MORTALITY ASSUMPTIONS

Age groups	*CBS life tables*[a] *Births*	*Woman-years of exposure*	*Rate*[c]	*Gubhaju life tables*[b] *Births*	*Woman-years of exposure*	*Rate*[c]
15-19	129	1208	107	130	1195	109
20-24	241	1058	227	242	1051	230
25-29	246	1014	242	247	1027	240
30-34	188	947	199	189	971	195
35-39	86	737	117	87	741	117
40-44	21	537	39	21	551	39
45-49	12	426	28	12	434	27
GFR[d]	922	5926	156	928	5970	155
TFR[e]			4794			4788

a. Abridged life tables for males and females for all of Nepal for the period 1961-71 (Nepal, Central Bureau of Statistics, 1977. pp. 99-100). Life expectancy for males is 37.04 years and that for females is 39.90 years.

b. Abridged life tables for males and females for al! of Nepal for the period 1961-70 (Gubhaju, 1974, p. G). Life expectancy for males is 42.9 years and that for females is 38.9 years.

c. Rates (per thousand woman-years of exposure) computed from more precise values of reverse-survived births and woman years of exposure than those shown.

d. General fertility rate, calculated as births 10 women aged 15-49 divided by person-years of exposure for women aged 15-49.

e. Total fertility rate, calculated as the sum of the age-specific birth rates multiplied by five. The total fertility rale is the number of children a woman would have if she lived out her reproductive life experiencing current age-specific birth rates. It is expressed here on a per-thousand basis. On a per woman basis the TI-Rs in the table are 4.794 and 4.788 children, respectively.

of other rural areas. To allow for a range of possible errors in mortality estimation, we ran the calculations again using two sets of Coale and Demeny (1966) Model West life tables by sex, identified by female life expectancies of 35 years (level 7) and 45 years (level 11), producing TFR estimates of 5113 and 4530 respectively. These estimates differ by five to seven percent from the estimates in Table 1.

Even under the assumption of very high mortality (female life expectancy of 35), the TFR estimate of 5113 is well below independent TFR estimates of around 7000 for Nepal's hill and mountain areas as a whole (Taludhar and Stoeckel, 1976 : 41). Since the census on which the TFR estimate is based was carefully conducted and checked by Schroeder in the field, it is extremely unlikely that such a large difference could be an artifact of underenumeration or other data collection errors. It is also unlikely that it could be an artifact of age misreporting, because the computation of estimates over a nine-year period largely eliminates bias from this source; similarly computed own-children fertility estimates for Pakistan, with equally bad age reporting, compare quite well with estimates from other sources (Retherford *et al.,* 1978).

Studies of local fertility variation elsewhere suggest that the relatively low fertility of Batulechaur is well within the realm of possibility. For example, large local fertility variations were common in nineteenth-century Europe (Demeny, 1972). In any case, when the specific ethnographic features of Batulechaur are examined, factors emerge that help explain its relatively low fertility. Most important among these is the economic decline which took place in the village during the estimation period. Prior to the early 1960's the village produced a major cash crop of tangerines and citrus fruits. This crop was portered out of the village and formed an important part of village income. In the early I960's a development expert attempted to improve the local citrus varieties by introducing some new trees from outside the country. These were unfortunately diseased. The disease quickly spread to the indigenous trees, and by the end of the 1960's every citrus tree in Batulechaur had died.

This precipitous economic decline probably stimulated a fall in fertility. By what means the fall in fertility was achieved, however, is somewhat of an open question. It was not accomplished by later age at marriage. Marriage age for women in the village is still about 15, with virtually al! women marrying between 13 and 17. In this regard, Batulechaur resembles most other Hima-

layan villages (Berreman, 1972), Neither could it be due to outmigration of males. There is some temporary outmigration of men for employment, but few Batulechaur men have served as mercenaries or engaged in work that has not allowed them multiple visits to the village during the year.

It seems likely, therefore, that conscious restriction of births within marriage has been practised in the village. For the most part, however, this has not been accomplished by modern contraception. Elaine Schroeder (1975) reports that modern methods of birth control arc hardly used, despite the presence of a government health clinic in the village and a private mission hospital nearby. But all villagers have been exposed to some amount of birth control education, and abstinence, a folk method, is widely practised.

Another factor possibly contributing to the comparatively low fertility of Batulechaur is that the rate of polygyny for the village, which is mainly Chetri-Brahmiii, may be higher than average for the region. Unfortunately regional statistics that would allow determination of whether or not Batulechaur is atypical in this respect are not available. In R. Schroeder's village census 16 percent of married women with husband present were living in polygynous households. An additional ten percent of the adult female population were listed as heads of households, most of them having been established in independent households by husbands cohabiting with another wife or wives. By village practice a husband's sexual attentions are focused on his most recent and youngest wife. Displaced first or second wives have little sexual contact with their husbands, and extra-marital contacts are both condemned and punished severely (Schroeder, 1975).

Conclusion

The estimated total fertility rate for the village of Batulechaur for the period 1964-72 was in the neighbourhood of five children per woman, about two children fewer than the TFR for the hill and mountain region of Nepal as a whole. It is unlikely that errors in the data could produce such a major departure from the typical level of fertility. On the other hand, it is very likely that the destruction of the village citrus orchards by diseases in the mid-1960s, which drastically reduced cash income, motivated village families to have fewer children. Consequent reduction of fertility appears to have stemmed principally from reduction of fertility within marriages, not from an increase in the age at marriage. Reduction of marital fertility was not accomplished to any significant

extent by use of modern contraception. Increased resort to abstinence, a common folk method, was probably the principal means. It is possible that the incidence of polygyny is greater for this village than the average for the hill and mountain area as a whole, and that this also contributes to the relatively low fertility of the village.

These findings have implications beyond this particular village. Many anthropological studies include field censuses that contain information on age structure and km relationship. The example of Batuleehaur has shown that an indirectdemographicestimationtechnique,theown-childrenmethodoff e r t i l estimation, can employ this commonly collected information to estimate age-specific birth rates, the general fertility rate, and the total fertility rate. No explicit information on fertility need have been gathered. Although the method has previously been applied only to large populations, the present application to a Nepalese village shows that application to small populations is also feasible. Indeed, in some instances it may prove feasible to apply the method to primitive societies which no longer exist in the premodern form in which they originally were studied. In sum, the own-children method of fertility estimation holds some promise to anthropologists and other social scientists interested in the comparative study of demographic behaviour in small populations.

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