# FERTILITY, STERILIZATION, AND POPULATION GROWTH IN SHANTI NAGAR, INDIA: A LONGITUDINAL ETHNOGRAPHIC APPROACH

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## ABSTRACT

The results of the 1981 Indian census showed a slight increase in the rate of population growth despite an energetic governmental campaign to reduce fertility, the growing use of contraception, a substantial number of sterilized persons, and a declining birthrate. The longitudinal ethnographic analysis of population data from Shanti Nagar dating from the 1950s and the 1970s suggests that the growth rate of the population might be better understood if analytical emphasis were to be shifted somewhat from birth and death rates to survivorship, that is, the average number of living children per mother, thus focusing attention on the family, the social unit in which the decisions are made that give rise to national demographic rates and averages. Currently, the principal fertility decision that a Shanti Nagar couple must make is whether to undergo sterilization and how many children are deemed necessary before taking this step. Analysis of the Shanti Nagar data shows that women of completed fertility in the 1970s had more living children than comparable women in the 1950s, and that even the sterilized couples of the 1970s had only slightly fewer children than the almost entirely noncontracepting women of the 1950s. Although the age of women at their own (or their husbands') sterilization is falling and the operation takes place after fewer children than formerly, the average sterilized couple nonetheless has more than four children instead of the two or three that the Government of India prefers. An analysis of the relationship to fertility of various modernization variables, such as urbanization and enhanced economic status, fails to show any consistent correlation of such variables with reduced fertility. School attendance by females is perhaps the most promising of the modernization variables, but its effect is somewhat ambiguous and relatively weak until women achieve the college level. Current trends suggest that soon after 2025, India may surpass China as the world's most populous nation (Demeny, 1984, table 1, fig. 3).


# INTRODUCTION[1]

In this essay, we present a study of population growth, fertility, and sterilization that was carried out in a north Indian village which we call Shanti Nagar. The analysis is based on censuses and holistic ethnographic studies that we made in 1958–1959 and 1977–1978 and a sterilization survey that was undertaken in the latter part of 1983. After the approximately 19.5-year interval between the two studies of the 1950s and 1970s, the number of sterilized persons in Shanti Nagar (women or their husbands) was tantamount


[1] The research reported here is based on fieldwork in Shanti Nagar in 1958–1959, 1977–1978, and 1983. We thank the people of Shanti Nagar for their friendship and cooperation during these 25 years without which the work could not have been undertaken.

During our fieldwork in India, in the 1950s and 1970s, we were aided by many individuals and organizations. Their indispensable assistance and hospitality are acknowledged with thanks in S. Freed and R. Freed (1976, pp. 28–29) for the work in the 1950s, and in S. Freed and R. Freed (1982, pp. 200–201) for the 1970s. We especially thank the staff of the Department of Anthropology, University of Delhi which has been a constant source of support during our 25-year association with India. In the late 1950s, the Department was chaired by the late Dr. P. C. Biswas; Dr. Indera Pal Singh succeeded him and was departmental chair in the 1970s. We hesitate trying to list all the people who rendered valuable assistance at one time or another, but Drs. J. S. Bhandari, V. C. Channa, and I. S. Marwah were especially helpful during the early days of our trip of 1977–1978. We also received aid and encouragement from the staff of the Department of Sociology, especially Drs. J. P. S. Uberoi and M. S. A. Rao, and from Dr. T. N. Madan in the Institute of Economic Growth.

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We thank Ms. Renu Jain and Mr. Tarun K. Sharma for undertaking the sterilization survey in 1983. Their work produced interesting and important data which considerably augmented the value of this study.

We thank Drs. May Beresin, P. K. Datta, Moni Nag, David Hurst Thomas, Etienne van de Walle and Ms. Laila Williamson for reading and criticizing the manuscript. Mr. Menachem Petrushka served as computer consultant and programmer and also read and checked the manuscript. Williamson assisted with the proofreading. The line drawings were prepared by Mr. Nicholas Amorosi. Ms. Patricia Bramwell managed the complicated task of entering the manuscript into the Museum's word processor with commendable skill and ease.

to about 21 percent of all ever-married women (both currently married women as well as those formerly married, such as widows) living in the village. Moreover, substantial social and economic change of the kind that is often assumed to affect fertility had taken place. The interval between the two studies was in all likelihood long enough to permit the identification of significant demographic trends. It is especially noteworthy that the study straddles the important demographic watershed between the pre- and poststerilization periods. The demographic research at both time periods was conducted in the context of holistic ethnographic research which makes it possible to deal with several socioeconomic variables, as they may affect fertility and survivorship (cf. Nag, 1976a, p. 318; 1977, p. 273). Although the study of a single village may fairly represent a limited region, it would be incautious to take it as a depiction of the general fertility situation in India. However, village studies have the important advantage of intensity and are a valuable complement to broad surveys (Leibenstein, 1981, p. 397).

A brief ethnographic section and a presentation of census data serve to introduce an analysis of the relation of fertility as measured by the child–woman ratio and various socioeconomic variables both in 1958–1959 and 1977–1978. This part of our analysis adopts the format of our earlier study of fertility in Shanti Nagar (S. Freed and R. Freed, 1971) in order to compare data from the two periods and to evaluate our previous conclusions. Next, the sterilization data are presented followed by an investigation of the relationships among the number of surviving children, selected social variables, and sterilization. A few speculations about the future conclude the study.

India ranks with China as one of the world's two demographic giants. On March 1, 1981, the reference date of the most recent census, India had 683.8 million persons, about 15 percent of the globe's population. Since the preceding census of 1971, India's population increased by 135.65 million persons or 24.75 percent, an absolute increment larger than the total population of Brazil, which ranks sixth in the world. The current annual increase of about 15 million persons is about equal to the total population of Australia. Although India's annual rate of increase is exceeded by many countries, her absolute annual population growth ranks first in the world, probably surpassing even that of China. "Short of a miracle," remark Visaria and Visaria, ". . . [i]t is virtually inevitable that India's population [will] approach or exceed the one billion mark by 2001" (Population Council, 1981a, pp. 325–329; Visaria and Visaria, 1981, pp. 1727–1728, quote, p. 1772). Demeny (1984, table 1) presents estimates by the World Bank in 1983 that predict an Indian population of slightly more than one billion persons in 2000 and of 1.6 billion in 2050.

After the decade of 1911–1921 that had a negative average annual growth rate owing largely to the influenza pandemic of 1918–1919, the demographic history of India from 1921 until the last census features very rapid sustained population growth. India's population in 1981 was 2.72 times the figure of 1921. Coale regards such rapid sustained population growth, which is typical of those countries designated as less developed, as having no precedent. The processes that led to this development in India seem reasonably clear: a sustained high birthrate into the 1970s and a steady decline in mortality from 1911, except for the decade of the influenza pandemic. The birthrate has fallen in the 1970s, dropping from 41.1 per 1000 persons in the 1960s to about 33.3 in the 1970s (Visaria and Visaria, 1981, table 2; Coale, 1983, p. 828).

The recent trend of birth and death rates in India, where initially high rates gradually declined, mortality first and then fertility, has led to the belief that India is on the verge of a "demographic transition" similar to those that have presumably occurred in western nations (Population Council, 1981a, p. 332; Nag, 1983, p. 56). Stimulated by increasing modernization, it was thought that India would evolve demographically from high to low rates of fertility and mortality. As a consequence, the rate of population increase would lessen and eventually approximate those of the economically developed western nations. Although the demographic transition would eventually take place in any case, an active program of fertility reduction (designated as family planning) was needed to hasten the

process, for the growing size of India's population was producing an undesirable, even unstable, social and economic situation.

The "population problem," as seen both by the Government of India and by outside observers, has several facets. In the long term, it is mathematically obvious that India, with less than 2.5 percent of the land area of the world, cannot continue to add 15 million persons to her population annually. There would eventually be no place to stand. In the short term, however, the problem raises questions that to some extent involve value judgments. At the national level, rapid population growth is held to be an obstacle to economic development (Gulhati, 1977, p. 1305). The implications of this assertion are that scarce resources have to be used to support the population increment with food, health care, and such necessities, thereby reducing the resources available for investment in modern industrial and agricultural enterprises and advanced technology. Absolute economic advance would continue to take place, but in terms of indices such as per capita income, improvement of the condition of the mass of the population would be negligible. For example, Gulhati (1977, p. 1302) notes a 50 percent increase in cereal production from 1966 to 1977 but an improvement of only 13 percent in the amount of grain available per capita. Moreover, the production of pulses, a principal source of protein, declined in this period. There is the conviction that India can have relatively rapid economic and technological development or a continued high rate of population growth, but that the two processes are basically incompatible. The Government of India has chosen to favor development and to try to reduce substantially family size and the rate of population growth.

In villages, where 76 percent of the people reside, the population problem takes a characteristically rural form. The traditional rural economy, based on family agriculture and limited by the available land, cannot economically absorb an indefinitely increasing population. Children are still needed for all the traditional reasons, but there are more of them than are economically required. Youths who wish to leave the traditional home or are almost forced to do so because they are severely underemployed turn to government employment or to the modern business and industrial sector, which has not grown rapidly enough to provide jobs for all who seek them. These developments, according to Poffenberger (1976, p. 151), begin to cause instability in the social structure. Despite these circumstances, as we shall see, villagers are generally unwilling to reduce the number of their children to the level that the government would like.

The relation of population to the rural economy is much more subtle than can be outlined in these few paragraphs. There are regional differences, possible periods of labor shortage during the agricultural year, such as at the harvest, village construction projects stimulated by prosperity that require more workers than are locally available, and work so hard, especially in construction, that local people shun it. When such needs develop in the more prosperous regions, they are met by migrant workers from poorer areas. Gangs of laborers from Bihar, for example, are common in the Union Territory of Delhi. There can easily be a surplus of educated and technically trained personnel and a shortage of artisans and manual laborers.

In 1951, the size of India's population was of sufficient concern to lead to a national program of family planning during the First Five-Year Plan (1951–1956), but it was presented in terms of maternal and child health rather than fertility control. Serious efforts at fertility control did not begin until the mid 1960s (Gulhati, 1977, p. 1301). In 1951, India's population was 356 million as compared to 684 million in 1981. When one considers these figures in the context of India's economic development from 1951 to 1981, one can appreciate why fertility control at first received relatively little attention from the Government of India. It could easily be maintained that Indians were better off in 1981 than they were 30 years earlier by any of the standard measures, such as educational level, life span, income, housing, and quality of health care, despite an increase of 328 million people. India currently has a strong economy with a relatively large component of high technology.[2] Whether a stable population

[2] Srinivasan (1984, p. 148) observes that although India's record of economic development compares favor-

would have produced a better or worse record can be debated, certainly for the short term. However, the absolute population base has become huge and a stable rate of population growth would produce progressively larger annual population increments. The Government of India probably began to view the growing population with alarm not a moment too soon.

In view of this perceived population problem, the anticipated appearance of the demographic transition, and the energetic measures that have been taken to reduce fertility, notably the sterilization campaign conducted during the political Emergency from June, 1975 to March, 1977, the results of the 1981 census are of considerable interest. In general, birth and death rates dropped during the 1970s, but the average annual rate of population growth increased slightly from 2.20 to 2.23 percent (Visaria and Visaria, 1981, tables 2, 5, p. 1728). The Center for Policy Studies of the Population Council comments, "Undoubtedly, the most conspicuous finding of the 1981 census is that the expected downturn of the rate of population growth during the 1970s (relative to growth in the 1960s) has not materialized" (Population Council, 1981a, p. 326). However, the slight increase in the growth rate can be considered negligible, and the staff of The Center for Policy Studies thinks that the steady acceleration in the annual growth rate has stopped, remarking that this development "may still mark a demographic watershed of great significance" (Population Council, 1981a, p. 326). On the other hand, it is perhaps equally significant that despite a decline in the fertility rate, it remained high enough to produce a slight increase in an already high annual rate of population growth.

The apparent paradox of a stable or slightly increasing rate of population growth in the context of the growing use of contraception, a substantial number of sterilized persons, and the falling fertility rate has been something of a surprise and suggests that the growth rate might be better understood if analytical emphasis were to some extent shifted from birth and death rates to survivorship, that is, the average number of living children per mother (or per ever-married woman). To think in terms of survivorship focuses attention on the family, the social unit in which the decisions are made that give rise to the national statistical rates and averages. Although the fertility rate, which is based on the number of live births, is related to the rate of population growth, survivorship is even more closely related. Population growth depends more on survivors than on children who die soon after birth (Chowdhury, Khan, and Chen, 1976, p. 259; Millard, 1982, pp. 147, 156).

The number of surviving children is related to both the birth and death rates, which to some extent can fluctuate independently. It is clear that if a decline of the birthrate is equaled or exceeded by a fall in the death rate, then in general the average number of surviving children per family will remain stable or increase. Both fertility and mortality have fallen in India. Since infant mortality is a considerable proportion of total mortality, much of the decline in the mortality rate can be traced to better health and nutrition for infants, improved delivery practices, the use of hospitals for childbirth, government-trained nurse-midwives who practice in villages, and the control of epidemic diseases to which children are especially vulnerable. There are several advantages in ethnographic contexts to working with survivorship rather than fertility and mortality rates: (1) data concerning survivorship are routinely collected in taking a census, a fundamental operation in ethnographic research; (2) such facts are easier to collect and verify than data concerning births and, especially, infant deaths; and (3) survivorship is family-specific to a greater extent than birth and death rates. Decisions such as those about family size and the desired proportion of male to female children are, at the present time, made almost exclusively by parents.

Sterilization, the principal and most effective form of contraception used in India by couples who wish to terminate childbearing rather than just to control the timing of preg-

ably, for example, with that of China, it fell far below its potential in human and material resources. He illustrates this point by comparing India and South Korea. In the 1960s, the manufacturing sector of South Korea was less than one quarter that of India; in the 1980s, South Korea almost equals India in manufacturing.

nancies (e.g., Minkler, 1970, pp. 36, 38; Poffenberger, 1975, p. 109; Nag, 1976b, p. 3, table 3; 1978, p. 49; Gulhati, 1977, p. 1301, table 2), is related more to survivorship than to fertility because a couple's decision to undergo sterilization is based chiefly on the number of their surviving children and not on the number of live births. When one examines the relation of sterilization and fertility, one tends to think of sterilization as the independent variable and fertility as the dependent one. However, when the connection of sterilization and survivorship is considered, it is easy to see that survivorship is the independent variable and sterilization, the dependent one, because the decision to be sterilized generally depends on survivorship. This shift of analytical emphasis is basic if one is to understand the rate of population growth in countries such as India. Coale (1983, p. 828) observes that in the highly industrialized countries, parents limit their fertility "by contraception or abortion . . . after a certain number of children, the desired number, have been born." Coale calls this kind of fertility limitation "parity specific." Sterilization affects the rate of population growth in proportion to the parity limitation selected by parents: the lower the parity the lower will be the rate of population growth.

Sterilization and parity-specific fertility limitation have not been significant factors affecting the growth rate of the Indian population until the late 1960s, especially not until the Emergency of 1975–1977 when compulsory sterilization was officially advocated, although not enacted into law at the national level, and couples were urged by a combination of cash incentives and various disincentives to undergo sterilization (Nag, 1976a, table 1; Gulhati, 1977; Visaria and Visaria, 1981, table 12, pp. 1759–1761, 1767–1769). Since the Emergency, however, sterilization has become an increasingly prominent variable in any analysis of the rate of population growth. Of particular value in such an analysis would be the comparison of a specific Indian population, such as that of Shanti Nagar, before the 1960s, when there were very few sterilized individuals, and after March 21, 1977 when the Emergency came to an end.

## SHANTI NAGAR: BASIC INFORMATION

Shanti Nagar is in the Union Territory of Delhi, northwest of the City of Delhi. As is typical of the region, the village consists of a compact habitation site surrounded by cultivated fields. The population, all Hindus, totaled 799 persons in 1958–1959, of whom 392 were females and 407 were males; in 1977–1978 there were 629 females and 695 males, for a total of 1324 persons. There were 110 families in 1958–1959 and 176 in 1977–1978. Although agriculture was the principal occupation, many men had salaried urban jobs. Men often worked at more than one occupation, a frequent combination being farming and urban employment. Most women also had two principal occupations: agricultural work and housework. The castes that were most populous in Shanti Nagar were Brahman Priest, Jat Farmer, Gola Potter, Chamar Leatherworker, and Chuhra Sweeper, all well represented in the villages of the Union Territory of Delhi and neighboring states. A description of the village as it was in 1958–1959 may be found in a series of monographs that have appeared in the last several years (S. Freed and R. Freed, 1976, 1978; R. Freed and S. Freed, 1979, 1980, 1981).

In the interval between our two periods of research in the 1950s and 1970s in Shanti Nagar, a number of socioeconomic trends had become established: the educational level had risen dramatically; there had been a substantial increase in salaried urban occupations; a few women worked for salaries outside the home; the technological level of agriculture was considerably higher; the villagers were more deeply involved in markets outside of Shanti Nagar, owing largely to the construction of the immense Delhi Vegetable Market just north of Delhi and within easy reach of the farmers of Shanti Nagar; electricity had been introduced; radios had become commonplace; there were a few television sets and automobiles; the daily delivery of newspapers had been instituted; and the extension

of a paved road to the village and more frequent bus service made Delhi and the nearby city of Narela much easier to reach. The village was much more modern in 1977–1978 than in 1958–1959, more prosperous, better informed about government programs, and more aware of governmental propaganda and pressure. Many of the socioeconomic factors presumably associated with low fertility, reduced family size, and the demographic transition had made their appearance.

## CENSUS

Our analysis is based principally on detailed census information that we collected in Shanti Nagar in 1958–1959 and 1977–1978. Both censuses include, among other data, the name, age, sex, marital status, caste, clan, education, urbanization, and employment of each family member. The relationships of family members are shown by a genealogical diagram. Census data were generally collected by interviewing one or more adult members from every family. The census data are generally reliable. We are sure that no family was overlooked, for we prepared maps of the village that show the location of every building, its use, and the family that owns it and compared the lists of families collected during the censuses with the maps. The censuses of individual families and the relationships of their members to one another are also reliable, a judgment that could be made by comparing the censuses of specific families taken at the two time periods.

Ages, however, are somewhat inexact. Informants sometimes did not know the exact ages of relatives and therefore reported approximate figures or, instead of specifying a single figure, reported an individual's age as lying in an interval, for example, of from 30 to 35 years. Furthermore, there was a tendency for villagers to report disproportionately ages ending in the digits five and zero. In 1958–1959, we interviewed 31 women twice about their ages. The interviews, separated by two years, provided the opportunity to estimate the reliability of our age data; we could accept the earlier figure as valid and then calculate what the women should have reported in the later interview. The median discrepancy was about four years (S. Freed and R. Freed, 1971, p. 276).

In 1958–1959, our source of data concerning age was the census that we took in those years. In 1977–1978, we had figures not only from the later census but also from the earlier one and, in addition, the ages reported in the Voters List. The greater amount of data in 1977–1978 probably led to somewhat more reliable ages for the later time period. Also then people were more conscious of precise ages, especially of younger people. The age data showed some interesting subtleties. For example, it is generally held to be desirable that a husband be a few years older than his wife. In some cases where a recently married husband and wife were almost the same age in 1958–1959, the requisite gap of five or so years mysteriously appeared in 1977–1978. In general at both time periods, the ages of younger persons are more trustworthy than those of older ones.

The censuses of Shanti Nagar for the two periods of fieldwork by age and sex are given in tables 1 (1958–1959) and 2 (1977–1978). Comparing the data, we find that the people of Shanti Nagar, especially the females, had grown slightly older during the intercensal period: females, on the average, were 1.74 years older; males, .43 years older. The median age of females had increased by 2.50 years; that of males, by 1.25 years. In 1958–1959, the average age of females was less than that of males; in 1977–1978, however, females were, on the average, about six months older than males. The sex ratio, which is the number of males per 100 females, had increased during the intercensal period; it was 103.8 in 1958–1959 and 110.5 in 1977–1978. Although the apparent increases in the mean and median ages conform to what one would expect because of, for example, improvements in health care, it should be kept in mind that many of the age data are approximations; therefore, conclusions based on them must be regarded as provisional.

The intercensal population increase was

TABLE 1
**Population of Shanti Nagar in 1958-1959 by Age and Sex**

| | Female | | Male | | Total | |
|---|---|---|---|---|---|---|
| Age[a] (Years) | No. | Column %[b] | No. | Column %[b] | No. | Column %[b] |
| 0–2 | 39 | 10.1 | 41 | 10.2 | 80 | 10.1 |
| 2–7 | 70 | 18.1 | 78 | 19.4 | 148 | 18.8 |
| 7–12 | 52 | 13.4 | 50 | 12.4 | 102 | 12.9 |
| 12–17 | 42 | 10.9 | 48 | 11.9 | 90 | 11.4 |
| 17–22 | 35 | 9.0 | 37 | 9.2 | 72 | 9.1 |
| 22–27 | 30 | 7.8 | 23 | 5.7 | 53 | 6.7 |
| 27–32 | 28 | 7.2 | 30 | 7.5 | 58 | 7.4 |
| 32–37 | 13 | 3.4 | 13 | 3.2 | 26 | 3.3 |
| 37–42 | 27 | 7.0 | 15 | 3.7 | 42 | 5.3 |
| 42–47 | 7 | 1.8 | 10 | 2.5 | 17 | 2.2 |
| 47–52 | 10 | 2.6 | 19 | 4.7 | 29 | 3.7 |
| 52–57 | 14 | 3.6 | 3 | 0.7 | 17 | 2.2 |
| 57–62 | 10 | 2.6 | 18 | 4.5 | 28 | 3.5 |
| 62–67 | 3 | 0.8 | 3 | 0.7 | 6 | 0.8 |
| 67–72 | 3 | 0.8 | 5 | 1.2 | 8 | 1.0 |
| 72–77 | 1 | 0.3 | 3 | 0.7 | 4 | 0.5 |
| 77–82 | 3 | 0.8 | 2 | 0.5 | 5 | 0.6 |
| 82–87 | 0 | 0.0 | 1 | 0.2 | 1 | 0.1 |
| 87–92 | 0 | 0.0 | 2 | 0.5 | 2 | 0.3 |
| 92–97 | 0 | 0.0 | 1 | 0.2 | 1 | 0.1 |
| Unknown | 5 | — | 5 | — | 10 | — |
| Total | 392 | 100.0 | 407 | 100.0 | 799 | 100.0 |
| Mean | | 21.08 | | 21.86 | | 21.48 |
| Median | | 15.50 | | 15.75 | | 15.50 |

[a] Intervals are open on the left and closed on the right. Because of the disproportionately large number of ages ending in 5 and 0, the intervals were set so that these digits would be near the midpoints of the intervals.

[b] Individuals whose ages are unknown have not been included in calculating column percentages. The column percentages are therefore to be understood as adjusted column percentages.

525 persons (65.7%). In order to calculate the average annual growth rate of the population, the duration of the intercensal period must be specified as precisely as possible. Both censuses were taken during a period of several months; we therefore selected as the reference date for each census the day on which the median family was censused: May 15, 1958 as the date of the first census and November 15, 1977 as the date of the second. Thus, the intercensal period was 19.5 years. Using the formula[3] given by Bogue (1969, p. 124), we calculated the average annual rate of population increase as 2.59 percent, somewhat higher than the all-India figure of about 2.21 percent for the two decades from 1961 to 1981. When we include in the calculation individuals currently living outside the village who are members of the families of Shanti Nagar (for example, sons living away from home for purposes of employment) while excluding married daughters living with their parents because they are no longer members of families of Shanti Nagar, the annual rate of population increase is 2.77 percent.

Our calculations do not include transients. Five families from other villages had purchased the fruit growing in some of the gardens of Shanti Nagar and were camping in their respective gardens to harvest and sell

[3] $P_1/P_0 = e^{rn}$ where $P_1$ and $P_0$ are the populations at the later and earlier dates respectively, $e$ is the base of the natural system of logarithms, $r$ is the continuous rate of growth, and $n$ is the interval of time for which the rate is computed.

TABLE 2
**Population of Shanti Nagar in 1977-1978 by Age and Sex**

| Age[a] (Years) | Female | | Male | | Total | | % Change 1958–1959 to 1977–1978 |
|---|---|---|---|---|---|---|---|
| | No. | Column % | No. | Column % | No. | Column % | |
| 0–2 | 52 | 8.3 | 46 | 6.6 | 98 | 7.4 | 22.5 |
| 2–7 | 94 | 14.9 | 114 | 16.4 | 208 | 15.7 | 40.5 |
| 7–12 | 81 | 12.9 | 103 | 14.8 | 184 | 13.9 | 80.4 |
| 12–17 | 76 | 12.1 | 87 | 12.5 | 163 | 12.3 | 81.1 |
| 17–22 | 76 | 12.1 | 80 | 11.5 | 156 | 11.8 | 116.7 |
| 22–27 | 51 | 8.1 | 69 | 9.9 | 120 | 9.1 | 126.4 |
| 27–32 | 32 | 5.1 | 33 | 4.7 | 65 | 4.9 | 12.1 |
| 32–37 | 32 | 5.1 | 30 | 4.3 | 62 | 4.7 | 138.5 |
| 37–42 | 25 | 4.0 | 25 | 3.6 | 50 | 3.8 | 19.0 |
| 42–47 | 28 | 4.5 | 22 | 3.2 | 50 | 3.8 | 194.1 |
| 47–52 | 23 | 3.7 | 21 | 3.0 | 44 | 3.3 | 57.1 |
| 52–57 | 21 | 3.3 | 15 | 2.2 | 36 | 2.7 | 111.8 |
| 57–62 | 15 | 2.4 | 16 | 2.3 | 31 | 2.3 | 10.7 |
| 62–67 | 6 | 1.0 | 13 | 1.9 | 19 | 1.4 | 216.7 |
| 67–72 | 7 | 1.1 | 10 | 1.4 | 17 | 1.3 | 112.5 |
| 72–77 | 5 | 0.8 | 5 | 0.7 | 10 | 0.8 | 150.0 |
| 77–82 | 2 | 0.3 | 4 | 0.6 | 6 | 0.5 | 20.0 |
| 82–87 | 3 | 0.5 | 1 | 0.1 | 4 | 0.3 | 300.0 |
| 87–92 | 0 | 0.0 | 1 | 0.1 | 1 | 0.1 | −100.0 |
| Total | 629 | 100.0 | 695 | 100.0 | 1324 | 100.0 | 65.7 |
| Mean | 22.82 | | 22.29 | | 22.54 | | |
| Median | 18.00 | | 17.00 | | 17.75 | | |

[a] See table 1, note *a*.

the fruit as it ripened. In addition, a brick kiln had been constructed on village land and a settlement of perhaps 100 individuals, migrant workers and their families, was located a hundred meters or so from the kiln.

Examination of the age brackets in tables 1 and 2 shows that the intercensal percent change varies considerably from bracket to bracket. Beginning with the age interval of 17 to 22 years, increases in excess of 100 percent are common. The two earliest age intervals, 0–2 and 2–7 years, are of particular interest. Population increases in these brackets have been relatively modest; in the youngest interval, there are only 13 more females and five more males than there were in 1958–1959, an intercensal percent change of only 22.5 percent. Although Indian censuses may underenumerate in the 0–4 age interval (cf. Bairagi et al., 1982, p. 450), we think that the reason the population increase in the two youngest age intervals is so modest is due in large part to the governmental birth-control program, especially sterilization, which was particularly effective during the Emergency which lasted approximately 21 months until March 21, 1977. We began to take our 1977 census only about 6.5 months after the end of the Emergency. Therefore, the relatively small number of infants up to about 2.5 to 3 years of age reflects the effectiveness of the sterilization program during the Emergency. Had the intercensal increase in the two youngest age intervals attained the approximately 80 percent that characterized the 7-to-17-year brackets, Shanti Nagar would have had 104 more people than was the case and the intercensal percent change would have been 78.7 percent instead of 65.7 percent. After the defeat of the Congress Party in March 1977, largely due to a popular revolt against what was considered to be coercive

sterilization, the Government of India was no longer in a position to pursue a forceful policy of sterilization. Thus, the relatively small increase in the number of infants may not be a harbinger of a permanent significant decline in fertility.

## FERTILITY

As a measure of fertility, we use the child–woman ratio which is the number of living children less than five years of age per 1000 living women 15 years of age to less than 45 years of age (Ryder, 1959, p. 405; Nag, 1962, p. 16). Fertility is ordinarily measured by indices such as the crude birthrate which is the number of births per year per 1000 of the total population or the general fertility rate which measures the number of births that occur in a year per 1000 women of childbearing age (Bogue, 1969, pp. 658–659). Such indices make use of the number of live births rather than the number of living children, as does the child–woman ratio. We use the child–woman ratio because our census of living individuals is generally reliable, we do not have the complete reproductive histories of all the women of Shanti Nagar, and we do not have great confidence in the vital registration system, especially for the 1958–1959 period. Parthasarathy (1971, p. 4) comments "The experience in India is that the actual number of births are not available because of the incompleteness in the vital registration system. Secondly, it is difficult to get data on a national basis regarding the reproductive performance given by the average number of children born to women of completed fertility. Therefore, fertility must be measured for rural India by the child woman ratio . . . ."[4]

The chief advantage of the child–woman ratio is that, in the context of rural India, it is based on more reliable data than indices using the number of live births. Although it underestimates fertility as measured in terms of live births (Ekanem, 1972, p. 396), it is strongly correlated with at least some such measures. According to Ghosh (1975, p. 39), who fixes the age intervals of children and women somewhat differently than is customary, there is a correlation coefficient of .920 between the child–woman ratio and the "birth rate." The major disadvantage of the child–woman ratio is that it does not easily lend itself to comparisons with indices based on live births. It is, however, possible to use the child–woman ratio in combination with other census data to estimate the crude birthrate, the general fertility rate, and other such measures (Bogue, 1969, pp. 662–663). In any case, the average annual crude birthrate for Shanti Nagar for the period from 1958–1959 to 1977–1978 can be estimated by taking the population growth per 1000 persons of 25.9 and adding to it an estimated death rate[5] of about 12.6 persons per 1000 for the rural area of the Union Territory of Delhi during the 1970s, yielding a figure of 38.5. It should be

[4] Although Parthasarathy's remarks are valid for the 1950s, the development of the Sample Registration System during the 1960s has improved the quality of Indian vital statistics. The Sample Registration System now covers all India. Until the mid-1970s, the sample population was about 3.5 million persons. The sample size was increased to nearly six million persons during the Fifth Five-Year Plan (1974–1979), and further expansion was projected (Visaria and Visaria, 1981, p. 1737). Dyson and Moore (1983, p. 37) comment that the Sample Registration System performs fairly well in most Indian States.

[5] The death rate in Shanti Nagar was estimated from data presented by Visaria and Visaria (1981, tables 5, 6) and the Census of India (1961, table A-II, p. 41). For all of India, the rural death rate was about 71.5 percent higher than the urban rate during the 1970s. The death rate in the Union Territory of Delhi in the 1970s, 7.95 persons per 1000, was basically an urban rate since about 88.7 percent of the population of Delhi was urban, based on the 1961 census, the latest one at our disposal. From these figures, one may easily calculate an estimated rural death rate for the union territory of 12.6 persons per 1000. Let x equal the urban death rate. Then $.887x + .113(x + .715x) = 7.95$. The urban rate is thus 7.35. The rural rate is 1.715 times the urban rate or 12.6.

borne in mind that this estimate is an average for a period of years and that the crude birth-rate could be expected to have changed significantly during the period.

Our earlier analysis of fertility in Shanti Nagar in 1958–1959 (S. Freed and R. Freed, 1971) was guided by the hypothesis that people of low socioeconomic status would have higher fertility than people of high socioeconomic status (Ryder, 1959, p. 412; Heer, 1966; Petersen, 1970). General socioeconomic status depends upon many specific factors, among which are literacy (or amount of education), urbanization (chiefly because of greater employment opportunities than in rural areas and enhanced income), caste, and landownership. In general, individuals who are literate, urbanized, high caste, and landowning are accorded higher prestige and/or enjoy a more favorable economic position than persons with the opposite qualities.

The hypothesis that fertility and socioeconomic status are inversely related was investigated by comparing groups of villagers defined in terms of the variables contributing to general socioeconomic status. For example, the fertility rates of literate and nonliterate villagers were compared. A similar procedure was followed for each of the other variables: urbanization, caste, and landownership. Finally, two groups were formed based on the four variables in combination; that is, the villagers who were literate, urbanized, high caste, and landowning were compared to the villagers with the opposite characteristics.

The fertility rates for Shanti Nagar for the two time periods as measured by the child–woman ratio are given in table 3. There has been a decline in fertility of 232 points or 24 percent based on the 1958–1959 fertility. The possibility that this decline in the child–woman ratio was due to an increase in infant and child mortality rates was not entertained because mortality rates have generally fallen in India from 1958–1959 to 1977–1978. Rather the reduction in the child–woman ratio is in all probability due to the sterilization program that the Government of India pursued during the Emergency. An appreciation of the effect of this program can be gained by calculating a child–woman ratio based on children in the (2–7] interval (tables 1 and 2) rather than those of the (0–5) bracket. The child–woman ratios are 937 in 1958–1959 and 803 in 1977–1978; the fertility decline was only 14.3 percent in terms of the 1958–1959 fertility rate. If the children in the (7–12] bracket are used to calculate child–woman ratios, fertility *increased* from 1958–1959 to 1977–1978 by 10.0 percent. Governmental pressure for sterilization affected especially people with jobs in government. There were many such people in Shanti Nagar which helps to explain the rather precipitous drop in fertility just after the Emergency. Villages more remote from urban areas with proportionately fewer people in government service than was true of Shanti Nagar may not exhibit a similar fertility decline.

Table 4 presents a comparison of fertility for the two time periods in relation to the literacy of family heads. We collected most of our literacy data while taking our censuses. We accepted our informants' testimony at face value; if an informant identified someone as literate, we did not ask that person to demonstrate the ability to read and write. Villagers considered a person to be literate who had at least "read one book," that is, had gone to school for one year as a child or had attended an adult education class. We used the literacy of a woman's family head rather than her own literacy in comparing fertility rates between literate and nonliterate villagers because, in the late 1950s, few women from 15 to 45 years of age were literate. Thus, it would not have been particularly meaningful to divide women by literacy and compare the fertility of the two groups, for one of the groups would have been rather small. Moreover, at that time, the family head was the dominant voice in all family decisions; we assumed that decisions about having children (when such decisions had to be consciously made as in the case of whether or not to approve surgery) were no exception, for we knew of two occasions when a family head did make such a decision.

In 1958–1959, the fertility of women in families with literate heads was 222 points lower than that of women in families with nonliterate heads. This difference tended to support the hypothesis that members of higher

TABLE 3
**Fertility (Child-Woman Ratio) in Shanti Nagar, 1958-1959 and 1977-1978**

| Number of | 1958–1959 | 1977–1978 |
|---|---|---|
| Children (0–5) | 152 | 189 |
| Women [15–45)[a,b] | 158 | 259 |
| Child–woman ratio | 962 | 730 |

[a] In this and subsequent tables, the use of brackets and parentheses follows the standard mathematical conventions for indicating open and closed intervals.

[b] S. Freed and R. Freed (1971, table 1) reported 157 women in 1958–1959. This figure has been increased to 158 because of data that were collected in 1977–1978 concerning one woman residing in Shanti Nagar in 1958–1959.

socioeconomic groups have lower fertility than members of lower socioeconomic groups. However, in 1977–1978, the fertility of women in families with literate heads was 148 points *higher* than that of women with nonliterate family heads. In view of these data, it would no longer be possible to claim that the literacy of family heads had any consistent influence on fertility. As for trends within literacy groups between the two periods of study, there has been a relatively slight decline of fertility for the literate group (60 points) and a much greater one (430 points) for the nonliterate group.

The apparent absence of a consistent relation of literacy and fertility is of interest in view of the considerable research effort that has been devoted to the problem. If a broad consensus exists among researchers concerning the connection of any socioeconomic variable and fertility, it is that fertility is inversely related to education (or literacy). However, the many studies in India that have probed the relationship have arrived at conclusions that are somewhat contradictory: sometimes fertility and education appear to be directly related (Bhowmik and Bhowmik, 1977, p. 112); sometimes they are inversely related (Kripalani, Maitra, and Bose, 1971, pp. 6, 7; Rele and Kanitkar, 1974, p. 306; Gupta, Singh, and David, 1975, p. 8; Dhar and Datta, 1978, p. 151); and some studies have found a direct relationship until a high educational standard has been reached, usually the college level, at which point fertility declines (Paulus, 1966, pp. 72, 75; Punekar, 1974, p. 100; Sharma and Misra, 1978, table 4, p. 49; Nag, 1981, p. 245). In his critical review of worldwide research about education and fertility, Graff (1979, p. 107) comments "At first glance, there seems to be a surprising and apparently reassuring degree of consensus on the importance of education, as well as on the directionality [i.e., an inverse relationship] of its contribution to the resulting patterns. Nevertheless, when the surface is broken much of this agreement and consistency begins to blur, if not in fact disappear. Problems of comparability of data, definitions, and, perhaps more importantly, contradictory results provide a first warning." The fact that the seemingly reasonable and generally accepted hypothesis of an inverse linear relationship of fertility and educational level cannot so far be confirmed with confidence bodes ill for the possibility of firmly establishing relationships between fertility and such socioeconomic or psychological variables as urbanization (e.g., van

TABLE 4
**Fertility (Child-Woman Ratio) and Literacy of Family Head in Shanti Nagar, 1958-1959 and 1977-1978**

| | 1958–1959 | | 1977–1978 | |
|---|---|---|---|---|
| Number of | Literate | Nonliterate | Literate | Nonliterate |
| Children (0–5) | 59 | 82 | 126 | 61 |
| Women [15–45) | 70 | 77 | 161 | 96 |
| Child–woman ratio | 843 | 1065 | 783 | 635 |

TABLE 5
**Fertility (Child-Woman Ratio) and Urbanization of Family Head in Shanti Nagar, 1958-1959 and 1977-1978**

| | 1958–1959 | | 1977–1978 | |
|---|---|---|---|---|
| Number of | Traditional | Urbanized | Traditional | Urbanized |
| Children (0–5) | 81 | 71 | 57 | 132 |
| Women [15–45) | 75 | 81 | 86 | 173 |
| Child–woman ratio | 1080 | 877 | 663 | 763 |

Groenous, 1972, p. 92) or modernity values (e.g., Mukherjee, 1977, pp. 7, 11, 66–67; Poston and Singelmann, 1975, p. 427).

The complications of studying the relationship of fertility and education are cogently summarized by Jain (1981, pp. 591–594). Jain points to such matters as the possibly contrary influences of intermediate variables. For example, a decrease in breastfeeding among educated women in less developed countries reduces the period of lactational amenorrhea (see below) and enhances the possibility of an increase in fertility. If the decrease in lactational amenorrhea is not countered by greater use of contraceptive devices (or sterilization) by educated than by uneducated women, the result could be that educated women might show a higher fertility rate than uneducated women (Nag, 1980, pp. 573–575; Jain, 1981, p. 593). Moreover, the contraceptive effect of breastfeeding is modified by the amount of supplementary food that is given to an infant and the age at which supplementary feeding begins. The contraceptive effectiveness of methods other than sterilization is difficult to determine. Although it is possible to deal quantitatively with variables such as breastfeeding, contraception, and attitudes concerning family size, the formidable problems of data collection and evaluation must always be kept in mind. It is much more difficult to confirm a respondent's claim to practice abstention or to use the condom than it is to verify educational attainments or sterilization, both of which are often common knowledge in the community or can be confirmed from institutional records.

The effect of urbanization on fertility is evaluated by dividing the villagers into two groups on the basis of urban experience and comparing the groups. One group, which we call urbanized, consists of people who have lived and/or worked in cities. Members of the other group, whom we call traditional, lack such experiences. Most urbanized individuals were men; in 1958–1959, relatively few women had the kind of urban experiences that were common for men. In order to analyze the relation of urbanization and fertility, we therefore used the urban experience of a woman's family head rather than her own urban experience, much as we had done in the case of literacy and for similar reasons.

The analysis of the possible effect of urbanization on fertility is presented in table 5. In 1958–1959, the fertility of women in families headed by traditional men was higher than that of women in families whose heads were urbanized, a result supporting the hypothesis that people of high socioeconomic status have lower fertility than those of low socioeconomic status. However, in 1977–1978, the urbanized rather than the traditional group had higher fertility (cf. Nag, 1981, p. 245). As in the case of literacy, these data lend no support to the belief that urbanization has a consistent influence on fertility. Concerning trends within the two groups defined by the presence or absence of urbanization, fertility declined for both groups, 417 points for the traditional group and 114 points for the urbanized. Our conclusions concerning the effect of urbanization on fertility must be qualified, as in the case of education, because of the largely unknown and possibly

TABLE 6
**Fertility (Child-Woman Ratio) and Caste[a] in Shanti Nagar, 1958-1959 and 1977-1978**

| | 1958–1959 | | 1977–1978 | |
|---|---|---|---|---|
| Number of | High Caste | Low Caste | High Caste | Low Caste |
| Children (0–5) | 92 | 60 | 106 | 83 |
| Women [15–45) | 103 | 55 | 165 | 94 |
| Child–woman ratio | 893 | 1091 | 642 | 883 |

[a] The high castes are Brahman Priest, Bairagi Beggar, Baniya Merchant, Chhipi Dyer, Jat Farmer, Jhinvar Waterman, Khati Carpenter, Lohar Blacksmith, and Mali Gardener. The low castes are the Chamar Leatherworker, Chuhra Sweeper, Gola Potter, Mahar Potter, and Nai Barber.

contradictory effects of intermediate variables.

The extent of the influence of caste status on fertility can be observed in table 6. The 14 castes of Shanti Nagar are divided into two groups—high castes and low castes—on the basis of village opinion and an analysis of the exchange of food and water (S. Freed and R. Freed, 1971, p. 280). The roster of castes was the same in 1977–1978 as in 1958–1959 except for the presence of a family of Khati Carpenters during the later period. Comparison of the high-caste and the low-caste groups reveals that the low castes exhibited higher fertility than the high castes in both 1958–1959 and 1977–1978. The differences between the two groups are in the direction that one would expect from the hypothesis that low socioeconomic status leads to greater fertility than high socioeconomic status. With regard to trends within the caste groups between the two time periods, there has been a roughly similar fertility decline in both groups: 251 points for the high castes and 208 points for the low castes.

The data presented in table 7 concern the possible relation of family landownership and fertility. Members of landowning families are all classified as landowning individuals despite the fact that technically the family land is usually registered in the name of only one person. The land in question is agricultural land outside of the village habitation site. Families that owned house sites and sometimes additional small plots within the habitation site are classified as landless unless they also owned agricultural land. At both time periods, all but one of the landowning families were high caste. Although most high-caste families owned agricultural land, there were several landless high-caste families. In 1958–1959, 58 of 64 high-caste families owned land and 45 of 46 low-caste families were landless; in 1977–1978, 96 of 108 high-

TABLE 7
**Fertility (Child-Woman Ratio) and Family Ownership of Land in Shanti Nagar, 1958-1959 and 1977-1978**

| | 1958–1959 | | 1977–1978 | |
|---|---|---|---|---|
| Number of | Owns Land | Landless | Owns Land | Landless |
| Children (0–5) | 87 | 65 | 101 | 88 |
| Women [15–45) | 97 | 61 | 153 | 106 |
| Child–woman ratio | 897 | 1066 | 660 | 830 |

TABLE 8
**Fertility (Child-Woman Ratio) and Socioeconomic Status[a] of Families in Shanti Nagar, 1958-1959 and 1977-1978**

| | 1958–1959 | | | 1977–1978 | | |
|---|---|---|---|---|---|---|
| Number of | High Status | Low Status | Other | High Status | Low Status | Other |
| Children (0–5) | 23 | 21 | 108 | 49 | 13 | 127 |
| Women [15–45) | 32 | 17 | 109 | 76 | 26 | 157 |
| Child–woman ratio | 719 | 1235 | 991 | 645 | 500 | 809 |

[a] Families of high socioeconomic status are defined as high caste, landowning, with literate and urbanized family heads. Families of low socioeconomic status are low caste, landless, with nonliterate and traditional family heads.

caste families owned land and 67 of 68 low-caste families were landless.

Landownership can be taken as a measure of general economic status, for landowning families ordinarily have a stronger economic position than those that are landless. In both 1958–1959 and 1977–1978, the landowning group had lower fertility than the landless group. Both groups experienced a decline in fertility between the two time periods, 237 points for the landowners and 236 for the landless. The relationship of land and fertility is generally similar to that of caste and fertility, which follows from the fact that in Shanti Nagar most high-caste families are also landowning and almost all low-caste families are landless.

Data concerning overall socioeconomic status as defined by literacy, urbanization, caste, and landownership are presented in table 8. Although the high-status group of families in 1958–1959 evidenced much lower fertility than the low-status group, the situation was reversed in 1977–1978 when the high-status group had somewhat higher fertility than the low-status group. The fertility of both groups had declined during the period between the two studies. Whereas the fertility of the high-status group fell slightly, 74 points, the low-status group experienced a substantial fertility decline, 735 points.

It appears that our conclusions based just on the study carried out in 1958–1959 are not supported by the data from 1977–1978. High socioeconomic status as we have defined it does not invariably lead to lower fertility than does low socioeconomic status. In addition, literacy and urbanization, defined in terms of family heads, appear to have no consistent relationship to fertility.[6] Our experiences are similar to those of van Groenous who repeated in South India a study originally carried out in Gujarat. The results were different enough to move him to remark "Replication of our studies in the South of India shows that no generalization is valid concerning 'villagers'" (van Groenous, 1972, p. 100). Although we would not go quite that far, we would, at the present time, be disinclined to accept any relationship between social variables as firmly established unless it had been found in several studies exhibiting both wide geographical distribution in India and also significant time depth. Moreover, any statistical tests of significance should attain at least the .01 level to be seriously considered as significant.

[6] Fertility is not the only domain where conclusions that seemed reasonable in 1958–1959 had to be abandoned on the basis of later data from, it bears stressing, the same village and involving many of the same individuals. A similar history developed concerning our study of the family (S. Freed and R. Freed, 1969, 1982). In 1958–1959, there appeared to be a weak but possibly statistically significant correlation ($p < .02$) of family type and landownership which seemed reasonable in view of current agricultural practices, property rights, and inheritance. In 1977–1978, we could find no trace of such a relationship; the changes in family type that had taken place between the two periods of study indicated that the apparent relationship of family type and landownership was in fact partly due to the specific age distribution of the population that existed in 1958–1959.

# STERILIZATION

It is evident that sterilization was a prominent factor in the decline of fertility in Shanti Nagar from 1958–1959 to 1977–1978, for the child–woman ratio involves children less than five years of age, precisely those individuals whose number would have been reduced by a sterilization program that reached its peak during the Emergency. Moreover, our field notes for 1958–1959 record one woman as having been sterilized by a physician in Delhi in 1954, and the notes for 1977–1978 contain the names of some 20 persons who had been sterilized. That we learned of this many sterilizations in the latter period while making no special effort to collect such information suggested the possibility that there were three or four times that number of sterilized persons in Shanti Nagar. It seemed clear that a full analysis of demographic trends in Shanti Nagar would require as complete information as possible concerning all sterilized persons living in the village.

Consequently we decided to undertake a survey in the summer of 1983 to learn the names of all sterilized persons, the date of their operation, and the number and sex of their children. We also wanted open-ended interviews from a small sample of both sterilized and unsterilized persons regarding various subjects, such as the motive for having (or not having) the operation. The survey was carried out by our two principal research assistants from our 1977–1978 research, both of whom were living in Delhi and were willing to do the work. They were thoroughly familiar with Shanti Nagar and the villagers knew them well. We could not go to India and therefore directed the work from New York by letter and telephone. Concerning what we regard as the principal problem of trying to conduct fieldwork at a distance, namely the extent to which one can have confidence in the validity of the data, we could in this case verify the survey data by comparing them with information that we had collected in the 1950s and 1970s. Moreover, our two assistants worked to some extent independently of each other, and we could compare the information that they collected. The data from all sources are in very close agreement. For example, all the names of sterilized individuals that we collected in the 1970s appear on the lists of our assistants. Thus, we see no reason to question the general validity of the data collected in the sterilization survey.

The sterilization survey was begun at the end of July 1983, and continued for two months on weekends until October. The 93 sterilized persons living in Shanti Nagar in 1983 are tabulated by sex and by the year of the operation in table 9. Sixty-eight of these individuals were sterilized in 1978 or earlier which means that they can be counted as sterilized at the time of our fieldwork which was conducted in 1977–1978 (if we assume that the three sterilizations of 1978 occurred early in the year). In a small village such as Shanti Nagar, 68 persons are a substantial number; it amounts to the protection by sterilization of 20.9 percent of the 326 ever-married women of the village at the time of our fieldwork in the 1970s. Therefore, a rather high proportion of the women potentially available for reproduction had been permanently protected from becoming pregnant. Although there is always the possibility that a woman with a sterilized husband could become pregnant, such an event would be relatively rare in Shanti Nagar since the repercussions from such a pregnancy could result in disgrace and, especially for a woman, death (R. Freed, 1971; cf. Gulati, 1980, p. 1186; R. Freed and S. Freed, 1985).

Several interesting aspects of the sterilization data are evident in table 9. The effect of measures to promote sterilization taken during the Emergency are quite clear from the disproportionately large number of operations tabulated in 1976. After the Emergency, the number of sterilizations per year returned almost to the pre-Emergency norm: from 1968 to 1974, the yearly average of individuals sterilized was 3.4; the corresponding figure for 1977–1983 was 4.7. The two averages may be judged to be roughly equivalent in terms of the number of persons available for sterilization when the growing population of the village is taken into account.

The chief difference between the post-

TABLE 9
**Sterilization by Sex and Year, Shanti Nagar**

| | Wife | | Husband | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Frequency | Row % | Frequency | Row % | Frequency | Cumulative Frequency | Column % | Cumulative % |
| 1954 | 1 | 100.0 | 0 | 0 | 1 | 1 | 1.1 | 1.1 |
| 1968 | 1 | 33.3 | 2 | 66.7 | 3 | 4 | 3.2 | 4.3 |
| 1969 | 2 | 100.0 | 0 | 0 | 2 | 6 | 2.2 | 6.5 |
| 1970 | 1 | 33.3 | 2 | 66.7 | 3 | 9 | 3.2 | 9.7 |
| 1971 | 1 | 100.0 | 0 | 0 | 1 | 10 | 1.1 | 10.8 |
| 1972 | 4 | 80.0 | 1 | 20.0 | 5 | 15 | 5.4 | 16.1 |
| 1973 | 4 | 66.7 | 2 | 33.3 | 6 | 21 | 6.4 | 22.6 |
| 1974 | 3 | 75.0 | 1 | 25.0 | 4 | 25 | 4.3 | 26.9 |
| 1975 | 1 | 20.0 | 4 | 80.0 | 5 | 30 | 5.4 | 32.3 |
| 1976[a] | 10 | 33.3 | 20 | 66.7 | 30 | 60 | 32.2 | 64.5 |
| 1977 | 5 | 100.0 | 0 | 0 | 5 | 65 | 5.4 | 69.9 |
| 1978 | 2 | 66.7 | 1 | 33.3 | 3 | 68 | 3.2 | 73.1 |
| 1979 | 2 | 100.0 | 0 | 0 | 2 | 70 | 2.2 | 75.3 |
| 1980 | 3 | 100.0 | 0 | 0 | 3 | 73 | 3.2 | 78.5 |
| 1981 | 4 | 80.0 | 1 | 20.0 | 5 | 78 | 5.4 | 83.9 |
| 1982 | 4 | 80.0 | 1 | 20.0 | 5 | 83 | 5.4 | 89.2 |
| 1983 | 5 | 83.3 | 1 | 16.7 | 6 | 89 | 6.4 | 95.7 |
| 1979–1983[b] | 3 | 75.0 | 1 | 25.0 | 4 | 93 | 4.3 | 100.0 |
| Total | 56 | 60.2 | 37 | 39.8 | 93 | 93 | 100.0 | 100.0 |

[a] Responses that specified "Emergency" as the date of sterilization were scored as 1976.
[b] Specific year not known.

Emergency period (if we take 1976 to mark the last year of the Emergency) and the pre-Emergency and Emergency periods is the sex of the person who underwent the operation. Prior to 1977, 32 men and 28 women were sterilized (cf. Nag, 1976b, table 2); from 1977 to approximately October 1, 1983, 28 women and only five men had the operation. The shift from roughly equivalent numbers of sterilized men and women to a situation where primarily women undergo the operation is probably due to several reasons, among them different governmental policies during and after the Emergency, improvement in surgical techniques for women (cf. Visaria and Visaria, 1981, p. 1771), and societal values (cf. Caldwell, Reddy, and Caldwell, 1982, p. 713). Until the end of the Emergency, the government was able to bring pressure to bear on its employees either to be sterilized themselves or to have their spouses sterilized. Almost all government employees in Shanti Nagar are men and they may have felt that this pressure was aimed at them more than their wives. Of the 20 men sterilized in 1976, the height of the Emergency, 17 were in government service and the other three held nongovernmental urban employment; not a single sterilized man exclusively followed a traditional village occupation. Of the 10 sterilized women, five were wives of men with government jobs, two had husbands with other urban employment, and three were married to men with traditional village occupations.

Moreover, tubectomy has apparently become simpler now than it was formerly. A technique known as laparoscopy, which requires only local anesthesia and makes hospitalization unnecessary, has become popular (Caldwell, Reddy, and Caldwell, 1982, note 25). Carbon dioxide is infused into the abdomen so that the Fallopian tubes may be isolated. An endoscope, a small tube with lights and mirrors, is inserted through a small incision below the navel, the Fallopian tubes are located, cauterized or tied, and the incision is closed with sutures (Sandler, Myerson,

and Kinder, 1980, p. 119). Dr. P. V. Mehta, who claims to have performed 120,000 laparoscopic sterilizations, is quoted in *India Abroad* (June 10, 1983, p. 20) to the effect that laparoscopy combines ease, economy, and speed; it is done in a minute and costs only $US 10.00.

Finally, there are a number of beliefs and values that would work in favor of female sterilization. The importance of family continuity is one such value. North Indian society is generally patrilineal. Were a sterilized husband to lose all his sons by some catastrophe, he could not continue his family except by adopting a son. However, if his wife rather than he is sterilized, he can take a second wife and, with luck, beget sons.[7] In addition, female sterilization avoided the problem posed by a woman's becoming pregnant after her husband's vasectomy. Poffenberger (1975, p. 35) comments, "Even if a wife was not having extra-marital coitus, neither husbands or wives were sure that the method [vasectomy] was 100 percent effective and if it were not, why take the chance of being the object of village jokes and gossip?"

Another important development of the post-Emergency period appears to be a reduction in the age at which people have their sterilization operation. Table 10 presents the ages of women either at the time of their own sterilization or that of their husbands. The mean age of sterilization before the end of the Emergency was 33.2 years; afterward, it was 29.1 years, a reduction of 4.1 years. The older age at sterilization before 1977 probably reflects the fact that it was a new development, people were cautious, and some individuals, who would have had the operation at an earlier age had it been available, decided nonetheless to protect themselves from additional children even though they were approaching their final reproductive years. Governmental incentives and, especially, pressure before 1977 also in all probability motivated some of the older people to have the operation. Correlated with the decline in the average age at sterilization is a reduction in the average number of children of sterilized couples. Couples sterilized before and during the Emergency had families of about five children; for people sterilized after the Emergency, the average number of children had fallen to 4.25 (table 11).

A noteworthy feature of sterilization in Shanti Nagar is that parents used it not only

TABLE 10
**Woman's Age at Either Own or Husband's Sterilization, Shanti Nagar, 1954-1983**

| Age | Frequency | Cumulative Frequency | % | Cumulative % |
|---|---|---|---|---|
| 18 | 1 | 1 | 1.1 | 1.1 |
| 21 | 2 | 3 | 2.2 | 3.4 |
| 22 | 2 | 5 | 2.2 | 5.6 |
| 23 | 4 | 9 | 4.5 | 10.1 |
| 24 | 3 | 12 | 3.4 | 13.5 |
| 25 | 6 | 18 | 6.7 | 20.2 |
| 26 | 3 | 21 | 3.4 | 23.6 |
| 27 | 4 | 25 | 4.5 | 28.1 |
| 28 | 7 | 32 | 7.9 | 36.0 |
| 29 | 6 | 38 | 6.7 | 42.7 |
| 30 | 6 | 44 | 6.7 | 49.4 |
| 31 | 2 | 46 | 2.2 | 51.7 |
| 32 | 2 | 48 | 2.2 | 53.9 |
| 33 | 7 | 55 | 7.9 | 61.8 |
| 34 | 2 | 57 | 2.2 | 64.0 |
| 35 | 6 | 63 | 6.7 | 70.8 |
| 36 | 5 | 68 | 5.6 | 76.4 |
| 37 | 3 | 71 | 3.4 | 79.8 |
| 38 | 5 | 76 | 5.6 | 85.4 |
| 40 | 4 | 80 | 4.5 | 89.9 |
| 41 | 1 | 81 | 1.1 | 91.0 |
| 42 | 1 | 82 | 1.1 | 92.1 |
| 43 | 2 | 84 | 2.2 | 94.4 |
| 44 | 1 | 85 | 1.1 | 95.5 |
| 45 | 2 | 87 | 2.2 | 97.8 |
| 48 | 1 | 88 | 1.1 | 98.9 |
| 50 | 1 | 89 | 1.1 | 100.0 |

| | Total | 1954–1976[a] | 1977–1982[a] |
|---|---|---|---|
| N = | 89 | 60 | 29 |
| Mean age (years) = | 31.9 | 33.2 | 29.1 |
| Median (years) = | 31 | 33 | 28.5 |

[a] The division between the two periods, 1954–1976 and 1977–1983, was selected to approximate as closely as possible the date of March 21, 1977 on which the Emergency ended.

[7] A Hindu man cannot legally take a second wife, and the practice would be especially difficult for a government servant. However, the custom caused no adverse comment in Shanti Nagar, and there were six polygynous families in 1958–1959 and two in 1977–1978, one of which was headed by a man who was in government service.

TABLE 11
**Children of Sterilized Couples (Wife or Husband) by Sex and Time Period, Shanti Nagar**

| Period[a] | Couples | Sons | | Daughters | | Children | | Ratio Sons/ Daughters |
|---|---|---|---|---|---|---|---|---|
| | | No. | Mean | No. | Mean | No. | Mean | |
| 1954–1976 | 60 | 173 | 2.88 | 128 | 2.13 | 301 | 5.02 | 1.35 |
| 1977–1983 | 20 | 57 | 2.85 | 28 | 1.40 | 85 | 4.25 | 2.04 |
| Total | 80 | 230 | 2.88 | 156 | 1.95 | 386 | 4.83 | 1.47 |

[a] The division between the two periods was selected to approximate as closely as possible the date of March 21, 1977 on which the Emergency ended.

to limit family size but also to stop childbearing when they considered the ratio of their male to female children to be favorable. Sons are important and generally preferred to daughters for several reasons. Parents regard sons as their only dependable insurance against misfortune, poverty, and the disabilities of old age. The marriage of a son costs less than that of a daughter; whereas a daughter requires an expensive dowry, a son brings the dowry of his bride into the home of his parents. Moreover, parents may find it difficult to arrange a marriage for a daughter if there is no son, for it is a woman's brother who, after the death of his parents, is responsible for sending his sister the necessary gifts at festivals and events of the life cycle. A son also has ceremonial functions at the funerals of his parents. Descent in India is generally patrilineal, and so families and patrilineages are continued through sons. Finally, farming is hard labor, and, as a man enters middle age, he expects his sons to take over much of the work, he himself assuming more of a supervisory role.

It is important to note that sterilization cannot influence the sex of children. However, if either by random chance or active intervention, a couple has more sons than daughters, a sterilization operation makes the situation permanent, provided that there are no untimely deaths of sons. Relevant data are presented in tables 11 and 12. Although there are few couples, the data in table 11 suggest that the ratio of sons to daughters is increasing among sterilized couples. Table 12 is especially interesting. Unsterilized couples have a ratio of sons to daughters approximately equal to the ratio of the 1950s, while sterilized couples have a ratio that strongly favors males, suggesting either that female children have been undernumerated in both groups or that some couples, probably especially those that opt for sterilization, may have taken steps to produce a favorable ratio of sons and daughters. The sex ratios in the

TABLE 12
**Children by Sex of Sterilized Couples (Wife or Husband), of Unsterilized Mothers, and of All Mothers, Shanti Nagar, 1958-1959 and 1977-1978**

| Mothers | | Sons | | Daughters | | Children | | Ratio Sons/ Daughters |
|---|---|---|---|---|---|---|---|---|
| | | No. | Mean | No. | Mean | No. | Mean | |
| 1958–1959 | | | | | | | | |
| Sterilized | (N = 1) | 2 | 2.0 | 0 | 0 | 2 | 2.0 | — |
| Unsteril. | (N = 140) | 275 | 1.96 | 261 | 1.86 | 536 | 3.83 | 1.05 |
| Total | (N = 141) | 277 | 1.96 | 261 | 1.85 | 538 | 3.82 | 1.06 |
| 1977–1978 | | | | | | | | |
| Sterilized | (N = 68) | 191 | 2.81 | 141 | 2.07 | 332 | 4.88 | 1.35 |
| Unsteril. | (N = 192) | 376 | 1.96 | 352 | 1.83 | 728 | 3.79 | 1.07 |
| Total | (N = 260) | 567 | 2.18 | 493 | 1.90 | 1060 | 4.08 | 1.15 |

TABLE 13
**Sterilized Couples (N = 80) by Parity and Sex of Children, Shanti Nagar, 1983**

| | Sons | | | Daughters | | | Children | | |
|---|---|---|---|---|---|---|---|---|---|
| Parity | Frequency | % | Cumulative % | Frequency | % | Cumulative % | Frequency | % | Cumulative % |
| 0 | 0 | — | — | 10 | 12.5 | 12.5 | — | — | — |
| 1 | 8 | 10.0 | 10.0 | 24 | 30.0 | 42.5 | 1 | 1.2 | 1.2 |
| 2 | 25 | 31.2 | 41.2 | 22 | 27.5 | 70.0 | 3 | 3.8 | 5.0 |
| 3 | 27 | 33.8 | 75.0 | 17 | 21.2 | 91.2 | 15 | 18.8 | 23.8 |
| 4 | 14 | 17.5 | 92.5 | 3 | 3.8 | 95.0 | 21 | 26.2 | 50.0 |
| 5 | 4 | 5.0 | 97.5 | 1 | 1.2 | 96.2 | 16 | 20.0 | 70.0 |
| 6 | 1 | 1.2 | 98.8 | 1 | 1.2 | 97.5 | 11 | 13.8 | 83.8 |
| 7 | 0 | — | — | 2 | 2.5 | 100.0 | 7 | 8.8 | 92.5 |
| 8 | 0 | — | — | 0 | — | — | 1 | 1.2 | 93.8 |
| 9 | 1 | 1.2 | 100.0 | 0 | — | — | 3 | 3.8 | 97.5 |
| 10 | 0 | — | — | 0 | — | — | 2 | 2.5 | 100.0 |
| | N = 230<br>Mean = 2.88 | | | N = 156<br>Mean = 1.95 | | | N = 386<br>Mean = 4.83 | | |

2–7 and 7–12 year brackets of table 2 suggest that one or the other explanation, or both, must be considered.

The usual explanation for the preponderance of males in North India is the suspected mistreatment of female children (e.g., Miller, 1981; Chen, 1982, pp. 368–369; Simmons et al., 1982, pp. 373–375, 383–384, 387; Dyson and Moore, 1983, p. 51). They are said to be relatively deprived of such necessities as food, perhaps due partly to poverty. Because the village was more prosperous in 1977–1978 than in 1958–1959, we expected to find a more equal balance of males and females. That the disproportion had increased was a surprise. Circumstantial evidence points to mistreatment of female children. However, direct evidence is hard to find in Shanti Nagar; some neglect may be so subtle that it is difficult to observe and severe mistreatment is in all probability hidden from view.

In any case, parity-specific fertility limitation in Shanti Nagar appears to be significantly influenced by the sex ratio of a couple's children. An idea of how this gender-influenced parity-specific fertility limitation works can be gained from table 13. No couple was willing to be without a son, and only 10 percent would accept fewer than two. A minority of 41 percent of the sterilized couples were satisfied with one- or two-son families. Couples felt safe with three sons; the largest percentage of sterilized couples (34%) had three sons, and 75 percent of the couples had three sons or fewer. The average number of sons was 2.88. Sterilized couples had an average of 1.95 daughters, about one daughter fewer than sons. Thus, 12.5 percent had no daughters, 30 percent only one, and 27.5 percent had two. Seventy percent of the couples were satisfied with at most two daughters. The mode for daughters was one as compared to a mode of three for sons. The apparent parity-specific fertility limitation of about three sons led to families of about five children.

In view of the desire for sons, it is worth speculating about the effects on the sex ratio if amniocentesis linked with selective abortion were ever to become widely used in India. Doranne Jacobson (personal commun.) reports that amniocentesis is being used by urban middle-class couples in India. To the best of our knowledge, it was unknown in Shanti Nagar when we were last there. That the sex ratio among sterilized couples is not higher than the current figure is because, in seeking to have two or three sons, a mother may give birth to several largely unwanted daughters. The birth of such daughters could be prevented by testing for the sex of the fetus and then aborting unwanted females. Such a scenario would produce another kind of "population problem" for India and could force legal remedies or lead to adjustments

in family structure, such as an increase in the number of celibate males.

The information collected in open-ended interviews, which confirms the conclusions that can be drawn from an analysis of the demographic data, involves personal experiences and attitudes that broaden considerably our understanding of sterilization and contraception in Shanti Nagar. Thirty-five interviews were held, in some of which more than one person participated. Of the 35 principal respondents, 25 (or their spouses) had been sterilized. Various motives for having the operation were cited, but the expense of raising children was overwhelmingly the main reason. Eleven respondents mentioned general expenses, another nine cited specifically educational expenses, nine respondents commented that parents cannot care properly for too many children, and two people alluded to the custom of expensive dowries. The only other motives for sterilization mentioned by more than two respondents were a wife's physical problems (five respondents) and governmental pressure (eight respondents). Two people mentioned the attractiveness of governmental payments for being sterilized, and one woman and one man had the operation apparently on impulse.

The foregoing responses focus attention on the cost of raising children as an important factor in decisions to limit fertility. If the costs of children exceed the benefits to be derived from them, then parents will be inclined to undergo sterilization to limit the size of their families. Attempts have been made to analyze the cost–benefit ratio of children in South Asia and a fair amount of commentary has been devoted to the topic. Cain (1977, pp. 201, 224) studied the economic activities of children in a village of Bangladesh and found that ". . . male children may become net producers as early as age 12, compensate for their own cumulative consumption by age 15, and compensate for their own and one sister's cumulative consumption by age 22," concluding that ". . . from the perspective of parents . . . high fertility and large numbers of surviving children are economically 'rational' propositions." However, he comments that children do not work as long hours in India as in Bangladesh and that the costs of raising children in India are higher (Cain, 1981, pp. 466–467).

Nag (1981, p. 240) cites an analysis of a village in the Union Territory of Delhi which indicates a decline in the need for agricultural labor in the last two decades and therefore a lessening in the value of child labor. Associated with these developments was an increase in employment opportunities that required an educational qualification. The parents aspired to better jobs for their children and began to prefer fewer, more educated children to more numerous, uneducated offspring (cf. Tilly, 1978, p. 36). According to Nag (1983, pp. 58–59), modernization generally reduces the labor value of children.

From their study of nine villages in Karnataka, Caldwell, Reddy, and Caldwell (1982, p. 715) report that ". . . the value of children ceased rising linearly with their numbers for three reasons: the value of their work declined; the cost of keeping them rose; and the maximum return from a child necessitated more investment in each than most parents could afford for a large number of children." The choice for Indian parents, according to these authors, was ". . . between an unlimited number of children with a lower level of schooling and a limited number with a higher level" (Caldwell, Reddy, and Caldwell, 1982, p. 700).

The value of the labor of children is not the only factor that parents need to take into account when considering sterilization: there are also the questions of protection against the hazards of life and maintenance in their old age. Although Cain denies the value of children as risk insurance under current conditions in India, his analysis uses an index of distress, land sales, which is relatively insensitive. He observes ". . . the absence of distress sale of land under any circumstances prejudges the results of such an analysis for the three Indian villages, and the grim experience of women who were widowed at early stages in their family cycle anticipates the findings [for Bangladesh where] . . . few alternatives to the security that children provide exist" (Cain, 1981, pp. 466–467).

Poffenberger's (1975, 1976) studies of attitudes about large and small families underscore the importance of economic concerns. Informants could give more reasons that favored the small over the large family, usually citing economic advantages (Poffenberger, 1976, p. 63). Poffenberger (1976, p. 65) ob-

serves, however, that "When they talked of a large family, they were thinking primarily of the advantages to be gained later in the life cycle when fathers could no longer work or when mothers might be widowed and this one variable may be more significant than all the low fertility motives together." Poffenberger (1975, p. 60) also notes that many informants who could suggest more advantages for small rather than large families themselves wanted four or five children, and many respondents who favored a "small" family were thinking specifically of three children with two of them sons.

The Shanti Nagar data concerning family limitation are in general agreement with those from elsewhere in India. The disadvantages of unrestrained fertility are widely recognized, but families of four or five children, at least two of them sons, are still desired. To the extent that the cost of raising children influences the parity at which family limitation becomes acceptable, the Government of India could exercise indirect influence by shifting more of the cost of child-raising from the state to the family. Such a step, however, would be contrary to current policy which is to provide basic educational and health services at little or no cost (Nag, 1983, p. 61). The sensitive issue of the care of elderly parents would, in any case, be difficult to resolve. Pensions are available only to a minority of Indians. Agricultural workers and individuals involved in petty trade and crafts are largely without pensions, provident funds, and the like. They must depend on their children, chiefly sons, for support in their old age.

Eight respondents discussed reasons for not being sterilized or for postponing the operation. Six of the eight cited an insufficient number of sons, and another was concerned with possible complications after surgery. One woman with three sons was postponing sterilization in hopes of having a daughter. She thought that there should be at least one girl in a family so that brothers would have a sister for ritual reasons, for example, to tie the traditional charm on their wrist at the festival of Rakhi Bandhan. She added that a daughter helps her mother more than a son. She said, however, that if her next child were a boy then she would be sterilized without trying once more for a daughter.

Twenty-two respondents offered information as to the timing of the operation. One husband was sterilized while his wife was pregnant. Ten sterilizations took place within one month after the birth of the last child. Eight operations occurred one or more years after the last birth. Three sterilizations were performed from one to 10 months after the last childbirth, that is, just before the end of what one respondent called the "safe period," which is the approximately 11-month amenorrheic period.

A full discussion of postpartum amenorrhea and lactational amenorrhea (the total duration of postpartum amenorrhea as prolonged by lactation) is beyond the scope of this essay but a brief account is in order because villagers generally thought that there was little or no possibility of conception during the period of amenorrhea. In fact, ovulation can occur as early as the 36th postpartum day (Perez et al., 1972, p. 1041) and the possibility of conception increases thereafter during the amenorrheic period although it remains lower than during the time that a woman is in her menstrual cycle. Ovulation can take place before the menstrual cycle begins again after childbirth (Potter, Kobrin, and Langsten, 1979, p. 151). One of our informants reported that his wife became pregnant before her menstrual cycles returned, much to their surprise.

Lactational amenorrhea is a hormonal phenomenon that can be somewhat lengthened or shortened by cultural practices affecting breast-feeding. During the latter half of pregnancy, the level in the blood of the pituitary hormone, prolactin, increases to about 10 times its pre-pregnant value. In the human female, prolactin stimulates milk secretion and enhances amenorrhea and infertility. "[T]he basal serum prolactin level returns to the prepregnant value within less than three months. However, whenever the infant sucks at the breast there is a pronounced surge of prolactin into the maternal system, the magnitude of which appears to vary with the intensity of the stimulus . . . . [Prolactin] also inhibits estrogen production by the ovaries . . . thereby preventing menstruation and ovulation. During lactation, the amount of prolactin secreted is strongly correlated with the duration of amenorrhea . . . ." (Harrell, 1981, pp. 797–798, quote on p. 798). Simp-

son-Hebert and Huffman (1981, p. 126) comment that ". . . the natural protection afforded by lactational amenorrhea is about as use-effective as that offered by [many] contraceptives and more effective than [some]" and Tietze (in Harrell, 1981, p. 800) states that for up to 10 months breast-feeding is a more reliable contraceptive than any other method in the hands of an inexperienced rural population.

An appraisal of the duration and contraceptive effectiveness of lactational amenorrhea is not a simple matter, for it depends on the frequency and duration of periods of breast-feeding, the intensity of the suckling stimulus, and may be related to a mother's nutritional status, nutritional deprivation being correlated with prolonged amenorrhea (Harrell, 1981, p. 798; Frisch, 1982, p. 1272). Physical exercise and hard physical labor also can promote amenorrhea (Harrell, 1981, p. 805; Frisch, 1982, p. 1273). Harrell (1981, p. 798) suggests that a partial explanation of the correlation of nutritional deprivation and prolonged lactational amenorrhea may be due to the fact that as nutritional status declines more prolactin is necessary to produce a given quantity of milk. Bongaarts (1982, p. 1273) notes, however, that "One explanation for shorter amenorrhea among mothers with better diets is that they have more food available to supplement their infants, who are then satisfied with shorter and less intense periods of breast-feeding." He offers an alternative explanation that infants of poorly nourished mothers, whose ability to produce milk is reduced, must suckle more vigorously than infants of well-nourished mothers to obtain an equivalent amount of nourishment. These various explanations appear to be in accord with the present understanding of the determinants of lactational amenorrhea, differing mainly on which factor is emphasized.

In Shanti Nagar, children were generally nursed on demand, slept with their mothers until weaned which permitted them conveniently to nurse at night, and were usually weaned between two and three years of age. When nursing continued beyond the age of two, which happened more often for boys than for girls, it was because no new infant had been born. A mother with insufficient milk would supplement her infant's diet with buffalo milk. Children who received supplemental milk appeared to be plumper and healthier than breast-fed children. Relatives sometimes served as wet nurses. If an infant died soon after birth, its mother, who was still lactating, might help a sister-in-law with supplemental feeding for her infant. When teething first began, infants were given soft foods to suck and chew; and at the age of one year, infants began to sit with family members at regular mealtimes and were given food from their plates. Thereafter, nursing on demand gradually tapered off and fitted into the schedule of meals of the family. As supplementary food increased, the periods between nursing gradually widened; by the age of two, a child would eat practically anything consumed by other family members and had largely adapted to the meal schedule of its family (R. Freed and S. Freed, 1981, pp. 58–60). Although these general observations provide no quantitative data concerning matters such as the intensity of the suckling stimulus, they suggest that by the age of one year supplemental feeding served to increase the interval between periods of nursing and, probably, to lessen the length and intensity of each episode of breast-feeding.

The duration of lactational amenorrhea may have slightly lessened from the 1950s to the 1970s because of the possibility that nutritional status and hard physical work can affect it. The greater prosperity that was general in the village in the 1970s was expressed in a better diet for most families. Because of the modernization of agriculture and the introduction of electricity, women had less hard work to do. For example, winnowing was done by machine; formerly, women winnowed grain by lifting it in baskets above their heads and allowing it to fall to the ground, the wind separating the chaff and grain. Most women no longer had to draw water from the village well and carry it home, for handpumps were liberally distributed throughout the village. Many women ground less grain by hand than formerly because they had access to power-driven grist mills. Women still worked hard for long hours, but some tasks that formerly demanded impressive strength and stamina were to a considerable extent done by machines. In view of these economic changes, it is unlikely that the average period of postpartum amenorrhea was the same at both periods. Although we lack data that might

decide the question, duration of postpartum amenorrhea was probably slightly less in the 1970s than in the 1950s.

The average period of lactational amenorrhea of Shanti Nagar was probably about 11 months in the 1950s, an assumption based on the findings of the Khanna Study that was carried out in Punjab from 1954 to 1959. Because the rural populations and cultures of Punjab and the Union Territory of Delhi are similar, the Punjab data concerning postpartum amenorrhea can be cautiously applied to Shanti Nagar. The Khanna Study's estimated mean length of postpartum amenorrhea of 11 months (Potter et al., 1965a, p. 1137) seems to agree well with the duration of intensive breast-feeding in Shanti Nagar.

Concerning the number of children desired before being sterilized, the interviews support the inference that couples generally think, first, in terms of sons and, second, about the number of their daughters. The interviewed parents had an average of 2.8 sons and 2.2 daughters. People generally wanted at least two sons; having only one son was risky, for he could die. Some couples postponed sterilization hoping for a second son. However, such couples were generally not willing to postpone the operation indefinitely. For example, a woman with two daughters and one son was going to try for a second son at the insistence of her husband's mother; but while pregnant with her last child, she had already decided on sterilization no matter what the sex of the child. She had her operation 14 days after the birth of the hoped-for second son. She said "Four children are enough, more than enough." She never used birth-control methods because she wanted children. Then she decided to be sterilized "to finish the problem once and for all."

Another woman with only one son was less fortunate in achieving the security of a second son. She had given birth to four daughters in succession and then one son. She said that she would have been sterilized earlier had she had sons initially and not girls. Neither she nor her husband had been sterilized and they used no method of birth control, for they wanted one more son. She felt that her present son was weak and she worried about his health. The dilemma the couple faced, of course, was that a sixth child might be a girl. In that case, should they risk a seventh pregnancy hoping for the elusive second son?

Fourteen parents offered spontaneous comments about how many children were "enough." The average was 3.8 children. Only a few people specified the number of sons and daughters that were "enough," but even these few figures confirm the general picture that people think in terms of two sons and one daughter. Six respondents mentioned a "desired" number of children before being sterilized, which averaged 3.3 children—two of them sons. Seven respondents extolled the "small family" without citing a specific number of children.

The sterilization of a person with only one son was unusual enough to suggest that such a case might involve rather special circumstances. For example, a man with three daughters and one son was sterilized during the Emergency. His wife said, "He was forced to get the operation done because he has a government job. They threatened to remove him from the job so he had to get himself operated." Neither husband nor wife wanted the operation, "because we have just one son." People later suggested the possibility of having the operation reversed, but the wife replied that she did not want it attempted because she did not want to risk her husband's life. The couple never used other birth-control methods because they wanted more sons. The wife commented that three daughters were enough, pointing out that dowries were a problem.

Seven persons mentioned 10 specific cases of sterilization owing to governmental pressure. All but one sterilized individual held a government job, seven of the 10 were low caste, and eight were men. They feared loss of employment or complained that their salaries were withheld until they had undergone the operation. The incentives offered by the government were cash payments, usually on the order of Rs. 100 (about $US 10.00 at the current rate of exchange). Other incentives were mentioned, such as sewing machines in addition to cash, but such gifts were never confirmed in any particular instance. One respondent mentioned two attempts to bribe doctors to issue false certificates of sterilization, but only one alleged attempt was said to have been successful, and our informant

was not a member of the couple reportedly involved. There were reports of complications after sterilization: one man reported an occasional shooting pain in his penis; the wife of another man complained that he became generally (not just sexually) weak, whereas he had been normal before the operation; and several women reported weakness and some unusual bleeding and menstrual activity.

In most cases both husband and wife were finally in favor of the operation although in some instances one or the other felt that their children, usually sons, were too few and wanted to delay the operation. Only twice did a relative other than the husband or wife, in each case a husband's mother, exert pressure to prevent or delay sterilization. Considerations of health or fear of unpleasant aftereffects did not appear to prevent couples from having a sterilization operation although such matters could influence the choice of the individual, husband or wife, who would undergo it. For example, one husband was sterilized rather than his wife because she was "weak"; some wives underwent the operation rather than their husband because of his "weakness."

Sixteen of the more than 35 respondents said that they used contraceptive techniques. Seven of the 16 mentioned only abstention or the rhythm method, both of which are considered to be risky and ineffective. The method most often used was the condom (*nirodh*); five persons mentioned using it. However, a number of individuals objected to the use of condoms although they were widely distributed in the village by the government nurse-midwife and by health visitors. Some people threw them away or buried them in an effort to keep them from children who used them as balloons. In fact, a colloquial term for condom was balloon (*gubbara*). Some people claimed not to know how to use the condom. A few people had tried foam tablets, the loop, or the Copper T, the latter two generally proving to be unacceptable because of the pain and bleeding that they caused. More than half (19) of the respondents explicitly stated that they did not use birth-control methods (other than sterilization).

One woman had an abortion in a hospital and four other women made unsuccessful attempts using as abortifacients various medicines and injections obtained from a doctor in a large neighboring village or a folk remedy known as *karha,* a decoction whose basic ingredient was almost always carrot seeds, which are said to be "very hot" and to burn anything in the womb. However, the most elaborate recipe that we obtained omitted carrot seeds: the ingredients were brown sugar (gur), tea leaves, two kinds of millet (jowar and bajra), and fenugreek seeds (methi) which were boiled and concentrated in water. The decoction was allowed to cool and then drunk. A man described another folk abortifacient, a mixture of mustard oil and opium that was rubbed on the body near the ovaries, but no woman mentioned having used it. We did not learn of a single case in which a folk medicine actually produced an abortion. None of our respondents reported any self-induced mechanical means of abortion. After checking our interviews conducted in 1977–1978 with the sterilization survey of 1983, we are of the opinion that the rate of abortion was probably higher than is indicated by the sample of 35 respondents from the survey. It is particularly noteworthy that one woman, who in 1977–1978 reported having had an abortion, forcefully denied having had one in her interview of 1983, characterizing abortion as a sin.

Although the interviews varied a good deal because of the particular personal experiences of the respondents, their different points of view, and the subjects that they chose to emphasize, it is worth reproducing the major part of one interview, lightly edited, to give an idea of the general flavor. In 1983, the respondent was a 32-year-old nonliterate woman with three sons and one daughter. Four of her children had died: a boy and a girl within 12 days of birth, and two daughters by the age of about two years. Her husband, 38 years old, was a government employee who received a low rate of pay. The family lived in relative poverty.

> I was sterilized in a hospital in Delhi in 1983. I went to the hospital two days after the death of my last infant daughter [who died 12 days after being born]. The government nurse-midwife suggested that I have the operation; however, my husband and I had already decided to do so because we did not want any more children. The doctors refused to operate at first be-

cause I was very weak and anemic, but then I was admitted to the hospital eight days before the operation and stayed for another eight days after the operation.

I had unusually heavy bleeding after my last child was born. Even now whenever I menstruate I have excessive bleeding and also leukorrhea. After the operation I did not do any work for six months. Only in the last two months have I started doing some work in the house. Both my husband and I are very weak, but I did not let my husband have the sterilization because he has to go out and work. I only have to be in the house and can rest more than he can. I did not want any more children, because so many died and I was physically very weak. My last infant daughter died of tetanus.

My husband always said that one of us would have the operation. He was not in favor of using any of the other methods like condoms or the loop. The government nurse would at times come and give us pills, but my husband did not think that these things were good, and so he did not let me take them. He is more educated and knows better what is right and what is wrong. Whatever he says is right. I have a radio and have heard on the radio that it is not necessary to have an operation to control birth.

You can use other birth-control methods too—like some injections. But I have never used any such methods. I am scared of using them. I heard long ago that [so-and-so] had a loop inserted but it harmed her so much that she was about to die. She finally had to get it removed and then have a sterilization operation. Also [another woman], even after using a birth-control device, became pregnant. She had a daughter and then was sterilized. Sterilization is the safest method.

I have heard elders say that if you don't sleep with your husband for eight days after the menses, then you don't conceive. I tried that also but nothing worked. I don't sleep with my husband every day. At times we don't sleep together for 10 to 15 days in a row. Our children are grown up now and it doesn't look good. When I was young and newly married, then we would sleep together every day because we wanted children.

There is no age to stop having children, but in the olden days, women had children after three or four years. But now after one or two years there is a child. So they have more children these days and it is very difficult to take care of so many children. They want the best to eat and wear so it becomes difficult with big families. In olden days, women did not sleep with their husbands so often and so did not have very many children. Even if they had many children, the gap between the children would be at least three to four years. So sterilization is the easiest method and also the safest.

This woman expressed several themes that are rather common in our open-ended interviews. The influence of government policy as represented by the suggestion of the government nurse and by radio broadcasts is noteworthy. In this case, both the husband and wife already wanted to end childbearing and they needed no particular urging. Their motives were among those commonly invoked: the expense of raising many children and the physical weakness of the wife. The wife's reasons for undergoing the operation rather than her husband rested on practical personal considerations, as was typical, rather than on a judgment as to whether vasectomy or tubectomy was the more difficult surgical procedure. Westerners often point out that vasectomy is simpler and less dangerous than tubectomy and that, therefore, in most cases the husband should have the operation. The villagers typically evaluate the relative strength and health of husband and wife in making their decision rather than the danger and complexity of the surgical procedures.

This respondent regarded all birth-control measures except sterilization as unreliable and/or dangerous, a widely shared point of view. Villagers considered sterilization to be the surest and safest method. Many women mentioned contraceptive injections; it was said that a woman could go to a hospital and ask a doctor for an injection that would prevent pregnancy for a specific period of years, to a maximum of five. Although many women mentioned such injections, we never learned of a woman who actually had one.[8]

Finally, this woman believed that the in-

[8] We are not aware of any injection that can prevent pregnancy for several years, but injections of Medroxy Progesterone Acetate (Depo Provera) are said to provide effective contraception for periods of several months. Women receive injections at intervals of three months. The side effects of the drug are cause for concern, and it was banned in the United States in 1978, although it is still being used in other countries (Sandler, Myerson, and Kinder, 1980, p. 112). Nag (personal commun.) believes that it has not been approved for general use in India, an opinion in accord with a comment by Visaria and Visaria (1981, p. 1772). See also Sun (1984).

terval between successive births had lessened, and that marital sexual activity was formerly less frequent than at the present time. Two other respondents also held the latter opinion and cited two reasons: the smaller, more crowded houses of those days made it difficult for couples to find opportunities for privacy (cf. Nag, 1972, p. 236) and, second, during the lengthy visits that wives made to their parents' home there was no possibility of marital sexual activity and therefore almost no possibility of conception. However, such visits are still the custom and privacy remains a problem for some couples, especially during the winter when everyone sleeps indoors. Five respondents discussed the spacing of children. They felt that a birth interval of at least two or three years was better for the health of mothers than a shorter interval and that, in addition, it reduced a mother's work. Two- or three-year-old children require less care than infants and a mother would then be able to devote more attention to her newborn. Moreover, a child of five years is old enough to help its mother care for a newborn.

## STERILITY

Two factors that affect fertility are the proportion of women who marry and the proportion of married women who are sterile. In Shanti Nagar and adjacent rural regions, it was a parental obligation to see that all daughters were eventually married. The force of this obligation can be observed in the census data: in 1958–1959, there were no women who had never been married older than 15 years, and in the 1970s, none older than 20 years. Despite the possibility of a rare exception to the rule, most women were married in time to begin childbearing by the age of about 20 years. Potential sterility can be estimated from the roster of childless married women. In the 1950s, there were 29 childless daughters-in-law whose mean age was 20.1 years, and 12 childless married daughters (temporarily living in their parental houses) whose mean age was 16.5 years. In the 1950s, the mean age at the birth of the first surviving child was 19 years. Eleven of the daughters-in-law and two of the daughters were older than 19 years. If we assume that 25 years marks an age when sterility becomes a strong possibility, only five women qualify, and only one of them was certainly barren, a woman of 48 years of age. The other four were still in their twenties.

An analysis of the data from the 1970s yields similar results. The mean age of 24 childless daughters-in-law was 21.6 years, and 24 childless married daughters had a mean age of 17.9 years. The mean age at first birth in the 1970s was 19.7 years. Twelve of the daughters-in-law and seven of the daughters were 20 years of age or older. If we again assume that 25 years is the minimum age at which barrenness becomes a strong possibility, only four of the women qualify; and only three of them were past their twenties.

Although these figures suggest extremely low rates of sterility, on the order of 2 percent of ever-married women, they agree well with the sterility rates reported in the Khanna Study (Wyon and Gordon, 1971, p. 163). Mandelbaum (1974, p. 34, note 6) suggests that such low sterility rates may be due to the custom of tacitly permitting sexual relations between a married woman and her husband's younger brothers; he writes "The low sterility rate may thus represent the effects of female sterility only, not that of male and female combined, as in most statistics on sterility, since the fraternal sharing may cancel out the effects of a husband's sterility." This sexual practice was also mentioned by the government nurse-midwife. In Shanti Nagar, the relationship of older brother's wife and husband's younger brother did have overtones that foreshadowed the levirate (S. Freed and R. Freed, 1976, pp. 68–69, 75), which was practiced to some extent by all the populous castes of the village, but it would be impossible to estimate the frequency of sexual relations between women and their husbands' brothers, for such occurrences were illegal and would not become public knowledge unless a woman's parents brought a case to court. In any case, however, sterility appears to have little effect on fertility in Shanti Nagar.

# MULTIPLE REGRESSION ANALYSIS OF SURVIVORSHIP AND SELECTED SOCIAL VARIABLES

The method used above to analyze fertility, which was based on the child–woman ratio, involved the cross-tabulation of cases in terms of several variables. It has two noteworthy limitations. First, the analytical potential of variables that can be measured on interval or ratio scales cannot be fully realized. For example, landownership was treated by comparing landless and landowning families; but the quantity of land held by each family, which had been recorded in our survey data, was not used. It would have been possible to use it by creating a series of small intervals and tabulating families by those intervals, but the relatively few cases in many of the intervals would have reduced confidence in the analysis. The second weakness concerns the problem of introducing control variables. For example, the comparison of literate and nonliterate villagers requires only two categories; but to compare literate and nonliterate villagers while controlling for landownership requires a cross-tabulation based on two variables resulting in a distribution of the available cases among four categories. Additional control variables would create more categories, thus producing a substantial reduction of average cell frequencies. If one is cross-tabulating a relatively modest number of cases, cell frequencies are often reduced to the point where conclusions become rather tenuous when one attempts to handle several variables simultaneously.

Multiple regression analysis, involving the calculation of partial correlation coefficients, is a commonly used technique to establish a linear relationship between a dependent variable and several independent variables, a by-product of which is that one can isolate the effect of any one independent variable, or combination thereof, on the dependent variable. In contrast to cross-tabulation which requires sorting the raw data into categories, multiple regression handles control variables by statistically removing their effects from the relationship between independent and dependent variables. Multiple regression requires variables that are measured on interval or ratio scales, but this restriction is not absolute and even nominal variables can be incorporated into the analysis (Nie et al., 1975, p. 321). Calculations were carried out using programs from the Statistical Package for the Social Sciences (SPSS) (Nie et al., 1975), SPSS$^x$, and Statistical Analysis System (SAS). The variables used in our analysis are number of living children; age and education, both measured in years; landownership measured in bighas (one acre = 4.8 bighas; one hectare = 11.9 bighas); caste rank measured on an ordinal scale of eight caste blocs; urbanization in terms of two categories, urbanized and traditional persons; and sterilization by two categories: sterilized and unsterilized individuals.

Missing data are handled by the so-called list-wise deletion option which means that the absence of any item of data for a specific ever-married woman eliminates her from all calculations. Thus, all computations are based on the identical population. For example, if the urban status of a woman's husband is unknown, she cannot be included in the calculation of the regression coefficient between age and number of living children, even if we know her age and her number of living children, the two variables involved in the calculation. Although list-wise deletion results in a substantial reduction in the number of cases, there are strong statistical reasons for using it in preference to other options (Nie et al., 1975, p. 353).

The ever-married women who were deleted from the regression analysis fall into two general groups. One group consists of older women, often widows, for whom we have incomplete information about the number of their children. The second group is composed of women for whom we lack information concerning one or several of the other variables, for example, the education of their husbands. Many of the women in this group were young married daughters of the village still living in their natal households. Their husbands were residents of other villages (villages are exogamous), and we usually col-

TABLE 14

**Partial Regression Coefficients for Selected Variables and Number of Living Children of Ever-Married Women, Shanti Nagar, 1958-1959[a] and 1977-1978[b]**

| Row | Variable[c] | Unstandardized Partial Regression Coefficients | | Standardized Partial Regression Coefficients | | *t* ratio | | Probability[d] | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1958–1959 | 1977–1978 | 1958–1959 | 1977–1978 | 1958–1959 | 1977–1978 | 1958–1959 | 1977–1978 |
| 1 | Age | .14 | .13 | .59 | .61 | 8.32 | 10.96 | .0001 | .0001 |
| 2 | Caste | .03 | .07 | .03 | .08 | .40 | 1.63 | .69 | .10 |
| 3 | Land | −.002 | .001 | −.08 | .03 | −1.07 | .64 | .29 | .52 |
| 4 | School | −.15 | −.03 | −.08 | −.04 | −1.11 | −.78 | .27 | .43 |
| 5 | Urbanized | — | .78 | — | .08 | — | 1.93 | — | .06 |
| 6 | Sterilized | — | 1.48 | — | .26 | — | 6.01 | — | .0001 |
| 7 | Head urb. | .43 | −.85 | .09 | −.17 | .99 | −2.72 | .33 | .01 |
| 8 | Head sch. | .003 | .06 | .004 | .13 | .05 | 2.12 | .96 | .03 |
| 9 | Husband urb. | −.14 | .73 | −.13 | .14 | −.32 | 2.24 | .75 | .03 |
| 10 | Husband sch. | −.07 | −.06 | −.03 | −.13 | −1.44 | −1.64 | .15 | .10 |

[a] For the 1958–1959 data, the estimated intercept is −.81. The overall $r^2$ is .46. The $F$ ratio is 14.8, indicating that the null hypothesis that $r = 0$ (or that $B_1 = B_2 \ldots = B_n = 0$) can be rejected at the .0001 level. After list-wise deletion of cases owing to missing data, 146 women and 470 children are included in this analysis.

[b] For the 1977–1978 data, the estimated intercept is −.98. The overall $r^2$ is .55. The $F$ ratio is 32.65, indicating that the null hypothesis that $r = 0$ can be rejected at the .0001 level. After list-wise deletion of cases owing to missing data, 276 women and 1042 children are included in the analysis.

[c] The variables are: 1) age of the woman, 2) her caste rank, 3) amount of land owned by her husband's family, 4) her years of schooling, 5) her urbanized or traditional status, 6) sterilization of the woman or her husband, 7) her family head's urbanized or traditional status, 8) her family head's years of schooling, 9) her husband's urbanized or traditional status, and 10) her husband's years of schooling.

Castes are ranked by an ordinal scale of eight caste blocs, from high to low, as follows: 1) Brahman Priest, 2) Baniya Merchant, 3) Jat Farmer and Bairagi Beggar, 4) Khati Carpenter, Jhinvar Waterman, Lohar Blacksmith, and Mali Gardener, 5) Chhipi Dyer, 6) Mahar Potter, Gola Potter, and Nai Barber, 7) Chamar Leatherworker, and 8) Chuhra Sweeper.

Land was measured in bighas (1 acre = 4.80 bighas; 1 hectare = 11.86 bighas). The amount of land owned by each landowner in 1977–1978 was scored as the exact number of bighas; for the 1958–1959 data, land was recorded by 16 intervals (none, 0–5, 6–10, 11–15 bighas, and so forth) and each landowner was scored at the midpoint of the interval in which he fell.

Ages of women in 1958–1959 were scored as their chronological ages at the time of the census. For the 1977–1978 period, ages were modified as follows: the ages of women who were sterilized (or whose husbands were sterilized) were taken to be the age at sterilization; women older than 55 years were scored as 55; the ages for nonsterilized women 55 years or younger were their chronological ages at the time of the census.

[d] These probabilities are two-tailed.

lected no information about these nonresident males when we took our census of the people of Shanti Nagar.

Twenty-six of the ever-married women of 1958–1959 are not included in the regression analysis because we lack their reproductive histories and 36 women were excluded because of other missing data; thus, 146 of the 208 ever-married women are included in the regression analysis. For the 1977–1978 data, the figures are 18 women omitted because of our inadequate knowledge of their reproductive histories and 32 women excluded owing to other missing data; thus, 276 of the 326 ever-married women are used in the regression analysis. The missing data largely reflect the fact that the analysis is based on censuses rather than on information collected specifically for a fertility analysis. A census focuses principally on the people of the unit being censused, in this case a single village. A fertility study would include people living out-

TABLE 15

**Partial Regression Coefficients for Selected Variables and Number of Living Children of Mothers, Shanti Nagar, 1958-1959[a] and 1977-1978[b]**

| Row | Variable[c] | Unstandardized Partial Regression Coefficients | | Standardized Partial Regression Coefficients | | *t* ratio | | Probability[d] | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1958–1959 | 1977–1978 | 1958–1959 | 1977–1978 | 1958–1959 | 1977–1978 | 1958–1959 | 1977–1978 |
| 1 | Age | .13 | .12 | .56 | .60 | 7.01 | 9.58 | .0001 | .0001 |
| 2 | Caste | .07 | .08 | .08 | .09 | .93 | 1.80 | .35 | .07 |
| 3 | Land | −.003 | .001 | −.11 | .02 | −1.23 | .38 | .22 | .71 |
| 4 | School | −.06 | −.05 | −.02 | −.08 | −.28 | −1.39 | .78 | .17 |
| 5 | Urbanized | — | .90 | — | .10 | — | 2.16 | — | .03 |
| 6 | Sterilized | — | 1.28 | — | .25 | — | 5.18 | — | .0001 |
| 7 | Head urb. | .85 | −.70 | .19 | −.15 | 1.69 | −2.11 | .09 | .04 |
| 8 | Head sch. | .04 | .05 | .06 | .12 | .55 | 1.72 | .58 | .09 |
| 9 | Husband urb. | −.59 | .51 | −.03 | .10 | −1.13 | 1.44 | .26 | .15 |
| 10 | Husband sch. | −.01 | −.04 | −.13 | −.08 | −.26 | −.94 | .80 | .35 |

[a] For 1958–1959, the estimated intercept is −.47. The overall $r^2$ is .37. The $F$ ratio is 8.25, indicating that the null hypothesis that $r = 0$ (or that $B_1 = B_2 \ldots = B_n = 0$) can be rejected at the .0001 level. After list-wise deletion of cases owing to missing data, 122 mothers and 470 children are included in this analysis.

[b] For 1977–1978, the estimated intercept is −.49. The overall $r^2$ is .50. The $F$ ratio is 24.24, indicating that the null hypothesis that $r = 0$ can be rejected at the .0001 level. After list-wise deletion of cases owing to missing data, 253 women and 1042 children were included in the analysis.

[c] See table 14, note *c*.

[d] See table 14, note *d*.

side the unit being studied, for example, husbands living in many different villages, if such information were pertinent to the analysis. That 85 percent of the ever-married women of Shanti Nagar were included in the analysis of the 1970s and only 70 percent in that of the 1950s is due to some extent to the fact that data not collected in the census of the 1970s could be partly supplied from the census of the 1950s. A similar option was not available for the census of 1958–1959; we had no earlier census information to use as a supplement.

Partial regression coefficients of the surviving children of ever-married women and selected variables are presented in table 14; table 15 is a similar computation for mothers. In these two tables, the number of children is taken as the dependent variable and the other variables, with the exception of sterilization, are conceived of as independent. Tables 16 and 17 concern partial regression coefficients of sterilization and selected variables for ever-married women and mothers, respectively, where sterilization is designated the dependent variable and the others are taken as independent variables.

The regression coefficient (*B*) is the slope of the least-squares line relating two variables, for example, a woman's age and the number of her living children. These regression coefficients in tables 14 to 17 are partial because in the calculation of each one of them all the other variables are held constant. For example, the coefficient of .14 in table 14, row 1, column 1, means that on the average an ever-married woman has an additional .14 children as she ages one year, all other variables held constant. The probabilities in the last two columns of tables 14 to 17 test the null hypothesis that the regression coefficient is equal to zero.

The standardized regression coefficients permit the comparison of the effects of independent variables on the dependent variable, an evaluation that cannot sensibly be made using the original measurements because the units are different (for example,

TABLE 16
**Partial Regression Coefficients for Selected Variables and Sterilization of Ever-Married Women (or Their Husbands), Shanti Nagar, 1977-1978[a]**

| Row | Variable[b] | Unstandardized Partial Regression Coefficients | Standardized Partial Regression Coefficients | *t* ratio | Probability[c] |
|---|---|---|---|---|---|
| 1 | Age | −.005 | −.15 | −1.69 | .09 |
| 2 | Caste | −.02 | −.09 | −1.38 | .17 |
| 3 | Land | −.0004 | −.05 | −.84 | .40 |
| 4 | School | .001 | .01 | .17 | .86 |
| 5 | Urbanized | .06 | .04 | .60 | .55 |
| 6 | Living children | .06 | .34 | 4.31 | .0001 |
| 7 | Head urbanized | −.10 | −.11 | −1.29 | .20 |
| 8 | Head school | .01 | .17 | 2.05 | .04 |
| 9 | Husband urbanized | .21 | .22 | 2.65 | .01 |
| 10 | Husband school | −.003 | −.04 | −.36 | .72 |

[a] The estimated intercept is .14. The overall $r^2$ is .15. The $F$ ratio is 4.79, indicating that the null hypothesis that $r = 0$ (or that $B_1 = B_2 \ldots = B_n = 0$) can be rejected at the .0001 level. After list-wise deletion of cases owing to missing data, 276 women and 1042 children are included in this analysis.

[b] See table 14, note *c*. In this list, "living children" replaces "sterilization" as variable 6. "Ages" (row 1) in this list are unmodified chronological ages.

[c] See table 14, note *d*.

years, bighas, and ordinal caste ranks). If one considers only the unstandardized coefficients, the effects of caste and age, for example (table 14, 1977–1978), appear to be rather similar, but when the standardized coefficients are compared, it is evident that age has a much stronger effect.

Although sterilization depends on the number of surviving children and we compute regression coefficients between the number of children and sterilization in tables 16 and 17 where sterilization is treated as the dependent variable, we nonetheless include it in tables 14 and 15, because these tables show the variation in the average number of children that is associated with sterilization. For example, in table 15 we note that a mother who is herself sterilized or whose husband is sterilized has 1.28 more children than an unsterilized mother. Tables 16 and 17, on the other hand, indicate that each additional living child increases by 6 percent the probability that an ever-married woman, or mother, will be sterilized.

The relationship of the number of a woman's living children and the first four variables listed in tables 14 and 15 are generally similar at both time periods. That a woman's age and the number of her living children are positively related (row 1) is basically a truism; therefore, the probabilities of .0001 at both time periods are no surprise. Women's caste rank (row 2), landownership (row 3), and years of schooling (row 4) show no significant relationship with number of children and thus offer little support to the hypothesis of a negative relationship between fertility and socioeconomic position.

Sterilization (row 6) is the only variable other than age that is strongly related to the number of surviving children. The relationship is positive: when all other variables are held constant, a sterilized couple will be expected to have one-and-a-fraction more children than an unsterilized couple. That a measure to limit conception is positively related to the number of children would appear to be a paradox were it not that people decide to be sterilized after achieving a certain number of children, especially sons. Therefore, a sterilized woman will have more children than her unsterilized counterpart when variables, such as age, are controlled.

The only surprises that occur in table 14

TABLE 17
**Partial Regression Coefficients for Selected Variables and Sterilization of Mothers (or Their Husbands), Shanti Nagar, 1977-1978**[a]

| Row | Variable[b] | Unstandardized Partial Regression Coefficients | Standardized Partial Regression Coefficients | *t* ratio | Probability[c] |
|---|---|---|---|---|---|
| 1 | Age | −.01 | −.15 | −1.63 | .10 |
| 2 | Caste | −.02 | −.10 | −1.48 | .14 |
| 3 | Land | −.0005 | −.06 | −.85 | .40 |
| 4 | School | .002 | .01 | .20 | .84 |
| 5 | Urbanized | .09 | .05 | .80 | .43 |
| 6 | Living children | .06 | .29 | 3.61 | .0004 |
| 7 | Head urbanized | −.13 | −.13 | −1.45 | .15 |
| 8 | Head school | .02 | .19 | 2.20 | .03 |
| 9 | Husband urbanized | .24 | .25 | 2.70 | .01 |
| 10 | Husband school | −.01 | −.07 | −.63 | .53 |

[a] The estimated intercept is .18. The overall $r^2$ is .14. The $F$ ratio is 3.81, indicating that the null hypothesis that $r = 0$ (or that $B_1 = B_2 \ldots = B_n = 0$) can be rejected at the .0001 level. After list-wise deletion of cases owing to missing data, 253 mothers and 1042 children are included in this analysis.

[b] See table 14, note *c*. In this list, "living children" replaces "sterilization" as variable 6. "Ages" (row 1) in this list are unmodified chronological ages.

[c] See table 14, note *d*.

(ever-married women) concern variables that involve family heads and husbands (1977–1978). The relationship of urbanization and the number of surviving children is negative for family heads and positive for husbands. Education has a positive relationship with the number of surviving children in the case of family heads and a negative one for husbands. That the regression coefficients for family heads and husbands carry different signs in the case of each variable is somewhat perplexing since many husbands are also family heads. However, the phenomena may not require explanation, for the probabilities that the regression coefficients differ from zero, while strong enough to attract attention, are still relatively insignificant except possibly in the case of the urbanization of family heads. The corresponding probabilities for mothers (table 15) are, on the whole, insignificant.

We are generally disinclined to attribute too much importance to probabilities on the order of .05 or sometimes even .01, such as appear in the last column of table 14, rows 7 to 9. When probabilities approach .001, one may accept a relationship of variables, especially if similar results are demonstrated in more than one study from different parts of India. We are cautious because of several intrinsic features of social science research. First, there is the matter of how variables are defined. Second, sampling causes problems: there are almost always missing data and people who cannot be interviewed. There is always the question of how conclusions would be affected if all possible respondents were included in the analysis.

An example from the analysis reported in table 14 is instructive. We prepared two versions of table 14 in the course of the research. The later one included an additional nine women for whom we obtained the necessary information from India after the first computation. In addition, we redefined the "age" variable (1977–1978) for the second computation: modified age replaced chronological age as described in table 14, note 3. The added cases caused only very slight changes in the calculations for the 1958–1959 data. The new cases and the redefinition of "age" had a negligible effect on the 1977–1978 computations for the variables age, caste, land, years of school, and urbanization (rows 1 to

5). However, the probabilities for the variables involving family heads and husbands were substantially different in the two versions. The probabilities for the urbanization and years of school of the family head changed by somewhat more than an order of magnitude, from .0007 to .01 for urbanization and from .001 to .03 for years of school. The change in the probabilities for husbands' urbanization was even more dramatic, two orders of magnitude from .0003 to .03. The figure for husbands' years of school changed from .01 to .10. Moreover, when "mothers" are substituted for "ever-married women" (table 15) the probabilities in rows 7–10 become even less significant. That such a small number of additional women and what seem to be minor shifts in the definition of variables can produce such noteworthy computational changes, at least in this case, should serve as a note of caution in evaluating the conclusions of any single study.

Tables 16 and 17 present a regression analysis with sterilization as the dependent variable. The number of living children is positively associated with sterilization and the relationship is quite strong. The only other variable that shows noteworthy signs of a relationship with sterilization is the urbanization of the husband. This positive relationship is significant at the .01 level. This connection is probably valid because men classified as urbanized almost always held city jobs, frequently in government. These men were especially vulnerable to the sterilization campaign mounted during the Emergency. A similar causal sequence suggests that the education of the family head may also be connected to sterilization although the association is somewhat weaker than that of husband's urbanization and sterilization. Education was an important factor in obtaining urban employment, often in government service, which in turn exposed individuals to the full force of the sterilization campaign.

The regression coefficient is the slope of the regression line; it does not measure the "goodness of fit" of the line to the data. The Pearson product-moment correlation coefficient, denoted by $r$, indicates both the goodness of fit for linear regression and measures the strength of the linear relationship between two variables. The statistic has a range from $+1.0$ to $-1.0$. Values that approximate 1 or $-1$ indicate a strong linear relationship; the value of 0 denotes the absence of a linear relationship. The square of $r$, sometimes called the coefficient of determination, measures the proportion of variance in one variable that is accounted for by the other variable. For example, if $r = .25$, then the regression line "explains" only 6.3 percent of the variation between the two variables. When one is concerned with the strength of a linear relationship between two variables, $r^2$ is a more easily interpreted statistic than $r$, for it measures the proportion of the variance in one variable that is accounted for by the other variable (Nie et al., 1975, p. 279). Control variables can be introduced into the calculation of correlation coefficients either singly or in various combinations. When no control variable is used, one speaks of a simple, or zero-order, correlation coefficient; when one control variable is used, the resulting correlation coefficient is termed a first-order partial correlation coefficient; two control variables yield a second-order partial, and so on.

The analysis involving the computation of correlation coefficients is presented in tables 18 to 23. The number of living children is the dependent variable in the first four tables, and sterilization in the last two. The independent variables are conceived as forming two groups: the modernization variables, namely urbanization (which usually involves urban employment) and education, as they affect women, family heads, and husbands; and the biological and traditional variables, namely, a woman's age, caste rank, family landownership, and, when sterilization is the dependent variable, number of children. Modernization is generally taken to mean a combination of some or all of the following processes: industrialization, urbanization, enhanced communications, spread of education, a more precise use of the clock to schedule activities, improved health and nutrition, female employment outside the home, erosion of traditional customs, and an increase in specific attitudinal-psychological processes, such as "rational" as opposed to "traditional" thinking (e.g., Nag, 1980, p. 571). Sometimes several attitudes or values are conceptually combined and designated as "modernity values" or a "modernity syn-

TABLE 18
**Partial Correlation Coefficients for Selected Variables and Number of Living Children of Ever-Married Women,[a] Shanti Nagar, 1958-1959**

| Control Variable(s) | Variables[b] 1 Age | 2 Caste | 3 Land | 4 Sch | 7 Head Urb | 8 Head Sch | 9 Husband Urb | 10 Husband Sch |
|---|---|---|---|---|---|---|---|---|
| Zero-order partial[c] | | | | | | | | |
| None | .63 | .02 | −.08 | −.31 | −.01 | −.10 | −.08 | −.32 |
| | .0001 | .84 | .29 | .0001 | .89 | .20 | .34 | .0001 |
| | 179 | 182 | 182 | 171 | 179 | 178 | 159 | 158 |
| First-order partials[d] | | | | | | | | |
| Age | — | .15 | −.19 | −.19 | .04 | −.12 | −.23 | −.005 |
| | — | .04 | .01 | .01 | .31 | .08 | .003 | .48 |
| Caste | .65 | — | −.08 | −.33 | .01 | −.07 | −.36 | −.06 |
| | .000 | — | .18 | .000 | .44 | .19 | .000 | .25 |
| Land | .66 | −.01 | — | −.32 | .01 | −.06 | −.35 | −.07 |
| | .000 | .45 | — | .000 | .47 | .22 | .000 | .20 |
| Second-order partials | | | | | | | | |
| Age and caste | — | — | −.14 | −.17 | .02 | −.10 | −.20 | −.01 |
| | — | — | .05 | .02 | .41 | .13 | .01 | .46 |
| Age and land | — | .09 | — | −.15 | .02 | −.10 | −.19 | −.04 |
| | — | .15 | — | .03 | .41 | .12 | .01 | .33 |
| Caste and land | .66 | — | — | −.32 | .01 | −.07 | −.35 | −.07 |
| | .000 | — | — | .000 | .47 | .21 | .000 | .20 |
| Third-order partial | | | | | | | | |
| Age, caste, and land | — | — | — | −.15 | .01 | −.09 | −.18 | −.03 |
| | — | — | — | .04 | .45 | .15 | .02 | .35 |

[a] List-wise deletion of cases with missing data reduces the number of observations (ever-married women) to 146 (who had 470 living children) in calculating first-, second-, and third-order partial correlation coefficients.

[b] For an explanation of these variables, see table 14, note *c*. Variables 5 (woman's urbanization) and 6 (sterilization) in table 14 were not used for the 1958–1959 data.

[c] The top figure in each cell is the simple correlation coefficient, the middle figure is the two-tailed probability determined by the *t* ratio, and the bottom figure is the number of cases.

[d] The upper figure in each cell is the partial correlation coefficient; the lower figure is the two-tailed probability.

drome" (Mukherjee, 1977, pp. 2–3). Fertility is generally assumed, with qualifications, to have an inverse linear relationship with most aspects of modernization (cf. Tilly, 1978, pp. 3–4, 19–21, 24; Nag, 1981, pp. 245–246; Population Council, 1981b, p. 312).

It was assumed that the modernization variables were undergoing more rapid change than caste rank and landownership, for education and urbanization would respond more readily to other features of modernization, such as improved communication, the extension of paved roads, bus service, and school construction. Therefore, the modernization variables would be the ones most likely to be implicated in changes in the dependent variables. However, in order to determine whether the modernization variables had any effect, it would first be necessary to control for age and the traditional variables. These considerations led to the analysis adopted in tables 18 to 23 where the biological and traditional variables are used as control variables.

It is apparent from the figures for ever-married women for both 1958–1959 and 1977–1978 (tables 18 and 20) that a woman's age has a strong positive correlation with the

TABLE 19

**Partial Correlation Coefficients for Selected Variables and Number of Living Children of Mothers,[a] Shanti Nagar, 1958-1959**

| Control Variable(s) | Variables[b] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 7 | 8 | 9 | 10 |
| | | | | | Head | | Husband | |
| | Age | Caste | Land | Sch | Urb | Sch | Urb | Sch |
| Zero-order partial[c] | | | | | | | | |
| None | .48 | .05 | −.04 | −.08 | .14 | .05 | −.04 | −.11 |
| | .0001 | .56 | .60 | .35 | .10 | .53 | .63 | .20 |
| | 140 | 141 | 141 | 137 | 138 | 137 | 130 | 129 |
| First-order partials[d] | | | | | | | | |
| Age | — | .17 | −.16 | −.05 | .16 | .03 | −.04 | .04 |
| | — | .03 | .04 | .28 | .04 | .37 | .32 | .34 |
| Caste | .58 | — | −.01 | −.10 | .15 | .05 | −.12 | −.05 |
| | .000 | — | .46 | .15 | .05 | .30 | .10 | .31 |
| Land | .58 | .05 | — | −.10 | .15 | .04 | −.12 | −.05 |
| | .000 | .29 | — | .14 | .05 | .32 | .09 | .29 |
| Second-order partials | | | | | | | | |
| Age and caste | — | — | −.11 | −.03 | .14 | .06 | −.003 | .03 |
| | — | — | .11 | .39 | .06 | .24 | .49 | .39 |
| Age and land | — | .12 | — | −.01 | .14 | .06 | −.02 | −.0004 |
| | — | .10 | — | .44 | .06 | .25 | .44 | .50 |
| Caste and land | .59 | — | — | −.10 | .15 | .05 | −.12 | −.05 |
| | .000 | — | — | .15 | .05 | .29 | .10 | .30 |
| Third-order partial | | | | | | | | |
| Age, caste, and land | — | — | — | −.004 | .13 | .08 | .01 | .002 |
| | — | — | — | .48 | .08 | .19 | .47 | .49 |

[a] List-wise deletion of cases with missing data reduces the number of observations (mothers) to 122 (who had 470 living children) in calculating first-, second-, and third-order partial correlation coefficients.

[b] For an explanation of these variables, see table 14, note *c*. Variables 5 (women's urbanization) and 6 (sterilization) in table 14 were not used for the 1958–1959 data.

[c] See table 18, note *c*.

[d] See table 18, note *d*.

number of her living children. The correlation coefficients from both of the two time periods hover around .66 and the strength of the association is not affected when rank and landownership are held constant; thus, an ever-married woman's age explains about 44 percent of the variation in the number of living children. The correlation coefficients are only slightly reduced when mothers (tables 19 and 21) are substituted for ever-married women. No other variable bears such a strong unambiguous relationship with the number of living children.

For 1958–1959, the correlation coefficients between landownership and the number of living children of ever-married women are negative; the strength of the relationship is masked in the simple correlation coefficient but becomes more evident when the age of women is held constant, attaining the significance level of .01, or .005 for a one-tailed test. The comparable correlation coefficients for mothers are also negative, but the probabilities are higher and not particularly significant, even for a one-tailed test. However, the association of land and the number of living children in 1977–1978 is neither positive nor negative consistently and, in any case, is not statistically significant. The generally positive relationship of caste rank,

TABLE 20
**Partial Correlation Coefficients for Selected Variables and Number of Living Children of Ever-Married Women,[a] Shanti Nagar, 1977-1978**

| Control Variable(s) | Variables[b] 1 Age | 2 Caste | 3 Land | 4 Sch | 5 Urb | 7 Head Urb | 8 Head Sch | 9 Husband Urb | 10 Husband Sch |
|---|---|---|---|---|---|---|---|---|---|
| Zero-order partial[c] | | | | | | | | | |
| None | .68 | −.01 | .02 | −.38 | .10 | −.04 | .002 | −.001 | −.40 |
| | .0001 | .92 | .67 | .0001 | .08 | .48 | .97 | .99 | .0001 |
| | 308 | 308 | 308 | 306 | 308 | 308 | 307 | 277 | 277 |
| First-order partials[d] | | | | | | | | | |
| Age | — | .10 | −.02 | −.11 | .13 | −.02 | .07 | .12 | −.05 |
| | — | .06 | .35 | .04 | .01 | .37 | .14 | .02 | .22 |
| Caste | .66 | — | .02 | −.35 | .12 | −.05 | −.03 | −.01 | −.41 |
| | .000 | — | .37 | .000 | .03 | .18 | .31 | .44 | .000 |
| Land | .66 | .02 | — | −.35 | .11 | −.05 | −.03 | −.01 | −.42 |
| | .000 | .39 | — | .000 | .02 | .20 | .28 | .46 | .000 |
| Second-order partials | | | | | | | | | |
| Age and caste | — | — | .01 | −.08 | .12 | −.02 | .09 | .12 | −.02 |
| | — | — | .47 | .09 | .02 | .34 | .07 | .03 | .37 |
| Age and land | — | .09 | — | −.11 | .13 | −.02 | .07 | .12 | −.04 |
| | — | .06 | — | .04 | .02 | .34 | .13 | .03 | .24 |
| Caste and land | .66 | — | — | −.35 | .12 | −.05 | −.03 | −.01 | −.42 |
| | .000 | — | — | .000 | .03 | .20 | .30 | .45 | .000 |
| Third-order partial | | | | | | | | | |
| Age, caste, and land | — | — | — | −.08 | .12 | −.02 | .09 | .12 | −.02 |
| | — | — | — | .09 | .02 | .35 | .07 | .03 | .37 |

[a] List-wise deletion of cases with missing data reduces the number of observations (ever-married women) to 276 (who had 1042 children) in calculating other than zero-order correlation coefficients.

[b] For an explanation of the other variables, see table 14, note *c*. Variable 6, sterilization, is not used in this table.

[c] See table 18, note *c*.

[d] See table 18, note *d*.

which in Shanti Nagar is strongly correlated with landownership, and number of surviving children, is masked in the simple correlation coefficients (tables 18 and 20). It becomes more evident when the age of women is controlled; however, none of the correlation coefficients are significant at the .01 level, even for a one-tailed test. On the basis of these data, the assertion that high socioeconomic status, as expressed in landownership and caste rank, is associated with fewer surviving children than low socioeconomic status must be regarded as unproved.

The relationship of surviving children and education is evaluated from three points of view, namely, the education of women, their husbands, and their family heads. These three variables are significantly related among themselves, especially the education of husband and wife. Except in the case of mothers in the 1950s, the number of living children is negatively correlated with the education of both wife and husband at a very high level of probability (.0001) both in the 1950s and 1970s; however, the correlation is largely spurious. When the age of women is used as a control both alone or in combination with caste and landownership, the correlation of the number of children and husband's education becomes insignificant. With regard to children and wife's education controlled for wife's age alone or in combination with other

TABLE 21
**Partial Correlation Coefficients for Selected Variables and Number of Living Children of Mothers,[a] Shanti Nagar, 1977-1978**

| Control Variable(s) | Variables[b] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 9 | 10 |
| | | | | | | Head | | Husband | |
| | Age | Caste | Land | Sch | Urb | Urb | Sch | Urb | Sch |
| Zero-order partial[c] | | | | | | | | | |
| None | .58 | .06 | −.03 | −.34 | .15 | −.04 | −.06 | −.07 | −.40 |
| | .0001 | .36 | .67 | .0001 | .01 | .52 | .34 | .28 | .0001 |
| | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 253 | 253 |
| First-order partials[d] | | | | | | | | | |
| Age | — | .13 | −.05 | −.14 | .15 | −.02 | .05 | .09 | −.06 |
| | — | .02 | .23 | .01 | .01 | .38 | .21 | .09 | .18 |
| Caste | .63 | — | .001 | −.36 | .14 | −.07 | −.06 | −.07 | −.40 |
| | .000 | — | .50 | .000 | .01 | .14 | .16 | .13 | .000 |
| Land | .62 | .05 | — | −.36 | .15 | −.07 | −.07 | −.07 | −.41 |
| | .000 | .20 | — | .000 | .01 | .14 | .14 | .13 | .000 |
| Second-order partials | | | | | | | | | |
| Age and caste | — | — | −.009 | −.11 | .14 | −.03 | .08 | .08 | −.02 |
| | — | — | .44 | .04 | .02 | .34 | .11 | .11 | .39 |
| Age and land | — | .12 | — | −.14 | .15 | −.03 | .06 | .08 | −.05 |
| | — | .03 | — | .02 | .01 | .34 | .19 | .10 | .22 |
| Caste and land | .63 | — | — | −.36 | .14 | −.07 | −.06 | −.07 | −.41 |
| | .000 | — | — | .000 | .01 | .14 | .16 | .13 | .000 |
| Third-order partial | | | | | | | | | |
| Age, caste, and land | — | — | — | −.11 | .14 | −.03 | .08 | .08 | −.02 |
| | — | — | — | .04 | .02 | .33 | .11 | .11 | .40 |

[a] List-wise deletion of cases with missing data reduces the number of observations (mothers) to 253 (who had 1042 children) in calculating other than zero-order correlation coefficients.

[b] For an explanation of the variables, see table 14, note *c*. Variable 6, sterilization, is not used in this table.

[c] See table 18, note *c*.

[d] See table 18, note *d*.

variables, the probabilities for both time periods are reduced by at least two orders of magnitude although the two coefficients in tables 18 and 21 where only women's age is used as a control are still statistically significant, especially if one is interested in testing the hypothesis of a negative relationship, in which case a one-tailed test is appropriate and the probabilities in tables 18 and 21 are halved. All but one of the second- and third-order partials that include women's age are not significant (.01 level) even for a one-tailed test. It bears noting that the strongest correlation coefficient relating number of surviving children and women's education is −.38 (the zero-order partial in table 20, column 4, 1977–1978) which means that the education of women accounts for only 14.4 percent of the variance; the comparable figure (table 20, column 4, 1977–1978) with age held constant is .11, yielding a minuscule value for $r^2$ of 1.2 percent. Fertility and the third educational variable, education of family heads, have no significant relationship.

The relationship of number of living children to urbanization is also evaluated from three points of view: the woman's own urbanization, her husband's, and her family head's. The urbanization of women was used as a variable only in 1977–1978; there were few urbanized women in 1958–1959. Number of children and women's urbanization

show a slight positive correlation that reaches the .01 level of significance in several computations, especially those using control variables (tables 20 and 21, 1977–1978). As for the possible relationship of living children and husband's urbanization, no consistent picture emerges. For ever-married women of the 1950s (table 18), the relationship is a negative one whose significance is masked in the simple correlation coefficients. When controls for women's age, caste rank, and landownership are introduced singly or in combination, all computations except the third-order partial attain at least the .01 level of significance. For mothers in 1958–1959 (table 19), the relationship of living children and husband's urbanization is far from statistical significance in all computations. In 1977–1978, the relationship of living children and husband's urbanization for both ever-married women (table 20) and mothers (table 21) is statistically insignificant in all computations. In short, we can discern no consistent significant relationship between number of living children and husband's urbanization. In the case of the third of the urbanization variables, the urbanization of the family head, there is no statistically significant correlation between it and number of living children in any computation for either time period. On the basis of these data, it seems that urbanization has no consistent relationship with number of living children, a conclusion in accord with our interpretation of the regression coefficients presented above.

The correlation coefficients concerning sterilization as the dependent variable in the 1970s are presented in table 22 for ever-married women and table 23 for mothers. The strong positive correlation of sterilization and number of living children is clearly marked. The negative correlation of women's age and sterilization is masked in the simple correlation coefficients but is significant when number of living children, alone or in combination with other variables, is controlled. Caste rank, landownership, and the education and urbanization of women have no relationship with sterilization.

The modernization variables of education and urbanization as they concern family heads and husbands are positively related to sterilization, and the correlation coefficients are generally statistically significant. Although none of the correlation coefficients of sterilization and the urbanization of family heads is statistically significant, they are all low enough to attract notice. As for the relationship of both the urbanization of husbands and the education of family heads with sterilization, the correlation coefficients are significant at quite high levels. The effect of the education of husbands is masked in many of the coefficients, but when the number of living children, alone or in combination with other variables, is controlled, the significant relationship of husbands' education to sterilization is clear.

Two points can be made concerning the relationship of sterilization and the modernization variables in the case of husbands and family heads. First, as we have pointed out above, the connection depends on the fact that education and urbanization are related to urban employment, often in government service, and that men holding such employment were especially susceptible to the sterilization campaign during the Emergency. Second, it is the perceived needs of the husband or family head in terms of his economic situation that affect the sterilization decision much more than the circumstances of the wife. It is worth noting, however, that the values of the correlation coefficients in tables 22 and 23 are generally low. The most significant variables explain, at best, no more than 9 percent of the variance.

## AGES AT FIRST AND LAST BIRTH AND DURATION OF CHILDBEARING

The census data for the 1950s and the 1970s concerning number of children and the mean age of women at first childbirth, classified by several traditional and modernization vari-

TABLE 22

**Partial Correlation Coefficients for Selected Variables and Sterilization of Ever-Married Women (or Their Husbands),[a] Shanti Nagar, 1977-1978**

| Control Variable(s) | Variables[b] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | | | | | | Head | | Husband | |
| | Age | Caste | Land | Sch | Urb | Chil | Urb | Sch | Urb | Sch |
| Zero-order partial[c] | | | | | | | | | | |
| None | .09 | −.07 | −.03 | −.04 | .07 | .30 | .10 | .18 | .21 | .08 |
| | .10 | .23 | .56 | .50 | .25 | .0001 | .08 | .002 | .0004 | .21 |
| | 308 | 308 | 308 | 306 | 308 | 308 | 308 | 307 | 277 | 277 |
| First-order partials[d] | | | | | | | | | | |
| Age | — | −.06 | −.03 | .02 | .07 | .29 | .10 | .19 | .22 | .13 |
| | — | .15 | .31 | .37 | .14 | .000 | .05 | .001 | .000 | .02 |
| Caste | .05 | — | −.05 | −.02 | .08 | .26 | .10 | .17 | .22 | .06 |
| | .20 | — | .20 | .35 | .10 | .000 | .05 | .002 | .000 | .15 |
| Land | .06 | −.08 | — | .001 | .06 | .26 | .09 | .18 | .21 | .08 |
| | .17 | .09 | — | .50 | .14 | .000 | .06 | .001 | .000 | .09 |
| Children | −.15 | −.08 | −.03 | .09 | .04 | — | .11 | .19 | .22 | .20 |
| | .01 | .11 | .30 | .07 | .26 | — | .03 | .001 | .000 | .000 |
| Second-order partials | | | | | | | | | | |
| Age and caste | — | — | −.05 | −.001 | .07 | .30 | .10 | .18 | .23 | .12 |
| | — | — | .20 | .50 | .11 | .000 | .05 | .002 | .000 | .03 |
| Age and land | — | −.08 | — | .03 | .06 | .29 | .10 | .19 | .22 | .14 |
| | — | .11 | — | .33 | .15 | .000 | .06 | .001 | .000 | .01 |
| Age and children | — | −.10 | −.03 | .05 | .03 | — | .11 | .18 | .20 | .15 |
| | — | .04 | .33 | .18 | .30 | — | .03 | .001 | .001 | .01 |
| Caste and land | .05 | — | — | −.02 | .07 | .26 | .09 | .17 | .21 | .07 |
| | .20 | — | — | .39 | .12 | .000 | .06 | .002 | .000 | .13 |
| Caste and children | −.17 | — | −.06 | .07 | .05 | — | .12 | .18 | .23 | .19 |
| | .002 | — | .17 | .11 | .21 | — | .03 | .001 | .000 | .001 |
| Land and children | −.15 | −.09 | — | .10 | .04 | — | .11 | .20 | .22 | .21 |
| | .01 | .07 | — | .05 | .28 | — | .04 | .000 | .000 | .000 |
| Third-order partials | | | | | | | | | | |
| Age, caste, and land | — | — | — | .01 | .07 | .30 | .10 | .18 | .22 | .13 |
| | — | — | — | .46 | .13 | .000 | .06 | .001 | .000 | .02 |
| Age, caste, and chil. | — | — | −.06 | .02 | .04 | — | .12 | .16 | .20 | .13 |
| | — | — | .16 | .35 | .24 | — | .03 | .004 | .000 | .02 |
| Age, land, and chil. | — | −.12 | — | .06 | .03 | — | .11 | .18 | .19 | .16 |
| | — | .03 | — | .16 | .32 | — | .04 | .001 | .001 | .004 |
| Caste, land, and children | −.17 | — | — | .08 | .04 | — | .11 | .19 | .22 | .20 |
| | .002 | — | — | .09 | .24 | — | .04 | .001 | .000 | .000 |
| Fourth-order partial | | | | | | | | | | |
| Age, caste, land, and children | — | — | — | .03 | .04 | — | .11 | .17 | .20 | .14 |
| | — | — | — | .31 | .26 | — | .04 | .003 | .001 | .01 |

[a] See table 20, note *a*.

[b] For an explanation of the variables, see table 14, note *c*. Variable 6 is living children. "Age" (variable 1) is chronological age.

[c] See table 18, note *c*.

[d] See table 18, note *d*.

TABLE 23

**Partial Correlation Coefficients for Selected Variables and Sterilization of Mothers (or Their Husbands),[a] Shanti Nagar, 1977-1978**

| | Variables[b] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| | | | | | | | Head | | Husband | |
| Control Variable(s) | Age | Caste | Land | Sch | Urb | Chil | Urb | Sch | Urb | Sch |
| Zero-order partial[c] | | | | | | | | | | |
| None | −.01 | −.06 | −.05 | .02 | .08 | .21 | .12 | .18 | .21 | .10 |
| | .84 | .37 | .38 | .80 | .20 | .001 | .06 | .004 | .001 | .11 |
| | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 260 | 253 | 253 |
| First-order partials[d] | | | | | | | | | | |
| Age | — | −.06 | −.04 | .02 | .07 | .25 | .10 | .18 | .21 | .13 |
| | — | .17 | .27 | .40 | .12 | .000 | .05 | .002 | .000 | .02 |
| Caste | −.003 | — | −.06 | −.002 | .08 | .20 | .11 | .17 | .21 | .09 |
| | .48 | — | .17 | .49 | .09 | .001 | .05 | .003 | .000 | .08 |
| Land | .004 | −.08 | — | .02 | .07 | .20 | .10 | .19 | .20 | .11 |
| | .47 | .12 | — | .37 | .13 | .001 | .07 | .002 | .001 | .04 |
| Children | −.16 | −.07 | −.04 | .09 | .05 | — | .12 | .20 | .23 | .20 |
| | .01 | .12 | .28 | .07 | .23 | — | .03 | .001 | .000 | .001 |
| Second-order partials | | | | | | | | | | |
| Age and caste | — | — | −.06 | −.004 | .08 | .27 | .11 | .18 | .22 | .11 |
| | — | — | .17 | .48 | .09 | .000 | .05 | .003 | .000 | .04 |
| Age and land | — | −.07 | — | .02 | .07 | .25 | .10 | .19 | .21 | .14 |
| | — | .12 | — | .35 | .13 | .000 | .06 | .001 | .000 | .01 |
| Age and children | — | −.10 | −.03 | .05 | .04 | — | .11 | .18 | .20 | .15 |
| | — | .05 | .31 | .19 | .26 | — | .04 | .002 | .001 | .01 |
| Caste and land | −.003 | — | — | .01 | .08 | .20 | .10 | .18 | .21 | .10 |
| | .48 | — | — | .47 | .10 | .001 | .06 | .002 | .000 | .06 |
| Caste and children | −.17 | — | −.06 | .08 | .06 | — | .12 | .19 | .23 | .19 |
| | .003 | — | .17 | .11 | .19 | — | .03 | .001 | .000 | .001 |
| Land and children | −.16 | −.09 | — | .10 | .04 | — | .11 | .20 | .22 | .21 |
| | .01 | .08 | — | .06 | .25 | — | .04 | .001 | .000 | .000 |
| Third-order partials | | | | | | | | | | |
| Age, caste, and land | — | — | — | .004 | .08 | .27 | .10 | .18 | .21 | .12 |
| | — | — | — | .47 | .10 | .000 | .06 | .002 | .000 | .03 |
| Age, caste, and chil. | — | — | −.06 | .03 | .05 | — | .12 | .16 | .20 | .12 |
| | — | — | .16 | .35 | .20 | — | .03 | .01 | .001 | .03 |
| Age, land, and chil. | — | −.12 | — | .06 | .04 | — | .11 | .18 | .20 | .16 |
| | — | .03 | — | .16 | .28 | — | .05 | .002 | .001 | .01 |
| Caste, land, and children | −.18 | — | — | .09 | .05 | — | .11 | .19 | .23 | .20 |
| | .003 | — | — | .09 | .21 | — | .04 | .001 | .000 | .001 |
| Fourth-order partial | | | | | | | | | | |
| Age, caste, land, and children | — | — | — | .03 | .05 | — | .11 | .17 | .20 | .13 |
| | — | — | — | .30 | .22 | — | .04 | .004 | .001 | .02 |

[a] See table 21, note *a*.

[b] For an explanation of the variables, see table 14, note *c*. Variable 6 is living children. "Age" (variable 1) is chronological age.

[c] See table 18, note *c*.

[d] See table 18, note *d*.

TABLE 24
**Ever-Married Women, Mothers, Living Children (Mean), and Mean Age at Firstborn by Selected Variables, Shanti Nagar, 1958-1959**

| Variables | Ever-Married Women | | Mothers | | Mothers Age at Firstborn | |
|---|---|---|---|---|---|---|
| | No. | Children | No. | Children | No. | Age (Years) |
| Caste | | | | | | |
| High | 119 | 2.94 | 93 | 3.76 | 88 | 19.85 |
| Low | 63 | 2.98 | 48 | 3.92 | 47 | 17.35 |
| Landownership | | | | | | |
| Owns land | 111 | 2.92 | 85 | 3.81 | 81 | 20.00 |
| Landless | 71 | 3.01 | 56 | 3.82 | 54 | 17.45 |
| Literacy | | | | | | |
| Woman | | | | | | |
| Literate | 26 | 1.27 | 10 | 3.30 | 10 | 21.70 |
| Nonliterate | 145 | 3.36 | 127 | 3.83 | 122 | 18.68 |
| Husband | | | | | | |
| Literate | 89 | 2.55 | 63 | 3.60 | 60 | 19.08 |
| Nonliterate | 69 | 3.93 | 66 | 4.11 | 65 | 18.70 |
| Family head | | | | | | |
| Literate | 81 | 2.73 | 59 | 3.75 | 56 | 19.64 |
| Nonliterate | 97 | 3.13 | 78 | 3.90 | 75 | 18.54 |
| Urbanization | | | | | | |
| Husband | | | | | | |
| Urbanized | 86 | 2.98 | 68 | 3.76 | 65 | 18.10 |
| Traditional | 73 | 3.36 | 62 | 3.95 | 61 | 19.71 |
| Family head | | | | | | |
| Urbanized | 91 | 2.92 | 64 | 4.16 | 60 | 17.98 |
| Traditional | 88 | 2.98 | 74 | 3.54 | 72 | 19.78 |
| Total | 182 | 2.96 | 141 | 3.82 | 135 | 18.98 |

ables, are shown in tables 24 (1958–1959), 25 (1977–1978), and 26 (1977–1978). The average age at first childbirth for all mothers has increased by about two-thirds of a year. In 1958–1959, it was 18.98 years; in 1977–1978, 19.66 years (tables 24 and 26).[9] Despite the later commencement of childbearing and also the introduction of sterilization, the mothers of the 1970s had an average of 4.07 living children as compared to the 3.82 living children for the mothers of the 1950s (tables 24 and 25). When the data for each social variable are examined, a generally similar pattern can be observed between the two time periods, namely, increases in the average age of first childbirth and in the number of children per mother. An increase in the average age of mothers at the birth of the first surviving child would seem to be in accord with the generally assumed influences of modernization on childbearing, although one must always be aware of the tentative quality of age data in evaluating the significance of apparent demographic trends, especially when

[9] The average age of first birth may be slightly overestimated in these data because firstborn children who died before the data were collected are not included in the calculation; however, interviews in 1958–1959 about age at first confinement with 64 ever-married women yielded an average age of 18.77 years, only .21 years less than the figure we obtained on the basis of calculations involving the age of the oldest living child. The difference is too small to be significant, which enhances the reliability of our analytical procedure.

TABLE 25
**Living Children (Mean) of Ever-Married Women and Mothers by Sterilization and Selected Variables, Shanti Nagar, 1977-1978**

| Variables | Ever-Married Women | | Mothers[a] Sterilized | | Mothers Unsterilized | | Mothers Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | Children | No. | Children | No. | Children | No. | Children |
| Caste | | | | | | | | |
| High | 190 | 3.43 | 47 | 4.57 | 117 | 3.73 | 164 | 3.97 |
| Low | 118 | 3.46 | 21 | 5.52 | 75 | 3.89 | 96 | 4.25 |
| Landownership | | | | | | | | |
| Owns land | 178 | 3.44 | 41 | 4.68 | 114 | 3.69 | 155 | 3.95 |
| Landless | 130 | 3.43 | 27 | 5.15 | 78 | 3.94 | 105 | 4.25 |
| Literacy | | | | | | | | |
| Woman | | | | | | | | |
| Literate | 98 | 2.10 | 23 | 3.78 | 49 | 2.43 | 72 | 2.86 |
| Nonliterate | 208 | 4.10 | 45 | 5.42 | 143 | 4.26 | 188 | 4.54 |
| Husband | | | | | | | | |
| Literate | 214 | 3.35 | 54 | 4.70 | 137 | 3.38 | 191 | 3.75 |
| Nonliterate | 63 | 5.16 | 14 | 5.50 | 48 | 5.17 | 62 | 5.24 |
| Family head | | | | | | | | |
| Literate | 179 | 3.47 | 47 | 4.66 | 106 | 3.80 | 153 | 4.07 |
| Nonliterate | 127 | 3.43 | 21 | 5.33 | 85 | 3.80 | 106 | 4.10 |
| Urbanization | | | | | | | | |
| Woman | | | | | | | | |
| Urbanized | 22 | 4.36 | 7 | 6.43 | 11 | 4.64 | 18 | 5.33 |
| Traditional | 286 | 3.37 | 61 | 4.69 | 181 | 3.74 | 242 | 3.98 |
| Husband | | | | | | | | |
| Urbanized | 188 | 3.76 | 58 | 4.79 | 118 | 3.64 | 176 | 4.02 |
| Traditional | 89 | 3.76 | 10 | 5.30 | 67 | 4.21 | 77 | 4.35 |
| Family head | | | | | | | | |
| Urbanized | 199 | 3.36 | 50 | 4.78 | 117 | 3.68 | 167 | 4.01 |
| Traditional | 109 | 3.58 | 18 | 5.11 | 75 | 3.97 | 93 | 4.19 |
| Total | 308 | 3.44 | 68 | 4.87 | 192 | 3.79 | 260 | 4.07 |

[a] Includes women whose husbands are sterilized.

The average number of children of sterilized mothers in this table (4.87) is slightly less than the comparable figure (4.88) in table 12. The difference is due to the fact that a mother with one child was pregnant and near term when her family was censused. Shortly thereafter, she gave birth and was then sterilized. In our sterilization file, she is listed as having two children; in our census, as having only one. Thus, the number of children of sterilized mothers in these tables may vary by one child depending on the file from which the data were drawn.

the trends are measured by mean changes of considerably less than one year. Nonetheless, the figures are of interest if we assume that errors in the reporting of ages followed a similar pattern both in the 1950s and the 1970s.

The data from the 1950s presented in table 24 show that low-caste, landless, and nonliterate women and those whose husbands and family heads are nonliterate have more children and are younger when they bear their first child than women with the opposite characteristics (high-caste, landowning, etc.). However, women with urbanized husbands and family heads are younger when they bear their first surviving child than women with traditional husbands and, in the case of mothers with urbanized family heads, have more children. Thus, while traditional vari-

TABLE 26
**Mean Age at Firstborn of Mothers by Sterilization and Selected Variables, Shanti Nagar, 1977-1978**

| Variables | Sterilized[a] | | Unsterilized | | Total | |
|---|---|---|---|---|---|---|
| | No. | Age | No. | Age | No. | Age |
| Caste | | | | | | |
| High | 47 | 19.76 | 115 | 20.17 | 162 | 20.05 |
| Low | 21 | 17.79 | 74 | 19.35 | 95 | 19.00 |
| Landownership | | | | | | |
| Owns land | 41 | 19.82 | 112 | 20.14 | 153 | 20.06 |
| Landless | 27 | 18.13 | 77 | 19.41 | 104 | 19.08 |
| Literacy | | | | | | |
| Woman | | | | | | |
| Literate | 23 | 20.02 | 48 | 20.16 | 71 | 20.11 |
| Nonliterate | 45 | 18.70 | 141 | 19.74 | 186 | 19.49 |
| Husband | | | | | | |
| Literate | 54 | 19.24 | 136 | 19.76 | 190 | 19.61 |
| Nonliterate | 14 | 18.79 | 47 | 19.72 | 61 | 19.50 |
| Family head | | | | | | |
| Literate | 47 | 19.21 | 105 | 20.00 | 152 | 19.76 |
| Nonliterate | 21 | 19.00 | 83 | 19.68 | 104 | 19.54 |
| Urbanization | | | | | | |
| Woman | | | | | | |
| Urbanized | 7 | 17.79 | 10 | 19.73 | 17 | 18.93 |
| Traditional | 61 | 19.30 | 179 | 19.85 | 240 | 19.71 |
| Husband | | | | | | |
| Urbanized | 58 | 19.31 | 117 | 19.46 | 175 | 19.41 |
| Traditional | 10 | 18.20 | 66 | 20.26 | 76 | 19.99 |
| Family head | | | | | | |
| Urbanized | 50 | 19.34 | 115 | 19.81 | 165 | 19.66 |
| Traditional | 18 | 18.61 | 74 | 19.91 | 92 | 19.66 |
| Total | 68 | 19.15 | 189 | 19.85 | 257 | 19.66 |

[a] Includes women whose husbands are sterilized.

ables of caste rank and landownership and one of the modernization variables, education, function in accord with the notion that high socioeconomic rank and modernization are related to few children and a relatively high age at first confinement, the other modernization variable, urbanization, does not. Urbanization is associated with a lower age at first childbirth and possibly with more living children.

These 1958–1959 data do not clearly show that women who begin childbearing at a somewhat later age have significantly fewer living children than women who begin bearing children at an earlier age. In the case of the variables caste and landownership, the differences in the number of children between high- and low-caste women and between landowning and landless women are very slight, whereas the difference in the mothers' age at firstborn is about 2.5 years. For example, landless and landowning mothers have an almost identical average number of living children although landless women have their first child at 17.4 years of age and landowning women at 20.0 years. Although relatively few women are considered in this comparison, it nonetheless should serve as a warning that the postponement of childbearing by a year or two may not necessarily substantially re-

duce the number of living children of the average woman.

The data from the 1970s classified by social variables are given in tables 25 and 26. The general pattern resembles that of the 1950s. Low-caste, landless, nonliterate women and those whose husbands and family heads are nonliterate and traditional have more children and bear their first living child at a younger age than women with the opposite characteristics. Urbanized women have more living children and bear their first child at a younger age than traditional women, but there are only a handful of them and therefore the data should be evaluated with caution. Nonliterate women have noticeably more living children than literate women, but it should be remembered that literate women are younger than nonliterate women and that the number of living children is positively correlated with the age of mothers.

Sterilized mothers had more children than unsterilized mothers, 4.87 and 3.79, respectively (table 25, 1977–1978), but this statistic loses significance when we note (tables 29 and 30, both 1977–1978) that sterilized mothers had fewer children than unsterilized mothers of completed fertility, who had an average of 5.49 children. Sterilized mothers are a subset of the population of mothers who have generally achieved a satisfactory number of children. Many unsterilized mothers have not yet reached this level and therefore have fewer children. However, unsterilized mothers have no protection from exceeding the desired level. These considerations explain why sterilized mothers have more children than unsterilized mothers but fewer than unsterilized mothers of completed fertility.

Data concerning mothers who have completed their childbearing years by 1958–1959 are given in table 27. The corresponding data for the 1970s are presented in three formats: table 28 concerns all mothers of completed fertility, both sterilized mothers and those 45 years of age and older;[10] table 29 deals only with sterilized mothers; and table 30 involves only unsterilized mothers 45 years of age and older. The average number of living children per mother of completed fertility, which was 5.0 in the 1950s, had increased to 5.2 for all mothers of completed fertility in the 1970s and to 5.5 for unsterilized mothers. When only sterilized mothers are taken into account, the average number of living children had declined slightly to 4.9. In general, mothers of completed fertility had a fraction more living children in the 1970s than in the 1950s. The increase was achieved despite a reduction in the duration of childbearing of about 2.9 years for all mothers. The reduction in the childbearing span was only .8 years for unsterilized mothers but a substantial five years for sterilized mothers, amounting in the latter case to a reduction of 29 percent. Yet this impressive lessening of the childbearing span of sterilized women achieved only a slight decrease in the number of living children, a development which reflects, in all probability, a decline in the rate of infant and child mortality.

The mean ages at both first and last births of these mothers of completed fertility have fallen. When the mothers of the 1950s (table 27) are compared to the unsterilized mothers of the 1970s (table 30), the decline has been .9 years for first births and 1.3 years for last births; when the comparison is between the mothers of the 1950s and all mothers of the 1970s (table 28), both sterilized and unsterilized, the age at first births has declined by 1.7 years and at last births by 4.25 years, the latter figure reflecting the effects of sterilization. The largest decline concerns the last births of sterilized mothers (table 29, 1977–1978), which took place at an average age of 30.5 years, 7.2 years younger than the figure for the 1950s. Two considerations should be kept in mind in evaluating these figures. First, mothers of completed fertility are a subset of all mothers. Although age at first births declined for this subset, it increased for all mothers, as noted above. Second, the number of mothers of completed fertility in the 1950s is small, only 24, which means that a few atypical cases could have rather pronounced effects on the averages.

No strong pattern is apparent when the data are classified by social variables, but a few interesting observations can be made. For example, landless mothers of completed fertility had fewer living children than landowning mothers in 1958–1959 but more in 1977–

[10] Chatterjee and Datta (1981, p. 40) report that the mean menopausal age of a sample of Rajput women from four villages on the border between the Union Territory of Delhi and Uttar Pradesh was 45.80 years.

TABLE 27
**Completed Fertility: Mothers 45 Years of Age and Older, Living Children, and Duration of Childbearing by Selected Variables, Shanti Nagar, 1958-1959**

| Variables | No. Mothers | Mean Age at | | Mean (Years) Duration Childbearing[a] | Mean Children |
|---|---|---|---|---|---|
| | | Firstborn | Lastborn | | |
| Caste | | | | | |
| High | 19 | 21.72 | 37.74 | 17.13 | 5.16 |
| Low | 5 | 21.63 | 37.00 | 16.50 | 4.40 |
| Landownership | | | | | |
| Owns land | 17 | 21.63 | 37.53 | 17.02 | 5.06 |
| Landless | 7 | 21.90 | 38.33 | 17.25 | 4.86 |
| Literacy | | | | | |
| Woman | | | | | |
| Literate | 2 | 31.00 | 43.25 | 13.00 | 5.00 |
| Nonliterate | 20 | 20.41 | 37.00 | 17.56 | 5.00 |
| Husband | | | | | |
| Literate | 7 | 19.90 | 37.00 | 17.85 | 5.57 |
| Nonliterate | 10 | 22.75 | 38.50 | 16.75 | 5.40 |
| Family head | | | | | |
| Literate | 10 | 21.25 | 37.50 | 17.00 | 5.00 |
| Nonliterate | 13 | 22.27 | 37.77 | 17.10 | 5.15 |
| Urbanization | | | | | |
| Husband | | | | | |
| Urbanized | 7 | 22.20 | 38.75 | 18.00 | 5.71 |
| Traditional | 11 | 21.36 | 37.65 | 16.80 | 5.09 |
| Family head | | | | | |
| Urbanized | 11 | 21.31 | 37.69 | 18.46 | 5.27 |
| Traditional | 12 | 22.36 | 37.70 | 15.75 | 4.83 |
| Total | 24 | 21.70 | 37.66 | 17.06 | 5.00 |

[a] The figures in this column were calculated by subtracting each woman's age at her firstborn from her age at her lastborn, adding nine months, principally to avoid calculating a childbearing duration of zero years in the case of mothers with only one child, and then taking an average. It can be observed that figures in this column may differ from those obtained by subtracting the mean age at firstborn from the mean age at lastborn and adding nine months. Such discrepancies are because the two ages were not known for every woman. A woman whose age at lastborn, but not firstborn, was known could be used in calculating the mean age at lastborn but not the mean duration of childbearing. Thus, these various calculations (mean age at firstborn, lastborn, and mean duration of childbearing) were based upon slightly different populations of women.

1978, which indicates that family size and landownership are generally independent of one another. It also suggests that the economic circumstances of the landless have to some extent been ameliorated. Another point of some interest is that urbanization appears to have mixed effects. Mothers of the 1950s and unsterilized mothers of the 1970s with urbanized husbands and family heads had a fraction more children on the average than those with traditional husbands and family heads. However, sterilized women of the 1970s with urbanized husbands and family heads had fewer children than mothers with traditional husbands and family heads. On the other hand, the sterilized mothers who were themselves urbanized had 1.7 more children than their traditional sisters. Urban sophistication evidently does not necessarily lead to smaller families. It is again necessary to note, however, that only a few individuals are involved in some of the comparisons; ur-

TABLE 28
**Completed Fertility: Mothers 45 Years of Age and Older or Sterilized, Living Children, and Duration of Childbearing by Selected Variables, Shanti Nagar, 1977-1978**

| Variables | No. Mothers | Mean Age at Firstborn | Mean Age at Lastborn | Mean (Years) Duration Childbearing[a] | Mean Children |
|---|---|---|---|---|---|
| Caste | | | | | |
| High | 92 | 20.48 | 33.28 | 13.56 | 4.95 |
| Low | 45 | 18.96 | 33.68 | 15.39 | 5.67 |
| Landownership | | | | | |
| Owns land | 84 | 20.46 | 33.45 | 13.74 | 5.01 |
| Landless | 53 | 19.22 | 33.35 | 14.81 | 5.45 |
| Literacy | | | | | |
| Woman | | | | | |
| Literate | 27 | 20.21 | 28.60 | 9.14 | 3.81 |
| Nonliterate | 110 | 19.92 | 34.60 | 15.41 | 5.52 |
| Husband | | | | | |
| Literate | 87 | 19.77 | 32.37 | 13.30 | 5.09 |
| Nonliterate | 45 | 19.97 | 36.00 | 16.77 | 5.67 |
| Family head | | | | | |
| Literate | 80 | 19.84 | 32.75 | 13.66 | 5.13 |
| Nonliterate | 57 | 20.20 | 34.36 | 14.87 | 5.26 |
| Urbanization | | | | | |
| Woman | | | | | |
| Urbanized | 13 | 18.73 | 34.98 | 16.83 | 6.46 |
| Traditional | 124 | 20.10 | 33.25 | 13.89 | 5.05 |
| Husband | | | | | |
| Urbanized | 90 | 19.28 | 32.43 | 13.85 | 5.14 |
| Traditional | 42 | 21.05 | 36.12 | 15.82 | 5.60 |
| Family head | | | | | |
| Urbanized | 86 | 19.47 | 33.03 | 14.26 | 5.16 |
| Traditional | 51 | 20.82 | 34.05 | 13.98 | 5.22 |
| Total | 137 | 19.98 | 33.41 | 14.15 | 5.18 |

[a] See table 27, note *a*.

banized mothers, of whom there are only seven, are especially rare.

Not too much should be made of such observations unless they form part of a strong demographic pattern that is evident when data are analyzed from several points of view, by different techniques, and from various Indian localities. For example, in the India-Harvard-Ludhiana Population Study, also known as the Khanna Study, Potter et al. (1965b) found a fertility differential between high-caste Jat Farmers and low-caste Chamar Leatherworkers. Chamar women have 1.25 live births more than Jat women and a childbearing span 2.88 years longer than Jats. Our classification of high and low castes is comparable to the distinction of Jats and Chamars used by Potter et al. The 1977–1978 data from Shanti Nagar are in general agreement with the findings of the Khanna Study; low-caste mothers have more children than high-caste mothers and their childbearing duration is about two years longer; but in the 1950s, the high-caste women had more children and a slightly longer childbearing span than low-caste women. Moreover, the differences between high- and low-caste ages at first and last birth were significant at the .01 level

TABLE 29
**Completed Fertility: Sterilized Mothers, Living Children, and Duration of Childbearing by Selected Variables, Shanti Nagar, 1977-1978**

| Variables | No. Mothers | Mean Age at Firstborn | Mean Age at Lastborn | Mean (Years) Duration Childbearing[a] | Mean Children |
|---|---|---|---|---|---|
| Caste | | | | | |
| High | 47 | 19.76 | 30.51 | 11.50 | 4.57 |
| Low | 21 | 17.79 | 30.41 | 13.38 | 5.52 |
| Landownership | | | | | |
| Owns land | 41 | 19.82 | 30.81 | 11.75 | 4.68 |
| Landless | 27 | 18.13 | 29.97 | 12.59 | 5.15 |
| Literacy | | | | | |
| Woman | | | | | |
| Literate | 23 | 20.02 | 27.73 | 8.46 | 3.78 |
| Nonliterate | 45 | 18.70 | 31.88 | 13.93 | 5.42 |
| Husband | | | | | |
| Literate | 54 | 19.24 | 29.55 | 11.06 | 4.70 |
| Nonliterate | 14 | 18.79 | 34.07 | 16.04 | 5.50 |
| Family head | | | | | |
| Literate | 47 | 19.21 | 29.52 | 11.06 | 4.66 |
| Nonliterate | 21 | 19.00 | 32.62 | 14.37 | 5.33 |
| Urbanization | | | | | |
| Woman | | | | | |
| Urbanized | 7 | 17.79 | 32.50 | 15.46 | 6.43 |
| Traditional | 61 | 19.30 | 30.25 | 11.69 | 4.69 |
| Husband | | | | | |
| Urbanized | 58 | 19.31 | 30.09 | 11.53 | 4.79 |
| Traditional | 10 | 18.20 | 32.75 | 15.30 | 5.30 |
| Family head | | | | | |
| Urbanized | 50 | 19.34 | 30.27 | 11.68 | 4.78 |
| Traditional | 18 | 18.61 | 31.04 | 13.18 | 5.11 |
| Total | 68 | 19.15 | 30.48 | 12.08 | 4.87 |

[a] See table 27, note *a*.

in the Khanna Study but insignificant in the 1950s and in the 1970s in Shanti Nagar, even at the .05 level, one-tailed test.

It is true that the two studies are not entirely comparable. The Khanna Study deals with live births and the Shanti Nagar data concern living children. The high-caste–low-caste distinction used in Shanti Nagar only approximates the Jat–Chamar comparison of the Khanna Study. In addition, the numbers of mothers are much smaller in Shanti Nagar than in the Khanna Study. This qualification is especially noteworthy for the 1958–1959 period when there were only 24 mothers 45 years of age and older. Therefore, the figures should be treated with considerable caution. Nevertheless, the Shanti Nagar data fail to support consistently the findings of the Khanna Study regarding the correlation of caste rank and fertility.

The size of completed families, the age distribution of the population, and the nature of the child–woman ratio largely explain the apparent anomaly of a rapidly growing population in the face of reduced fertility, shorter childbearing span, a relatively large number of sterilized couples, economic development, and social change. As measured by the child–

TABLE 30
**Completed Fertility: Unsterilized Mothers 45 Years of Age and Older, Living Children, and Duration of Childbearing by Selected Variables, Shanti Nagar, 1977-1978**

| Variables | No. Mothers | Mean Age at Firstborn | Mean Age at Lastborn | Mean (Years) Duration Childbearing[a] | Mean Children |
|---|---|---|---|---|---|
| Caste | | | | | |
| High | 45 | 21.25 | 36.25 | 15.75 | 5.33 |
| Low | 24 | 20.03 | 36.53 | 17.23 | 5.79 |
| Landownership | | | | | |
| Owns land | 43 | 21.09 | 36.03 | 15.69 | 5.33 |
| Landless | 26 | 20.39 | 36.86 | 17.21 | 5.77 |
| Literacy | | | | | |
| Woman | | | | | |
| Literate | 4 | 21.33 | 33.58 | 13.00 | 4.00 |
| Nonliterate | 65 | 20.80 | 36.52 | 16.46 | 5.58 |
| Husband | | | | | |
| Literate | 33 | 20.65 | 36.98 | 17.08 | 5.73 |
| Nonliterate | 31 | 20.53 | 36.89 | 17.12 | 5.74 |
| Family head | | | | | |
| Literate | 33 | 20.72 | 37.34 | 17.37 | 5.79 |
| Nonliterate | 36 | 20.94 | 35.41 | 15.18 | 5.22 |
| Urbanization | | | | | |
| Woman | | | | | |
| Urbanized | 6 | 20.06 | 37.88 | 18.75 | 6.50 |
| Traditional | 63 | 20.89 | 36.20 | 16.06 | 5.40 |
| Husband | | | | | |
| Urbanized | 32 | 19.21 | 36.68 | 18.20 | 5.78 |
| Traditional | 32 | 21.97 | 37.21 | 15.99 | 5.69 |
| Family head | | | | | |
| Urbanized | 36 | 19.66 | 36.96 | 18.04 | 5.69 |
| Traditional | 33 | 22.03 | 35.70 | 14.42 | 5.27 |
| Total | 69 | 20.83 | 36.35 | 16.26 | 5.49 |

[a] See table 27, note *a*.

woman ratio, fertility is directly proportional to the number of children less than five years old and inversely proportional to the number of women 15 to 45 years old. The proportion of young children in the population has fallen, chiefly due to sterilization, and the average age of women has increased, slightly augmenting the proportion in the childbearing years. The result is a drop in the child–woman ratio. However, mothers have more living children and the size of completed families is greater in the 1970s than in the 1950s. Reduction in the mortality rate (Padmanabha, 1982, table 1) contributes to this situation. Enhanced chances of survival can lead to larger families even if fertility declines and the childbearing span decreases.

## REMARKS

If, as seems likely, the demographic trends in Shanti Nagar are to any extent typical of the Union Territory of Delhi and the prosperous states of Haryana and Punjab, it is

worth speculating as to the future. The most prominent trends from the 1950s to the 1970s were a high rate of population growth, lower fertility, larger completed families, and a considerable number of sterilized couples. Sterilization appears to be the key to Shanti Nagar's demographic future. At the moment, it is the only method that can check a quite rapid population increase. The many sterilizations that took place during the Emergency have exercised a pronounced restraining effect on population increase in the youngest age brackets. After the Emergency, the annual number of sterilizations dropped to slightly less than five per year, which is probably not enough to serve as an adequate brake on population growth, especially since sterilized couples usually have between four and five children. In evaluating the demographic effects of sterilization, not only the number of sterilized persons must be considered but also the age of a woman at her sterilization (or that of her husband) and the average number of children per sterilized couple. In this regard, the average age at sterilization has fallen since the Emergency by some 4.5 years and the average number of children per sterilized couple has also declined but it still remains at the rather high level of 4.25 living children.

Since Indians of rural areas depend upon sons for support in their old age, it is interesting to note the average completed family size in Shanti Nagar is five and a fraction living children, for, on the basis of computer simulation, May and Heer (1968, pp. 205–206, and table 4) have calculated that about 5.1 children would be required for a couple to be reasonably sure of a living son when they were old. Specifically, May and Heer have calculated that in a stable population with the mortality and fertility rates of India, 1951–1960, a family that instituted perfect family planning (sterilization) upon being assured of having enough children to insure a surviving son at the 95 percent confidence level to the father's sixty-fifth birthday would have 5.1 living children. There were no facilities for computer simulation in Shanti Nagar, but it is possible that through generations of observing the fate of completed families, the villagers have arrived at a conclusion about a safe family size that approximates the calculation of May and Heer.

That couples make their decisions about whether to be sterilized in terms of their own self-interest brings us face-to-face with what is termed the "isolation paradox," or the "tragedy of the commons," the point of which is that sometimes what is good for the individual is bad for the society (Cassen, 1978, pp. 74–75). Family-size is potentially a case in point. A five-child family may be good for the specific rural couple but bad for India. It is a question of the family-size that a couple judges to be best. If families opt for sterilization or contraception after, say, five children, they would be using modern methods to plan their families most effectively from their own point of view, but this is not the result that the Government of India hopes to achieve. The government is thinking in terms of families with an average of two to three children.

The Shanti Nagar data cautiously suggest that indirect efforts at population control through literacy, urbanization, enhanced economic status, and modernization cannot be expected to contribute significantly to fertility control. It is not clear that any of the modernization variables consistently correlate with reduced fertility. The education of females is perhaps the most promising of the modernization variables, but its effect is ambiguous and, in any case, relatively weak until women achieve the college standard and are allowed to work for pay outside the home before and after marriage. It will be a long time before a significant proportion of rural Indian females are sent to college. The urbanization and education of husbands and family heads are in general positively related to sterilization, a phenomenon that largely derives from Government of India policies during the Emergency and may not characterize the post-Emergency period to the same extent.

Some of these points have been made by others. With regard to economic status, Gulhati (1977, p. 1302) observes "There is no conclusive evidence that motivation [for a small family] springs forth after a certain threshold of socioeconomic development is achieved. Nor is there incontrovertible proof that a silent demand for contraceptive usage exists, waiting only to be fulfilled by free and widespread distribution of the means." He notes that even for sterilized couples, the number of living children was about four (Gulhati, 1977, p. 1303). Poffenberger com-

ments (1976, p. 152) ". . . it was the high castes with the largest incomes that appeared to be least concerned about family limitation. . . . there is no evidence to support the position that interest in family planning will come about only as a result of raising economic status. Nor may additional education make significant short-run differences." The situation in Shanti Nagar is similar to what Poffenberger found in Gujarat. Poffenberger (1975, p. 110) remarks "When the cultural, social and economic realities of these village couples were understood and when the role expectations were known . . . we concluded that their fertility behavior was 'rational.' For village couples, the only logical thing to do was to have children in excess of the number they actually believed they needed. The two- or three-child family of the government propaganda and the pressure of family planning workers to limit family size did not make sense to most villagers. They did not believe the government or anyone else would take care of them when they could no longer support themselves." (See also Basu, 1981, p. 629; Cain, 1983, pp. 691–693.)

In his critical appraisal of the Khanna Study, Mamdani (1972) explains why rural Punjabis have large families. They want large families, claims Mamdani, because they need them. "The reality was that these villagers were solving their *poverty* problem by having larger families: most of them use the labor of their children within the village, and over a quarter of the families resort to emigration to supplement their family income. This alone explains their lack of receptivity to contraception" (Mamdani, 1972, p. 44, emphasis in the original). Mamdani (1972, p. 21) summarizes the failure of the Khanna project to introduce a successful program of contraception in the villages of the study in dramatic economic terms: "No program would have succeeded, because birth control contradicted the vital interests of the majority of the villagers. To practice contraception would have meant to willfully court economic disaster." However, economic conditions can change rather rapidly in modern India, and, in any case, it must be remembered that the Khanna Study and Mamdani's analysis of it took place before the Emergency.

During the last 10 years in Shanti Nagar, sterilization has been established as a viable option, which is currently being exercised, from the point of view of the Government of India, about two children too late. A vasectomy or tubectomy after four or five children, while better than no operation, will still allow a rate of population growth that will be tolerable only in the near term. The isolation paradox will hold sway in the absence of Draconian governmental pressure which, at the present time, is out of the question. The triumph of the Janata Party, which focused its campaign efforts in the rural areas chiefly on the issue of sterilization, is fresh in the minds of politicians. Mohan (1982, p. 16) comments that the 1977 election ". . . was decided, so far as the masses of the people in the northern states were concerned, by a single issue—alleged coercion in implementing the family planning program. The Janata Party's slogan in that election was 'Indira ko hatao, aur indriya ko bachao' (Throw Indira [Gandhi] out, and save your [generative] organ)." It is highly improbable, however, that the problem of population growth will disappear of itself and strong antinatalist measures may yet have to be imposed.

Fertility has been declining in India for some time and the growth rate has apparently stabilized. That these developments presage an imminent solution to India's population problem is possible but unlikely. For our part, we would be inclined to keep a rather sharp eye on the size of completed families. If it remains true that almost all Indian women marry and that sterility is relatively uncommon, the number of children left alive at the end of the average woman's childbearing span will possibly provide greater insight into India's demographic future than the drop of a few points in the birthrate. If parity at completed childbearing shows signs of stabilizing at between four and five children, India will continue to live up to its reputation as a demographic juggernaut.

## APPENDIX: ERRATA

This monograph is the seventh about Indian rural life that has been published in *Anthropological Papers of the American Museum of Natural History*. In an undertaking of such scope it is almost inevitable that a few factual errors slipped by our checking and entered the copy. In order to avoid problems for researchers making use of our data, we devote this Appendix to the correction of errors that have appeared in preceding monographs. Most of them concern measurements accompanying line drawings that were published in S. Freed and R. Freed (1978). In addition, however, the figure of 4.75 bighas given as the equivalent of one standard acre in S. Freed and R. Freed (1976, p. 30; 1978, p. 13) is incorrect; the correct figure is 4.80, for an acre is the equivalent of four bighas and 16 *biswa*s (there are 20 *biswa*s in a bigha), which in decimal notation is 4.80. The comment in S. Freed and R. Freed (1976, p. 31) that one can approximately convert seers to pounds by dividing by two is obviously incorrect. One multiplies the number of seers by approximately two to convert to pounds. In S. Freed and R. Freed (1976, p. 28) Mrs. Urmila S. Soni was incorrectly identified as Mrs. Urmila Anand Sat Soni.

In S. Freed and R. Freed (1978, p. 79), it is stated that 14 seers (one seer equals .93 kg or 2.05 lbs.) of buffalo milk yield one seer of ghee (clarified butter). The correct equation is 10 seers of buffalo milk yield one seer of ghee (see S. Freed and R. Freed, 1981, p. 488). Figure 74 in S. Freed and R. Freed (1978) is upside down.

Three of the line drawings of agricultural implements in S. Freed and R. Freed (1978) give incorrect impressions because of distortion produced by the attempt to depict each implement in a single drawing. These implements are here redrawn in two views in order to remove any ambiguity. We take advantage of the opportunity of correcting the drawings of the three agricultural implements to publish measurements of eight additional artifacts illustrated by line drawings in S. Freed and R. Freed (1978). Although all the drawings included scales, various dimensions could not be estimated from the scales owing to distortion produced by artistic perspective and, moreover,

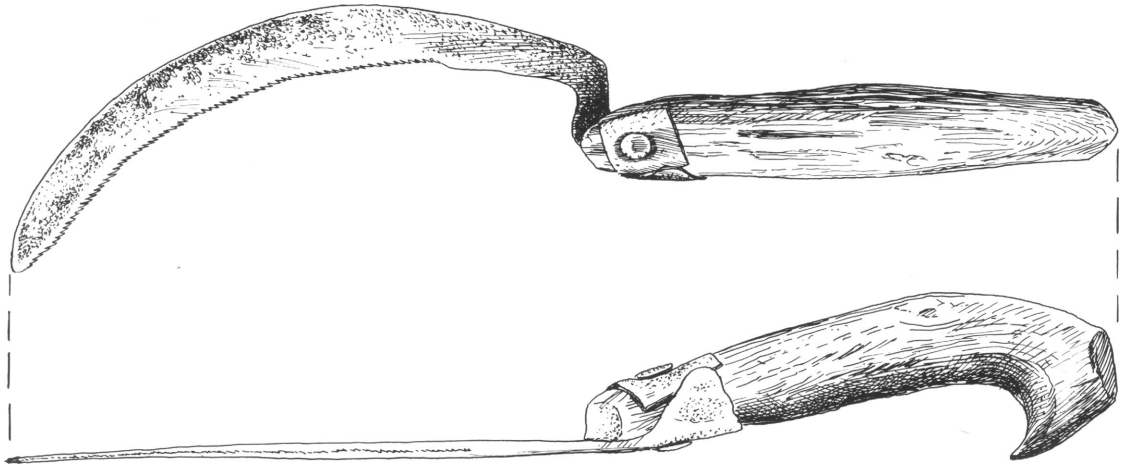

FIG. 1. Sickle (*daranti*) with a wooden handle and an iron blade used to harvest grain. It was made to be used by a right-handed person. Sickles used by left-handed persons had blades the curvature of which faced in the opposite direction from the blades of right-handed sickles (Mehra, 1966, p. 33). The blade is attached to the handle at a slight angle so that when the implement is held in harvesting position with the blade parallel to and as close to the ground as possible, the handle is elevated so that the fingers do not scrape the ground. The sickle was originally illustrated in S. Freed and R. Freed (1978, fig. 28), but the drawing gave an incorrect impression of the implement. Length, 37.5 cm. AMNH 70.2-6448.

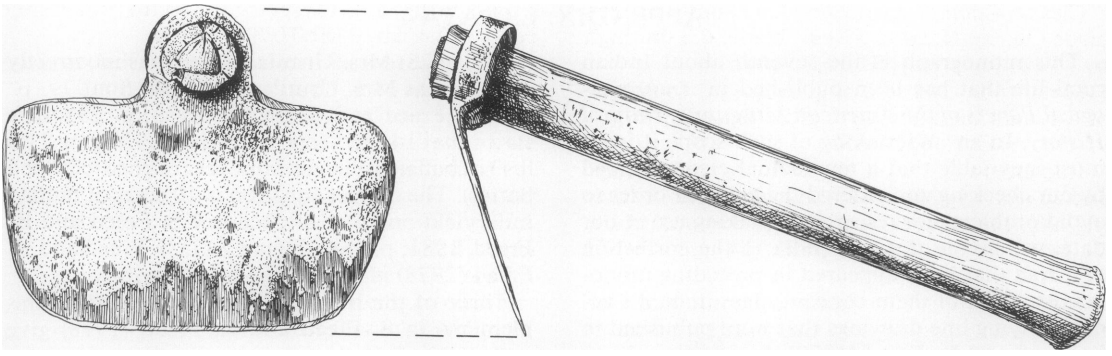

FIG. 2. Short hoe (*khudali*) with a bamboo handle and an iron blade used to loosen earth and to weed around sugarcane. (Originally illustrated in S. Freed and R. Freed, 1978, fig. 3.) Handle, 31 cm; blade, 10 cm long by 17.7 cm wide at widest point. AMNH 70.2-8174.

the scales for five figures (figs. 24, 26, 31, 41, 59) were inaccurate. The implements with their dimensions and the figure numbers from S. Freed and R. Freed (1978) are as follows.

Long-handled spade or hoe (*kasaula*) with bamboo handle and iron blade (fig. 8). Handle, 147 cm; blade 19 cm long by 20.4 cm wide. AMNH 70.2-6449.

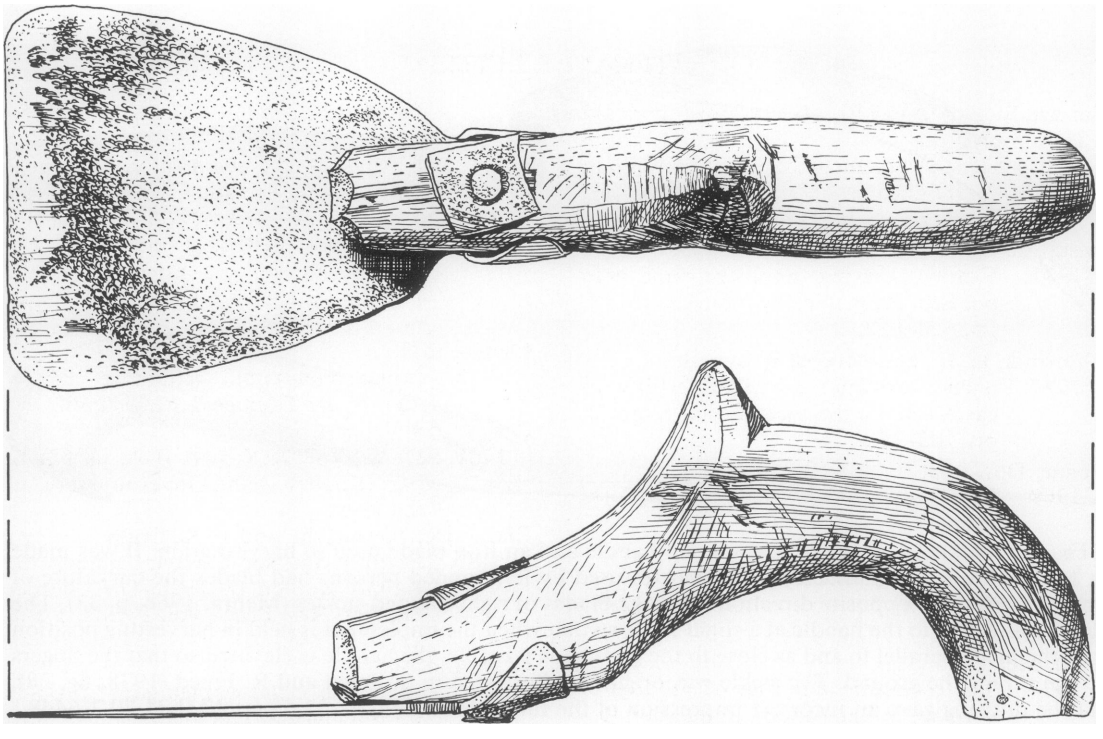

FIG. 3. Scraper or trowel (*khurpa*) with a wooden handle and an iron blade used to weed vegetables. (Originally illustrated in S. Freed and R. Freed, 1978, fig. 39.) Length, 29.4 cm; width of blade, 10.4 cm. AMNH 70.2-6485.

Cleaver (*gandasa*) with wooden handle and iron blade (fig. 9). Handle, 35 cm; blade, 6.3 cm high by 20 cm long. AMNH 70.2-8181b.

Metal tube used to sow grain (*orna*) consisting of a funnel mounted on a pipe (fig. 24). Length, 93 cm. AMNH 70.2-6450.

Implement (*gorhi*) of thick wood, iron fittings, and an iron edge drawn by bullocks to move earth (fig. 26). Front to back, 54.7 cm; width at blade, 71 cm; height at highest point, 14 cm. AMNH 70.2-8173.

Pitchfork (*jeli*) with bamboo handle and iron tines (fig. 31). Length, 194 cm; width at points of tines, 23 cm. AMNH 70.2-8180.

Reed winnowing basket (*chhaj*) (fig. 35). Width at the front edge, 62 cm; height, 15 cm; length, 32 cm. AMNH 70.2-8156.

Churn (fig. 41) consisting of an earthenware pot (*biloni* or *bilowani*), wooden shaft and paddles (*rai*), wooden cover (*chakhra* or *phul*), wooden handles (*koli*), and rope (*neta*). Length of shaft and paddles, 88.5 cm; length of rope, 144 cm; diameter of cover, 26.5 cm; diameter of mouth of jar, taken at exterior margin of the rim, 22 cm; height of jar, between 21 and 22 cm because the jar is somewhat asymmetrical. AMNH 70.2-6451a–e, 6452.

Basket (fig. 59). Diameter at top, 61 to 63 cm; depth, 22.4 cm. AMNH 70.2-8153.

The *jal* tree was incorrectly identified as *Tamarix dioca* in R. Freed and S. Freed (1979, p. 308). The correct botanical designation is *Salvadora oleoides* (Maheshwari, 1976, p. 210).

The changes below refer to R. Freed and S. Freed (1980).

Page 339, right column, fifth line from the bottom. Change "rites" to "rituals."

Page 345, right column, next to last sentence in middle paragraph. "As a result, they . . . ." Change "they" to "the villagers."

Page 346, left column, second paragraph, next to last sentence. "For example, Krishna is often . . . ." Change the sentence to read, "For example, Krishna is often identified by his playing the flute or Shiva, by being pictured with his vehicle, the white bull."

Page 451, left column, third paragraph. "Ram Chandra won Sita . . . ." Change the sentence to read, "Ram Chandra won Sita in a contest to see who could bend the bow of Shiva" (Dowson, 1950, p. 257).

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