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**Child and Maternal Health Services
in Rural India**

The Narangwal Experiment

Volume 2
Integrated Family Planning
and Health Care

*Carl E. Taylor, R. S. S. Sarma,
Robert L. Parker, William A. Reinke,
and Rashid Faruqee*

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V.2

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THE JOHNS HOPKINS UNIVERSITY

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Child and Maternal
Health Services
in Rural India

The Narangwal Experiment

Carl E. Taylor and Rashid Faruquee
Research Coordinators

A WORLD BANK RESEARCH PUBLICATION

Foreword

The two volumes of this study are books I have long been waiting for: waiting to find corroboration or refutation of what initially may have been no more than hunches or surmises, born of valid observation but not subjected to any rigorous statistical analysis. My generation was brought up in an age when quantitative analysis had not yet developed into the modern technology of intervention that it is today. It is true, of course, that this technology may often lead one astray by forcing upon one what will be no more than spurious refinements that the multitude of individual responses, which depend so much on exogenous factors, will bear. Nevertheless, one feels fortified when one's subjective hunches are supported by objective statistical analysis. When they are not, one is still loth to shed one's hunches but gives more serious thought to doubts. And doubts are far more important than certitudes.

In the late 1950s through the early 1970s, the certitudes of many national policies to improve the well-being of people in the developing countries were almost exclusively the establishment of family planning services, the development of contraceptives, and the extension of family planning communication. Reduction of fertility, it was argued, was a straightforward function of these services: they alone would deliver the goods. International advice and aid bore down on national doubts, and anyone who pleaded that mortality (especially infant and child mortality), or the state of nutrition, or the low levels of literacy and women's participation in economically productive activity was a far more obdurate enemy than high fertility was shunned like a pariah.

Policy prescriptions and action programs that relied almost exclusively on these assumptions--in whose aid, again, many statistical correlations were invoked--did not, however, work the way they were expected to. Already in the 1950s the United Nations had convened a distinguished interdisciplinary group of scholars who foretold why they would not (United Nations 1953). C. Chandrasekharan (1961; see also WHO 1954) also had produced the Mysore study, which identified many determinants and imponderables and the cunning ways in which they interact to affect fertility behavior.

Some of these determinants had been spelled out by critics of Malthus as early as the second quarter of the nineteenth century when, as a result of social, cultural, and economic factors, natural fertility in Europe had already declined to levels lower than in developing countries a century later. Socialist thought in the last quarter of that century hinted that education, health (particularly reduction of infant, child, and maternal mortality), women's liberation and work outside the home, equity, and income were the chief determinants of a woman's right and decision to have the number of children she desired. The development of contraceptives and family planning communication came more or less after the other determinants had begun to work in Europe. But these interrelations and historical paths were ignored for the developing countries in the haste to achieve quick results that kept eluding their sponsors despite the pressures already mentioned.

Against this faith in the primacy of contraceptive supply and services together with family planning communication that prevailed throughout the 1960s and well into the 1970s, small groups of men and women persisted in investigating more comprehensive approaches to the complex problem of child and maternal health in the developing world. For India, the Khanna study (Wyon and Gordon 1971) yielded important and complex relationships, as did Project Poshak (Gopaldas 1975) and several of the evaluation exercises conducted by the Planning Commission of India, which ultimately led to substantial attitudinal and policy changes from the period of the Fifth Five Year Plan onward. A series of interim research conclusions emerging from the Narangwal Project, which had its origin as early as 1955 in the Narangwal Rural Health Teaching Centre (it became the Narangwal Rural Health Research Centre in 1961), have whetted the appetite for the full account these volumes provide.

The chief value of these books to me lies in their statistical rigor, complexity, and rectitude bordering on welcome understatement and a disinclination to attempt blanket answers. The conclusions they contain cannot, of course, be the last word on policy issues or on the understanding of subtle interrelationships. Rather, the principal virtue of the books rests in the way the authors have questioned assumptions that need investigation because they are so firmly embedded in faith and honest endeavor.

There were difficulties in the way of continuing the Narangwal Experiment, but these were quite unconnected with the objectives, content, and worth of the Experiment. The way in which the Experiment

was conducted and analyzed must not suffer obloquy, and surely not for the wrong reasons. I did not have then, nor do I have now, any misgivings about the solid worth of the Experiment and the messages it had begun to convey as long ago as 1968-69, to which the books bear ample testimony. And for this I must compliment the authors for their devotion, persistence, and rectitude. These volumes are indispensable to those who, like them, hustle while they wait, work with faith yet are visited by doubt, and look for rigor and comprehensiveness in research design and methodology.

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New Delhi
November 1983

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Definitions

Project Terms

child loss rate	Demographic variable: proportion of children who were born alive but were dead at time of survey
continuing-user rate	Prevalence of continued use of modern (project) contraceptive methods
CONT-N	Control--Nutrition Project (designates villages not receiving nutrition, health, or integrated services)
CONT-P	Control--Population Project (designates villages not receiving family planning, health, or integrated services)
current-user rate	Prevalence of contraception at a specified time
effective-user rate	Prevalence of contraception adjusted for differences in effectiveness of contraceptive methods
ever-user rate	Cumulative acceptance of contraception before and during project
fetal death rate	Demographic variable: proportion of pregnancies that ended in fetal death
FHW	Family health worker
FPCC	Family planning and child health care services, including nutrition care (designates villages receiving such services; same as NUTHC villages in parallel Nutrition Project)
FPED	Family planning and family planning education (designates villages receiving such services)
FPWS	Family planning and women's health services (designates villages receiving such services)

FPWSCC	Family planning, women's health services, and child health care services, including nutrition care (designates villages receiving such integrated services; also called NUTHC-P in parallel Nutrition Project)
HC	Health care (designates villages receiving such services, which included infection control, in parallel Nutrition Project)
input	Services provided by the project
new-acceptor rate	Acceptance of first use of modern contraception because of project
NUT	Nutrition care (designates villages receiving such services in parallel Nutrition Project)
NUTHC	Nutrition and health care (designates villages receiving such integrated services in parallel Nutrition Project; same as FPCC villages)
outcome	Effects of project services on health and family planning status
output	Utilization and coverage of services provided by the project

Technical and Indian Terms

<i>chowkidar</i>	Village watchman responsible for reporting births and deaths under government's vital statistics system
<i>dai</i>	Traditional village midwife or birth attendant
IUD	Intrauterine device (the Lippes 27.5-millimeter loop or the "Taviti," a shield-shaped polyethylene device developed at Narangwal)
Jat-Sikh	High-caste, landowning farmers of the Sikh religion
<i>muklawā</i>	Second marriage ceremony held when cohabitation begins

neonatal	Refers to the first month of life
<i>panchayat</i>	Elected village council
<i>patti</i>	Village faction or clan
perinatal	Refers to the period from the seventh month of pregnancy to the first seven days of life
postneonatal	Refers to the second through twelfth months of life
prenatal	Refers to the period from conception to birth; antenatal
scheduled Sikh	Low-caste, non-Jat, landless agricultural workers of the Sikh religion; "Ramdasia" is the term used in volume I (Kielmann and others 1983) and refers to religious subsect; "Chamar" is the term used in reports of the Khanna study (Wyon and Gordon 1971) and refers to occupation

Preface

The name Narangwal has come to mean much more than the name of a village in the Punjab. That village was the base for a Rural Health Research Centre sponsored by the Indian Council of Medical Research (ICMR). The name Narangwal now represents an evolving methodology for long-term field research done in a collaborative style with village people. The Narangwal research has produced some of the most specific evidence available to date on what primary health care can do for women and children in the poor and deprived areas of the world. It contributed directly to the insights incorporated into the background documents for the Alma Ata World Conference on Primary Health Care in 1978. More specifically, it demonstrated the benefits of integrating family planning and maternal and child care in one project and nutrition and infection control in a parallel project. It showed how auxiliary-based health care can be organized to be provided at an average cost of US\$2 per capita per year at 1970 prices. The project was conducted during 1967-74 in eight village clusters including a total of twenty-six villages with a population of 35,000, distributed in three community development blocks with a population of 300,000. The challenge now is to go beyond the Narangwal findings, and the results of many demonstration projects which have supported and added to its findings, to learn how to implement mass programs for needy people in villages throughout the world.

The Narangwal research used the experimental design of a controlled field trial, but it was applied flexibly to develop, adapt, and improve services over time. Measuring the inputs of services, the outputs of utilization, and the outcomes of improved health and family planning made it possible to calculate the effectiveness, cost effectiveness, and equity of different interventions. The findings should help national health planners in their judgments of probable costs and benefits. Our experience indicates, however, that trials are needed in each new area--to adapt what was learned at Narangwal to other local conditions.

The Narangwal Population Project grew out of long involvement in the life and problems of village India. Members of the staff had spent many

years working in villages. During the project we all lived in village homes with simple hygienic improvements that would demonstrate healthful living. The depth of understanding that came from sharing the life of villagers greatly enhanced the interpretations from more sophisticated data gathering.

The formal origins of the population project derive from the earlier research activities of the Narangwal Rural Health Research Centre. In two adjacent villages--Bara (big) Narangwal, with 1,800 people, and Chota (little) Narangwal, with 800 people--the research center which provided a base for this project had been set up in 1961 in collaboration with the ICMR. It is near a teaching health center, started by the Ludhiana Christian Medical College in 1955 to provide a base for rural internship training. The first project of the Rural Health Research Centre was a study of the rural orientation of physicians (Taylor and others 1976). That led to a series of studies on indigenous practitioners and on the beliefs of village people about diet and disease (Grover, Taylor, and Parker, forthcoming). A research project was then undertaken to develop the functional analysis methodology for measuring health needs and resources for primary care (Johns Hopkins 1976).

The several years of background information on rural health services led to the research projects on the two health problems that seemed most important in village India. The Narangwal population study reported here was started in 1969. A similar controlled experiment on the interactions between malnutrition and infection in children of weaning age (Kielmann and others 1983) was started in 1967. The nutrition project included all children under 3 years old in four groups of villages: one group received nutritional surveillance and supplements; another was provided health care emphasizing infection control through immunizations and early diagnosis and treatment; the third received both nutrition and health care services; and the fourth continued to receive routine government services and served as a control. The use of primary care interventions selected to meet local needs led to dramatic improvements in growth, development, mortality, and morbidity. The nutrition and population projects were developed in parallel, and the combined nutrition and health care group of villages for the nutrition project was also the child care and family planning group of villages for the population project. The methods that evolved for providing services are summarized in two field manuals for village auxiliaries on child care and child nutrition (Uberoi and others 1974; DeSweemer, Sengupta, and Takulia 1978).

The initiative for this research came from the Indian Ministry of Health and Family Planning. National leaders recognized that balanced

and continuing long-term development of services needed field research on how to make family planning activities an effective part of routine health services. The Ministry of Health and Family Planning delegated responsibility for the oversight and surveillance of the Narangwal projects to the ICMR so that the research would become part of the national research effort. Annual reports were made to the ICMR to keep research in line with national objectives. Direct communications were also maintained with officials in the Ministry of Health and Family Planning, and there were numerous site visits and conferences at Narangwal throughout the research. The first feasibility funding was from a PL-480 grant by the U.S. Department of Health, Education, and Welfare. The project was greatly expanded with long-term financing from the U.S. Agency for International Development (USAID). Funds were also contributed by the World Health Organization (WHO; H9/181/22 and H9/181/23). Most important, the ICMR provided direct research grants after the PL-480 grant ended, showing the strong commitment of the Indian Government to this research.

From the start of this project, officials in the Ministry of Health and the research team agreed that a second-stage effort would be desirable to encourage multiple demonstration projects to adapt the methods and findings of the Narangwal research to local conditions in other parts of India. Several such projects have been successful in reaching larger populations in the years since the Narangwal field work stopped (ICMR 1981). Although they did not collect detailed research data, they have been especially effective in demonstrating the value of community participation and the ways a health team can help people solve their own health problems. As the national program of training multi-purpose health workers and community health workers develops in India, there will be special need for the continuing stimulus that can be provided by demonstration and research projects. Continuing adaptation will be needed to find local solutions to the problems of providing primary health care, family planning, and nutrition to improve the quality of life of the rural poor. This presentation of the findings of the Narangwal research will provide a baseline for this continuing effort.

When the Narangwal population study was started, it was projected that it would take at least five years of consecutive field observations to get definitive results on the levels at which family planning practice curves would reach a plateau in the various experimental groups. This was considered the best measure of the relative influence of women's or children's care on family planning. Because of political repercussions from Indo-U.S. relations at the time of the Bangladesh

War, the project was terminated prematurely. Most family planning curves were still rising, although two were showing signs of reaching a plateau. Because of the multiple sources of data, however, the detailed analysis reported here provides a more precise analysis of issues of cost effectiveness and equity as well as overall effectiveness than would have been possible simply from following the family planning curves.

By the time the project was terminated in 1974 there had already been a great deal of preliminary analysis that had directly influenced policy and planning in India. Overall, more than seventy-four publications have come from the Narangwal Rural Health Research Centre, mostly journal articles published in India. When the project terminated, the original data and a complete set of computer tapes were left in India for use by Indian scientists. After a lag period of several years, when it became evident that the Narangwal data had major significance for international policy, a duplicate set of computer tapes which had been generated at the Johns Hopkins University in Baltimore before the project terminated were analyzed with support from the World Bank. Throughout the process of analysis, Indian scientists who were originally involved in the field research have been intimately involved, and good communication has been maintained with the ICMR.

In expressing appreciation to those who made the Narangwal Population Project possible, we must first recognize a long and distinguished sequence of Indian government officials. The original decisions to do the research were made by the Ministry of Health and the ICMR. The main credit for sponsoring the research and bringing it to fruition must go to the directors general of the ICMR--started under Professor Wahi, continued under Dr. Gopalan, and especially promoted by Professor V. Ramalingaswami. With their colleagues at the ICMR, they provided intellectual and administrative support that went far beyond the official requirements of liaison with the research team.

Many officials of the Ministry of Health helped with policy guidance and direct advice through field visits. At the series of Narangwal conferences, leaders in academic institutions and in central and state governments provided insights about what should and could be done and about how to interpret the findings. Special mention must be made of officials in the Punjab Health Services--including the health secretaries, directors of health services, state officials in Chandigarh, and district officials in Ludhiana--who helped in ways ranging from selecting study areas and seconding staff to discussing at length how the research could be made relevant. Many colleagues in academic and research institutions participated in the field research, especially

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Those of us who have had the privilege of producing this analysis and book feel a special debt of gratitude to our many colleagues who shared the field work. Listing their names and roles cannot give enough recognition to the collegial collaboration and hard work that made the field experience so productive. The long list that follows this preface indicates the importance of the contributions by a large number of researchers and field staff over the life of the project. Starting with fifteen or so, the staff grew to about 150 by the end of the project; at any time during the project an average of two professionals from six countries other than India were on the field staff in Narangwal. The excitement of living and working together in the villages strengthened the close ties of collaborative endeavor. And as individuals moved to new positions after the project, they carried the imprint of this experience. All in the Narangwal family know that life brings few opportunities to work with so congenial and dedicated a group.

Our deepest thanks go to our wonderful hosts in the villages. Their hospitality made us feel that the villages were our homes. We often identified so completely with their joys and concerns that we worried about scientific objectivity; but because community participation calls for seeing things through the eyes of local people, this identification became an asset. With patience and goodwill the people of Narangwal welcomed our research activities. Their understanding of the reasons for the research led to their pleasure in knowing that lessons from this work might help programs in villages elsewhere in India and the world. To our village friends, we express our deepest gratitude--for the shared hope that this book can help improve the quality of life of the world's neediest people.

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Although many other administrative and support staff are not listed, we would like to recognize their important contribution to the project. They include secretaries, clerical and accounts staff, construction and maintenance staff, watchmen, village attendants, drivers, and mechanics.

PART ONE

*The Narangwal
Population
Experiment*

Chapter 1

Background, Design, and Policy Issues

Carl E. Taylor

To village people, health and family planning seem to fit naturally together. Politicians also have intuitively tended to want to combine these services. There is now abundant evidence that family planning is one of the most important means of improving the health of mothers and children in areas where fertility and mortality are high. For many years, however, the importance of family planning both for health and general socioeconomic development was largely ignored. Intensive effort in introducing family planning services has been required to catch up with other development activities. On the other side of the two-way interaction, the usefulness of health services in facilitating family planning has not received equivalent attention. At first it was taken for granted that family planning would be part of health services. In the last twenty years this assumption has been challenged, but with little definitive research to support strong assertions on both sides of the issue.

Background

In the early 1960s, when international awareness of the drastic social and economic consequences of surging population growth moved family planning into a position of high priority, a number of international agencies began to advocate separation of family planning from health services. In most countries a lack of success in vertical programs, and political repercussions when excessive pressure to practice family planning was applied, caused rapid integration of

services. In a few countries (such as Indonesia) large-scale, vertically administered national programs were set up which achieved significant success in promoting family planning. After such an initial success, these countries are having to decide when and how to integrate family planning with health services. Almost all countries now agree that eventually the two services will have to be integrated, especially as international funding is diminished.

In addition to considerations of how health and family planning services should be delivered, there is the parallel issue of how motivation for family planning should be promoted. A great deal of effort has gone into analyzing factors associated with acceptance of family planning, with much concern about "beyond family planning" policies. These matters clearly require the involvement of several ministries with a range of responsibilities going much beyond the scope of ministries of health. Integration with health in the delivery of services should never interfere with these broader motivational efforts.

India was the first country to have a national policy promoting family planning. Consistently, responsibilities for health and family planning services have been in the same ministry, but there have been great fluctuations in the autonomy of family planning services. When the Narangwal research was started, there were major questions about whether integration was appropriate. The policy that services should be integrated is now firmly established, but ways continue to be sought to have wider, high-level support for promoting family planning motivation. For Indian policy, therefore, the major value of the Narangwal findings relates less to the question of whether integration is appropriate and more to questions of how it should be accomplished.

A starting point in discussions of how integration should be done is recognition of the significant advances being made in primary health care. The Alma Ata World Conference on Primary Health Care in 1978 declared that "maternal and child health, including family planning" is one of the seven components of primary health care (WHO and UNICEF 1978). For primary health care to be effective, it is essential that great selectivity be exercised in choosing a limited package of interventions, but this package should be chosen locally, not in Geneva or New York. The package must be kept small enough to permit an effective management framework to be developed.

In international policy discussions the question whether there should be integration of health and family planning still continues to be important. The arguments against integration usually stress the expectation that, by concentrating on a single set of activities, a program can be more tightly managed for greater impact. It is also

claimed that, in comparison with other ministries, the ministry of health tends to be less effective and efficient and has lower status. It is sometimes said that family planning cannot wait for health services because in many places primary health care is not yet available to village families. The proponents of any type of single-purpose program tend to justify separate services by saying that if an immediate effect can be achieved then the various services can be integrated later.

Why Integrate Health Care and Family Planning?

It seems appropriate at this point to summarize six arguments that support the benefits of integrated programs for health and family planning. The first is greater long-term efficiency and effectiveness. An initial but short-term increase in family planning can be produced just by providing services to meet existing demand. In most countries the demand for contraception--by parents whose families already exceed their desired family size or their ability to care for more children--has not yet been met. It has seemed reasonable, therefore, to get some family planning services out to these couples as fast as possible. But the experience has been that, when such a service is set up separately from health services, it is then extremely difficult to achieve integration. Particularly damaging have been personnel attitudes of jealousy and competition created by the common tendency to provide special incentives for family planning workers, because the resulting ill will has reduced subsequent chances for cooperation with other health and development workers.

Rather than having four to six workers for different categorical programs carrying out one task each, as is now done in some countries, it is more efficient to have a single multipurpose worker carry out several tasks if the package is kept simple enough to permit consistent performance and sound supervision. An integrated package of a few activities can improve the organizational structure of primary health care, the training and supervision of personnel, and the use of supplies, equipment, and facilities. Primary health care should not try to do everything at once, but the selection of the service package components that will eventually fit together should be planned from the beginning.

Second, integrated programs offer more diversity of responsibility and therefore more challenge to field workers. Workers who have become comfortable with doing only one task tend to resist additional

responsibility, but having only one thing to do also tends to sap the motivation that leads to service of good quality. Having a range of tasks permits workers to get a favorable response from different people for different parts of their activities. A major danger of integration, however, is the tendency to overload workers. When workers obviously cannot do everything they have been asked to do, they will concentrate on what they are most comfortable with or on what brings them the greatest rewards and social response. Because health workers usually are most interested in curing patients, it is important that curative activities should not crowd out both preventive health services and family planning. If the population covered and the package of services are kept small enough, it is possible to avoid such overloading. There must be established routines, good management, and supportive supervision to ensure continuing attention to family planning in integrated services, just as these supporting services are needed to make categorical programs effective.

Third, integrated services make sense to families. When a health or family planning worker visits homes, people like to have all their problems cared for by this worker rather than to have visits from other personnel whose activities are separated for reasons that the people cannot understand. They prefer to get care for themselves and their children from one person in one clinic, and they do not like to go to various clinics at different times. The demand for better health care will always lead people, as their living conditions improve, to seek better health care for their children. National decisionmakers therefore logically reject the occasional suggestions by international experts that efforts should be focused on family planning while child health services remain undeveloped.

Fourth, public acceptance of family planning can be improved by attaching these activities, which often have equivocal acceptance, to programs for which there is spontaneous and continuing demand. For continuing reduction of fertility, demand for family planning must be increased by influencing motivation by the most direct means that fit each local situation. Of these, one of the most universally available is the motivational benefit of combining health and family planning services. Even though some parents are eager for family planning because they already have more children than they can care for, the demographically more important and larger number of low-parity parents tend to have mixed feelings about family planning. For them the case for early spacing or limitation is more convincing when it comes from a health worker they have learned to trust because of the worker's continued help with their health problems.

Fifth, family planning for women has been shown (in hospital postpartum studies) to be especially effective when provided as a routine part of maternal care because of high motivation associated with pregnancy. As demonstrated in this research, entry points for family planning can be identified and readily introduced in the normal routine of maternal care. The high motivation at this time has several sources. When family planning education starts in the prenatal period, the mother accepts as natural the proposition that family planning should begin immediately after delivery to protect her health and the well-being of the child. Considerations of time and money also make parents realize that they would have difficulty caring for the children they already have if another pregnancy supervened. An important psychological consideration also seems to be that, having just passed through one pregnancy, mothers tend to want a respite before starting another. Prolonged lactation and cultural patterns support spacing, but they tend to become less effective in societies that are developing rapidly.

Sixth, it seems reasonable that the experience or expectation of reduced infant and child mortality will increase the practice of family planning. As long as the proportion of children who die in childhood remains substantial, a major psychological obstacle will be that parents will feel that they should have extra children to achieve desired family size. Health services that lead to significant reductions in child mortality may thus be an important, though not essential, means of encouraging lower fertility in areas where fertility and mortality are high. Efforts to increase the perception of higher child survival, although not guaranteeing a decline in fertility, would be expected to shorten the demographically important lag between the decline of mortality rates and fertility rates.

From the evidence now available, the question of how much change in child survival will influence motivation for family planning must still be considered open. These influences probably operate differently at various stages of development and in the context of other forces influencing attitudes about fertility. From our earlier work in Punjabi villages, it was evident that the effect is not automatic. There is certainly not a one-to-one replacement of children who are lost, as had been postulated in earlier statements of the child-survival hypothesis (Preston 1978). Two types of motivational forces need to be distinguished: "replacement" of children who die, and "insurance" births because of the expectation that some children might die. A conference report summarizing some of the evidence on replacement (Preston 1978) showed that the main reason for the well-documented shortening of interpregnancy intervals after a child's

death was the cessation of lactational amenorrhea, which normally provides biological protection from pregnancy. In a series of other studies, separate but smaller reductions in birth intervals after a child's death, presumably due to replacement motivation, were demonstrated in situations where lactation could not have been the explanation (Taylor, Newman, and Kelly 1976). The consensus is that motivational influences may be associated with the replacement of a third to a half of the children lost (Preston 1978).

An analysis of Korean data (Park, Han, and Choe 1979) showed that before 1965 most of the mortality-related reduction in birth rates was due to lactational amenorrhea; after 1965, when the National Family Planning Program became effective, the motivational influence on replacement became more important. In any case, after mortality had already declined, the frequency of child deaths became so low that it could have contributed only about 3 percentage points to the reduction in the number of births. This supports the general experience (Preston 1978) that motivation to replace children who die can be demonstrated mainly in such places as France and Taiwan, where development has been general and where parents are already limiting their family size. Replacing a child implies an uncompleted ideal family size and therefore would be relevant only up to the parents' desired family size. As long as reproductive performance is not controlled and people fatalistically or enthusiastically accept whatever children may come, there is little restraint on fertility that can be removed in response to the replacement motivation. Therefore, replacement motivation probably is not an important force in maintaining high birth rates in developing countries. From the policy point of view, however, this conclusion does not justify the further assumption that it disproves the child-survival hypothesis, because it still ignores the more important issue of insurance motivation.

Under conditions in which infant and child mortality remains high (such as in the Punjab), the relevant variable, which is more difficult to measure, is insurance motivation. Early studies assumed that decisions to have extra children because some might die would be deliberate and rational, but we have found that these attitudes become manifest as subconscious expectations. Early in this research, we showed that only 10 to 15 percent of parents said yes when asked if they were having more children because of the fear that some might die; 45 percent said they had never thought of the possibility (Taylor and Takulia 1970). Cross-tabulations, however, have shown statistically significant associations between parents' expectations of a child's death and their readiness to practice family planning,

suggesting that the subconscious motivation of insurance needs to be studied as a separate force to define the strength of this association and whether it might have policy implications. Analyses of Narangwal data in this volume contribute to further clarification of the issues.

Despite these arguments for integration, it has been difficult to integrate services once separate services have been set up. Competitiveness at the periphery is strong, and workers have to change basic attitudes if they are to work effectively in integrated services. Our experience has been that workers from vertical programs, although expressing the desire for broader responsibilities, frequently have proved resistant to taking on expanded activities. Workers whose whole job experience has been in comprehensive services have seemed from the beginning to be more ready to adapt to changing priorities and responsibilities.

At the top and middle administrative levels, the problems of separate services have been just as great as those at the periphery. In some categorical programs, the people in charge spend much of their effort trying to justify their separate existence. The effect of this type of justification can be seen in Nepal, where integrated services had to be formally designated as a vertical program outside of the regular health services to get the attention and priority to compete with continuing categorical programs, especially family planning.

In some states of India, rudimentary services for maternal and child health were essentially destroyed when vertical family planning programs were started in the 1960s. It is important now in the converse situation that, as integration is carried out, care should be taken to ensure that successes achieved in family planning services are not downgraded. In any integrated program, program priorities should be clearly focused to achieve an effectiveness and efficiency similar to vertical programs. As much attention should be devoted to management as in categorical programs. In the past, the best management capability was usually absorbed by vertical programs, which have had special glamour and resources. As a result, the general health infrastructure with which the special programs were supposed to be integrated never developed.

The suggestion that other activities can be added progressively to an effective vertical program after it has achieved good coverage has the problem that each categorical service then sees itself as being the one to which other activities should be added. The problems of eventual integration into general services will only get worse over time. The stronger the separate services are when they are combined, the greater the likelihood of rivalries and traumatic adjustments.

What Is the Evidence for Integration?

Evidence that has been accumulated on the two-way interactions between health and family planning will now be presented. It is generally recognized that high fertility and short birth intervals greatly interfere with the health of mothers and children (Omran 1971 and Omran and Standley 1976). The converse influence of health on fertility and birth intervals (and thus on population growth) is much more complicated and little research has been done. A distinct difference between short-term and long-range interactions needs to be emphasized. The obvious direct effect of better health is to reduce mortality, and if fertility remains high the population increases. Yet the long-term effect seems to be that a group of interacting factors work together so that health services can promote family planning and thus reduce fertility.

Attempts to unravel the many determinants of population growth have relied mainly on increasingly complicated statistical analyses of cross-sectional demographic surveys to determine associations among variables (Nortmann and Hofstatter 1978, Kendall 1979, UNFPA 1980). Such interpretations of the spontaneous interactions between population growth and other factors important in national development do not always lead to understanding of what happens when different kinds of program interventions or social changes are deliberately introduced. This kind of information is best obtained from prospective field research, such as that reported in this volume.

Many recent analyses have confirmed the direct effect of national family planning services in producing an initial reduction in population growth (Mauldin and Berelson 1978). This is presumably due largely to meeting existing demand for family planning. It has become evident that more will have to be done to maintain the decline in fertility, in going beyond family planning and increasing motivation. Largely because of the apparent success of family planning programs in such countries as China, and because mortality rates have not fallen as rapidly as predicted in other countries, the projection of world population in 2000 has come down from more than 7 billion (before the censuses done around 1970), to between 6 and 7 billion in the mid-1970s (World Bank 1975), to about 6 billion in 1980 (World Bank 1980).

There is growing information on how program interventions from other development sectors can influence the practice of family planning (Ridker 1976, World Bank 1980). Experience in a growing number of countries indicates that economic development may not be as important as social development in promoting a rapid decline in fertility

(Wolfson 1978). One of the most important considerations is a clear relationship, with equitable distribution of services. Social justice has long been a political goal, but most national and international decisionmaking has continued to filter out legitimate claims to equity, so that social programs still disproportionately benefit the elite. Skepticism exists about whether the new emphasis on equity can be put into action. Economic planners have depended mostly on studies that measured economic effects because they seemed to be precisely quantifiable. Social development variables have seemed vague and diffuse, with few clearly definable indicators. To parallel GNP, three indicators have been put together to make up the Physical Quality of Life Index (PQLI): infant mortality, life expectancy, and literacy (Grant 1978). That two are health indices further indicates the importance of health in social development. That spending on health care and nutrition consumes a large part of the income of poor people also supports the importance of health interventions.

It would strengthen commitment to action if measures to improve equity and distributive justice in health care, which carry strong moral and political imperatives, could also be shown by scientific data to be important in solving the world's population problem. Other than by political revolution, the most direct way of improving equity is to give the poorest people better access to services that can meet the basic requirements for a better life.

Of special interest is the experience of Sri Lanka and the state of Kerala in South India (Ratcliffe 1978), where political decisions created long-term policies that permit the separation of social and economic influences on population growth. For a prolonged period before the 1960s, both governments provided nearly universal coverage of health care, family planning, education, and basic nutrition, but each state experienced almost zero growth in GNP. Birth rates declined more than 10 percentage points in ten years. The reasonable conclusion is that it is better not to wait until people have enough money to pay for social services as economic benefits "trickle down" to them. When the fundamental requirements for family sustenance were provided at relatively low cost, motivation for family planning was strengthened naturally. In the long run, of course, economic development is essential to support the whole development process. Such analyses of national data indicate the need for better local studies to dissect the dynamics and causal relationships among social development variables.

Few longitudinal, controlled studies have attempted to measure the strength of program variables in influencing the practice of family planning. One of the best-known field projects in India was the

Khanna Project, which was conducted between 1953 and 1969 in the Ludhiana District of Punjab, just twenty-six miles from Narangwal (Wyon and Gordon 1971). It provided much new data on the epidemiology of fertility and a wealth of information on methods of field research. Efforts to promote family planning had minimal impact partly because foam tablets were the only contraceptive used. Contrary to the claims of Mamdani (1973), the Khanna field work was conducted in a way that was especially sensitive to what people in the villages were thinking. The style of research and published reports stressed sociocultural and economic considerations and the need for sympathetic understanding of the way village people think about problems of fertility and the value of children. Much was added to understanding of why village people are cautious about family planning. The study identified five principles of population control as a basis for future planning: reducing child mortality, promoting community education, encouraging social and material progress recognizing the economic value of children, providing inducements for delayed marriage and small families, and ensuring supplies of suitable and efficient contraceptives.

As far as we know, Narangwal was the first field project to measure in a prospective and controlled experimental design the interactions between various combinations of health services and family planning. After the Narangwal Project started, a study with similar objectives but a very different experimental design was conducted in Danfa, Ghana (University of Ghana 1979). According to that study, family planning acceptance increased from 11 percent in 1972 to 34 percent in 1977 in the area with the most intensive services. In an area with fewer services, only health education and family planning, the increase was from 7 percent to 21 percent; in an area with family planning alone it was from 2 percent to 8 percent. The project showed that acceptable services can be developed at reasonable cost under the conditions in Africa.

A larger demonstration project was conducted from 1974 to 1979 in Lampang Province, Thailand, in an effort to improve the coverage of primary health care for more than 600,000 persons (International Council for Educational Development 1979). Although not strictly a research project, the analysis included the designation of control districts and the use of a complex system of gathering data. Special training of 96 medical assistants and 901 community health volunteers produced substantial increases in the use of services, but it was difficult to supervise the large, dispersed cadre of volunteers. Many parts of the program are being extended throughout Thailand with World Bank support.

These seem to be the only comparisons of the effects of health interventions on family planning and fertility that used control groups. Related information can be derived from demonstration projects that did not have control groups but did measure over time the results of innovative packages of integrated services. Examples are the Companiganj Project in Bangladesh (McCord 1976 and 1977; Chowdhury, Ashraf, and Aldis 1978); the projects of the Population Council in Turkey, Nigeria, Indonesia, and the Philippines (Williamson, Parado, and Maturan 1983; Atkins 1980); the projects developed by Antia (1979), Coyaji (1979), P. M. Shah (1977), and the Aroles (1975) in Maharashtra, India; and an increasing number of projects in other parts of India (ICMR 1981).

Purposes Underlying the Research

The research had two goals. For general international and scientific interest, a complex set of research hypotheses and models was tested in a controlled experimental design. Different packages of services were designed as inputs for clusters of villages so as to quantify the relationships between project inputs (services provided), outputs (utilization and coverage of services), and outcomes (effects on health and family planning status). For further definition, see "Design and Data Base," below (under "Analytic Model").

A parallel goal was to develop low-cost packages of integrated services for rural areas that were inputs into the research design. These packages were to be developed in such a way as to meet the needs of primary health care programs in India and other developing countries and to be adaptable in demonstration projects in other states and countries. The Indian government's main objective in promoting this research was to find out how to develop integrated services that combine family planning, women's services, child care, and nutrition. Even in the late 1960s it was evident to some officials in the Ministry of Health that eventually it would be necessary to go beyond the intensive, single-purpose national program for family planning. Massive investment was being concentrated on sterilization camps that provided vasectomies and tubectomies. The mass approach of inserting intrauterine devices (IUDs), also in camps, had already produced a serious backlash. Increasing use of pressure and incentives was leading to negative reactions among the population. Eventually it would be essential for the government to face the reality that long-

term effectiveness in family planning depends on development of the total, integrated health care package.

The research approach rejected the notion that it was reasonable to wait for social and economic forces to reduce birth rates. We set out to find the most direct and culturally acceptable ways of promoting family planning through integrated services. It was obviously important to separate the effects of general social change from those of the integrated program, and this called for the simultaneous analysis of many variables. (For further detail see below, under "Design and Data Base.")

Two groups of factors were identified. The first group included most of the variables which have been studied by demographers as being strongly associated with a decline in fertility but which have the limitation that they are not easy to manipulate. Either they are endogenous and not susceptible to change (for example, caste), or they are the result of slow-moving social trends (for example, changes in the status of women and in the preference for sons). Policy-makers and program managers must understand such variables to identify target groups for special services. Our results include data on these variables and show how they can be selectively identified to help focus services on groups with special patterns of response.

The second and much smaller group of variables are those that can be manipulated directly through program interventions. Throughout this report it will be apparent that we were frankly interventionist in seeking causal variables that can be readily changed. The most readily manipulated set of variables is integration of health services with family planning. It is surprising, therefore, that this subject has received so little systematic research attention. The Narangwal research not only measured the strength of associations between various combinations of services; it also showed how these combinations could be implemented. All services were designed to be at a technological and skills level so that they could be carried out by normal government services using auxiliaries--at an annual cost of less than US\$2 a person.

The Narangwal Setting

A study of the ecology of population dynamics in village communities must start with an understanding of village culture. The Punjab has always tended to be progressive in accepting technological innovations. As beneficiaries of the Green Revolution, these communities

enjoyed socioeconomic development and improved access to basic social services before and during the project period of 1969-74. For those who have not been in the Punjab since the 1960s, it may be hard to appreciate the transformation that occurred when the Green Revolution doubled agricultural production, even though the increased income went disproportionately to the rich. Money has changed the villages, as brick replaced mud and electrification brought labor-saving devices and the radio, shattering the quiet of village life. The paving of village streets eliminated the need for agility in maneuvering past mud holes. Mechanized agricultural implements were brought in to ease the work pressure of handling larger crops. Education expanded so rapidly that there soon were primary schools in almost every village, a high school within a few miles, and an increasing number of rural colleges. Good roads have extended public and private transport by bus and bicycle. The spread of literacy has increased the supply of newspapers, magazines, and other written materials. Punjabis have always been politically active, but village politics have become even more intense because of the influence *panchayats* (elected village councils) have been given in controlling government benefits that reach the villagers.

One great advantage of working in Punjabi villages was that the progressive attitudes helped in getting frank discussion and feedback from communities as we jointly worked out better ways of improving health care. Free and open discussion with the frank and vigorous Punjabi villagers about any activity that might benefit them and their children showed a healthy balance between eagerness and reluctance to change. The cooperation was gratifying because local people enthusiastically took part in the research by telling us what would or would not work and by suggesting better approaches.

Punjabi villages are strongly interacting social units, each of which has its own history and personality. Groups of villages tend to be geographically pocketed, and each one has two or three strong factions based on clans (or *pattis*) of the dominant Jat-Sikh caste. This clustering of characteristics and affiliations produced unexpected problems in getting comparable experimental groups.

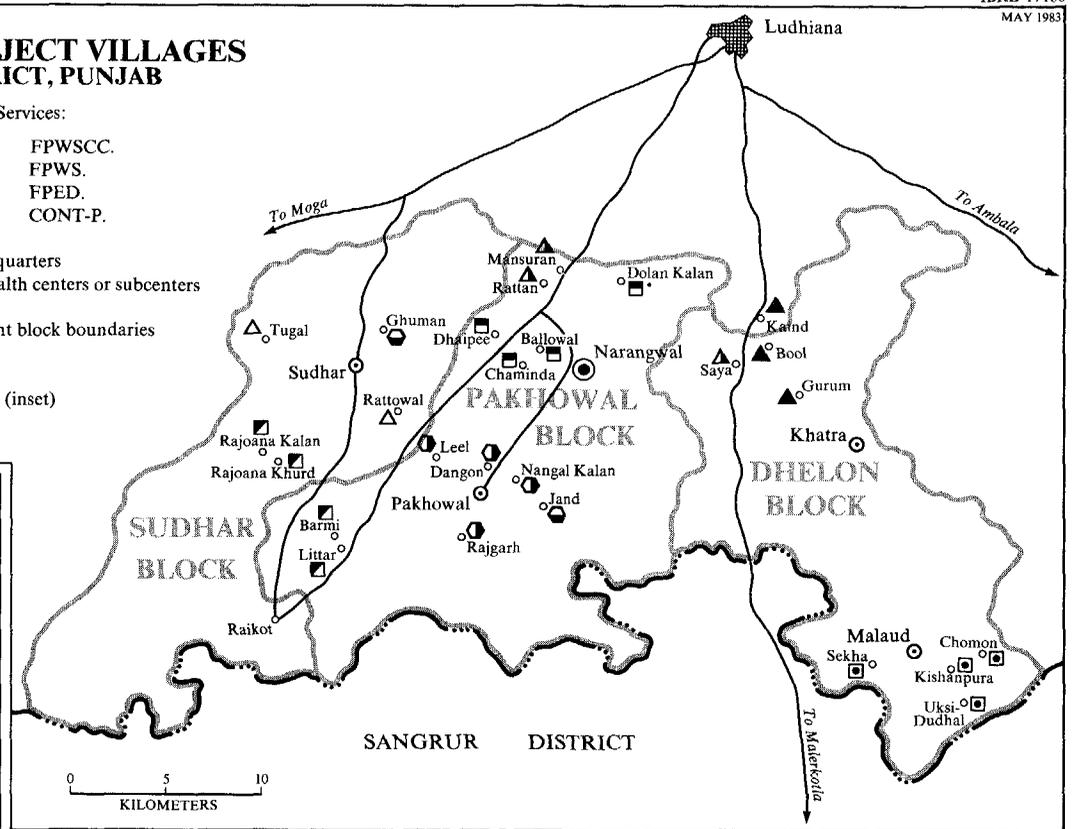
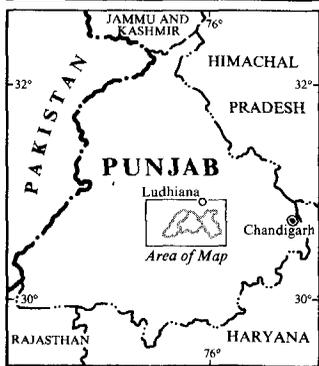
The village of Narangwal is in Pakhowal Block--in the south-central section of Ludhiana District (see map). It was the location of the project research headquarters and therefore was not used as a study village. A careful selection process was used in the surrounding area to identify twenty-six experimental villages in eight clusters with a population of about 35,000 in the Pakhowal, Sudhar, and Dhelon community development blocks. Government health services in the area

INDIA
NARANGWAL PROJECT VILLAGES
LUDHIANA DISTRICT, PUNJAB

Narangwal Project Services:

- | | | | |
|---|-------------|---|---------|
| ▲ | NUT. | □ | FPWSSC. |
| △ | HC. | ◻ | FPWS. |
| ▲ | NUTHC-FPCC. | ◻ | FPED. |
| ◻ | CONT-N. | ◻ | CONT-P. |

- (with dot) Narangwal project headquarters
- (empty) Government primary health centers or subcenters
- Major roads
- - - - - Government development block boundaries
- · - · - District boundaries
- · - - - State boundaries (inset)
- · - - - International boundaries (inset)



are based on primary health centers, with each center serving one community development block of between 80,000 and 100,000 people.

The usual quantifiable parameters were taken into consideration in selecting villages. Differences between experimental groups which could not be eliminated in the selection process are outlined in the next section of this chapter. It proved impossible to balance the lack of homogeneity in subtle but ultimately important characteristics, such as the willingness to change. Only after the field work began did we realize how different the responses were between villages and between groups of villages. According to several indicators, the villages receiving comprehensive integrated health and family planning services happened to be the most conservative and traditional in the study, partly because we chose them for their isolation from existing services. This accidental bias against our hypotheses gave us even more assurance that the final differences in outcome variables between experimental groups were important.

A cultural characteristic that complicated data gathering is the pattern of village exogamy. All girls marry outside the village, and for their first several births women go home to their parents. More than a third of the births in our population were in villages where we had no personnel, so we had to set up elaborate mechanisms for recording incoming and outgoing births. In addition, women typically went to their parents' homes two or three months before delivery and stayed for three or four months after delivery. That made it difficult to get complete reporting of abortions and miscarriages, of neonatal and infant mortality, and of such specific measures as birth weights. It also made it difficult to provide continuity of maternity services and family planning.

General fertility trends in rural Punjab needed to be carefully accounted for in the analysis. There was a steady decline in fertility during the decade before the project started in 1969. Data from Punjab generally and from Ludhiana District show that birth rates had fallen from more than 40 to around 35 per thousand, something less than 1 percent a year. Our detailed data from pregnancy histories suggest that in the control villages there was no general acceleration of the rate of decline before or during the project, despite a massive national program for family planning that started in 1965, first with IUDs and then with sterilizations.

An important variable defined in the Khanna study (Wyon and Gordon 1971) was the increasing age at marriage for women. In our population the mean age at first marriage increased from 12.8 years for those married before 1940 to 19.3 years for those married after 1970. In

Figure 1-1. *Distribution of Villages According to the Experimental Design of Both Nutrition and Population Studies, Narangwal Project*

	No nutrition	Nutrition	
No health care	CONT-N Ghuman Jand	NUT Kaund Gurum Bool	
Health care	HC Tugal Rattowal	NUTHC or FPCC Mansuran Rattan Saya	Child care
		FPWSCC or NUTHC-P Ballawal Chaminda Dhaipee Dolan Kalan	
	CONT-P Dangon Leel Nangal Kalan Rajgarh	FPED Barmi Rajoana Kalan Littar Rajoana Khurd	No child care
		FPWS Chomon Sekha Uksi-Dudhal Kishanpura	
	No women's services		Women's services

- Nutrition project design.
- - - - - Population project design.
- CONT-N Control—nutrition project.
- CONT-P Control—population project.
- FPCC Family planning and child care.
- FPED Family planning and education.
- FPWS Family planning and women's services.
- FPWSCC Family planning, women's services, and child care.
- HC Health care.
- NUT Nutrition care.
- NUTHC Nutrition and health care (integrated services).
- NUTHC-P Nutrition and health care (integrated services)—population project.

Punjab a second ceremony, *muklawa*, takes place when cohabitation starts, and the mean age for muklawa for the same groups of women increased from 15 years to 19.8 years.

The fertility patterns of all experimental groups appear to have been fairly uniform during the years before the project began. This is indicated by the small differences in mean age for given parities or for pregnancy order. For all women in the study population, the mean parity was 4, the mean number of pregnancies was 4.2, and the mean age at parity 4 was 33 years.

Design and Data Base

The experimental design grew out of the general hypothesis that the attitudes toward and the practice of family planning would improve if family planning were integrated with health services. Two subhypotheses were that each of the separate components of services would have measurable effects and that the dynamics of their interactions could be traced to define options for policy and program decisions. An additional hypothesis was that a decline in infant and child mortality would lead, after a lag, to increased contraceptive practice because of attitude changes associated with expectations that more children would survive. We arbitrarily estimated at the outset that at least five years would be needed to demonstrate motivational changes resulting from improved child survival. A major problem that made it impossible to obtain more definitive data on the child-survival hypothesis was that a change in relations between India and the United States at the time of the Bangladesh War led to the termination of the project in 1974, after four years of service implementation in some experimental groups and after only two years in others. The family planning acceptance curves in integrated service villages were still steadily increasing. We had expected to show a plateau of family planning curves in groups of villages receiving various service packages as our best measure of the long-term effect of motivational changes related to the child-survival hypothesis. We were, however, able to analyze in depth the associations between intermediate variables that do provide strong support for the hypothesis.

Four experimental groups of villages received different service packages; a fifth served as a control (figure 1-1). As discussed in greater detail in appendix B, the service packages included different combinations of services: family planning (FP), women's services (WS), child care services (CC), and family planning education

(ED). The initials are combined in identifying the four experimental groups by the services provided: FPWSCC, FPWS, FPCC, and FPED. Throughout this book the groups of villages and service packages they received will be identified as follows (the dates below show when full-scale family planning services were provided; in some cases, especially in FPCC villages, some health services had been started earlier):

FPWSCC	Family planning, women's services, and child care services, including nutrition care (mid-1969 to 1974)
FPWS	Family planning and women's services (mid-1969 to 1974)
FPCC	Family planning and child care services, including nutrition care (1971 to 1974)
FPED	Family planning education and services (mid-1972 to 1974)
CONT-P	Control for population project

The concurrent nutrition project had four experimental groups of villages, which received the following service inputs:

NUTHC	Child care services: nutrition care and health care, mainly infectious disease control and health education
NUT	Nutrition care
HC	Health care, mainly infectious disease control and health education
CONT-N	Control for nutrition project

One experimental group was used by both projects: the family planning and child care (FPCC) group in the population study was also the child nutrition and health care (NUTHC) group in the nutrition project. For details about services, see the next subsection (under "Project Services").

Designing a field project of this scope introduced major conceptual and methodological problems. One choice of options at the beginning was whether to match the total service inputs in each experimental cell or to match inputs for each type of service. To compare the effects of each service would obviously have been desirable for equalizing analysis of the impact of that component. This would have meant, however, that the FPWSCC villages would have received the additive inputs of three services. Because we were interested not in the separate effect of each service but in the effect of integrated services, we decided to take the other approach and equalize the overall inputs, which meant that effort devoted to any one service in combined programs would be proportionally reduced. We expected that improved efficiency and other benefits would partially compensate for this reduction of effort in any one service. To further sharpen the analysis, we developed observational methods of work sampling that gave us

detailed data on inputs by all categories of workers in minutes of effort per week by activity.

The inputs for each experimental cell were viewed as service packages built around various combinations of family planning, women's services, and children's services. Rather than just add activities together, we devoted great effort to working out the best combinations and sequences under field conditions, so that activities were truly integrated, not merely juxtaposed. Because our most important objectives were to develop practical services for eventual use in government primary health centers, we decided not to follow the usual principle of holding inputs uniform throughout the experiment. What we first decided would be best was frequently shown to be unworkable or ineffective after a few weeks or months of field trial. Holding rigidly to a prescribed service input after we had learned a better way of providing services would have been unethical. Interaction and feedback from family health workers (FHWs) and village people was encouraged and proved most constructive and innovative.

Strong convictions about the ethics of research in village communities obliged us to ensure that the rights of village people took precedence over the scientific objectives of our research. The first of these rights was to involve them in planning and implementing the field work. Preliminary negotiations were conducted with panchayats, and they continued to be consulted and approved all activities. It proved relatively easy to get their understanding and concurrence with the notion of an experimental design in which different packages of services were to be offered to various villages. In any case, any of our service packages supplemented the limited care provided by government primary health centers. They were used to differences in government services because the health centers had divided their 100,000 population into intensive and extensive areas of service delivery, with the intensive areas limited to the 5,000-10,000 people immediately adjacent to each health center or the 2,000-3,000 adjacent to each subcenter. For ethical reasons, we decided that CONT-P villages, FPED villages, and the FPWS villages that did not receive child care from us should be in a health center's intensive zone or as close as possible to government primary health centers. This diluted considerably the comparability of our controls. It also made for significant differences in prior use of contraception, because the main outreach activity of the primary health centers has been family planning. The net effect of these differences, however, is to make our results more convincing because they had to start by compensating for these initial advantages in control and single service groups.

Table 1-1. *Selected Demographic, Socioeconomic, and Other Characteristics of Experimental Groups of Villages, 1971*

Item	FPWSCC	FPWS	FPCC	FPED ^a	CONT-P	Other
No. of villages	4	4	3	4	4	7
Census population ^b	5,877	4,614	4,623	5,661	5,047	7,379
Sex ratios (M/F × 100)	117	114	117	111	108	115
Percent of population						
Under 15	42.6	42.2	42.0	36.8	39.2	42.3
Women 15-49	20.8	21.4	20.7	22.6	22.7	21.2
Married women 15-49	17.9	17.9	17.5	16.5	18.0	16.9
Women over 50	6.0	5.9	6.2	6.8	6.3	6.1
Caste group (percent)						
Jat-Sikh	50.3	47.3	40.8	59.2	53.9	57.7
Scheduled Sikh	33.1	32.2	39.2	28.4	34.9	25.7
Others	16.6	20.5	20.0	12.4	11.2	16.6
Percent literate	33.1	25.7	34.0	43.2	34.3	38.3
Occupation of head of household (percent)						
Farmers (landowners)	41.7	46.0	33.6	55.2	43.0	46.2
Laborers	34.5	33.1	35.7	25.3	29.8	25.2
Others	23.8	20.9	30.7	19.5	27.2	28.6
Housing (percent)						
All mud	31.2	34.7	21.0	35.6	33.9	23.6
Courtyard handpump	88.9	90.2	93.3	94.4	85.0	90.0
Lane drains	44.2	44.0	55.4	16.3	38.8	54.7
Electrified	42.2	24.7	42.8	24.3	28.6	35.8
Farming						
Median land acreage ^c	5.7	8.5	5.0	4.9	7.8	5.4
Tractor users (percent)	8.2	10.8	17.7	27.5	22.8	21.7
Tubewell owners (percent)	27.2	32.1	21.3	31.9	33.3	32.1
Household annual income and possessions (US\$)						
Median total income	292	256	323	362	289	309
Median nonland income	77	140	162	172	75	169
Median value of possessions	521	575	508	644	572	612
Accessibility (km) ^d						
To project center	4	24	6	17	-	13
To closest other health center	4	2	6	8	2	6
To market town	13	10	10	4	9	11
To city (Ludhiana)	23	35	19	31	33	24

FPWSCC Family planning, women's services, child care; FPWS Family planning, women's services; FPCC family planning, child care; FPED family planning, education; CONT-P control, population project; - not applicable.

a. Data for FPED is for 1972.

b. Individuals (primarily women and children) identified through provision of services and by means of other surveys but not enumerated on the census would increase the total population by about 5-6 percent in each experimental group except FPED, where no extra people were identified. This would bring the total study population up to about 35,000.

c. Median of households owning land.

d. Mean distance in kilometers weighted by village population.

To have a base against which the influence of health services could be measured, it was necessary to measure the effect of family planning services alone. Acceptance always increases when a program is started because existing demand for family planning leads people to try the new methods as a substitute for methods they had been using. We projected that practice curves in FPED villages would reach a plateau in about two years, after existing demand for family planning had been met, and this did happen. These villages presented a problem in negotiations because our government advisors considered the existing situation in control villages serviced by the national family planning program to have been essentially a family-planning-only approach, and they were interested mainly in testing other combinations of services. It was finally agreed that the family-planning-only group should become a FPED group to see how much an intensive educational program could increase the use of family planning. Rather than using FHWs at the village level, the basic field personnel for this group of villages were family educators, who had been trained as junior basic teachers for village schools. These negotiations and arrangements took time, and services in this group of villages did not get started until more than two years after those in the first groups of villages receiving integrated services.

Differences between Villages

Experimental field studies testing alternative interventions and using controls necessarily confront the reality that villages are unique and complex social units. We attempted to reduce differences by selecting and grouping villages to provide comparability in major socioeconomic characteristics. Selection criteria also included clustering villages geographically so that they were at a reasonable distance from other clusters to reduce intergroup contact (see map). Year-round accessibility to four-wheel drive travel within one hour of the project headquarters in Narangwal was the main geographical requirement. Despite these efforts to ensure comparability, some important differences between experimental groups were found in subsequent analyses (table 1-1). FPED villages, and to a lesser extent CONT-P villages, had low dependency ratios of children and old people, the highest proportion of higher castes, the highest literacy, the most landowners, and the highest average income. Additional evidence from the 1961 and 1971 government censuses on these villages (table 1-2) reveals that FPED villages had a history of higher literacy as well as more rapid improvement in the education of women

Table 1-2. *Literate Population in Narangwal Villages:
Indian Government Censuses, 1961 and 1971*

<i>Experimental group</i>	<i>Percent literate</i>		<i>Sex ratio of literate population</i>	
	<i>1961</i>	<i>1971</i>	<i>1961</i>	<i>1971</i>
FPWSCC	23.22	31.48	241	182
FPWS	24.02	26.15	274	185
FPCC	25.76	33.45	210	178
FPED	35.45	39.02	211	136
CONT-P	27.02	39.08	-	151
Other	29.22	38.63	200	156
Total	27.87	34.98	n.a.	161

- Not applicable; n.a. not available.

between 1961 and 1971. The differences identified between experimental groups indicate that the positive results from integrating services for health care and family planning probably would have been even stronger if the prior differences had not existed. Analyses at the individual level were able to adjust statistically for many of these differences.

Summary of Variables

A large number of input-output-outcome variables were measured in the many surveys and studies of the project. Table 1-3 summarizes the data sources and the dates when the data collection was carried out. A description of the methods of data collection is given in appendix A. Field projects usually do not measure inputs through work sampling but attempt only to equalize personnel and resources between groups. Even though we attempted to standardize formal inputs by having one FHW or family planning educator for each village, we realized that the different packages of services would involve different responsibilities and investments of time. Fortunately, the method of functional analysis that we had developed earlier provided an excellent means of getting detailed data on services, including counts of service contacts, time investments for each function, and detailed costs by activity (Johns Hopkins 1976). This provided a basis for using quantitative measures of services as independent variables in input-output-outcome analysis and for performing detailed studies of cost effectiveness.

To define the background factors that influenced program results, many socioeconomic, demographic, and attitudinal variables were measured. These included indices of some of the variables considered most likely to influence population growth: educational level, communication between husband and wife, attitudes toward children, and attitudes toward planning for the future (Easterlin 1974, Ridker 1976).

Analyses reported in this monograph have focused on the variables that have the greatest policy relevance. A brief description of these variables follows. Variations in the data sources will be described with individual analyses in the appropriate chapter.

Demographic factors. Age, sex, marital status, parity, number of living children, number of children who had died, and dates of entrance and exit from the study population were used as important control variables to standardize results as well as to develop specific population denominators.

Socioeconomic factors. Religion and caste group, husband's education, husband's occupation, household income, household landownership, and possession of selected household items were used to measure individual and household characteristics.

Attitudes and beliefs. Approval of family planning for themselves or for newlyweds, intent to have another child, beliefs about changes in child mortality, chances of children surviving, and various combination variables, were obtained from responses to a questionnaire from married women 15-49 years old. An important index proved to be whether husbands and wives talked about family planning, a variable that we assume to be an indicator of a woman's feeling of independence and of her ability to participate in family decisions.

Knowledge and practice. Awareness of methods of contraception before the project were obtained for all married women 15-49 years old.

Fertility and mortality. All births and deaths (including fetal, infant, and child) before the project were recorded in a detailed pregnancy history for married women 15-49 years old. All births and deaths (all ages) during the project were recorded as they occurred, using multiple sources of reporting.

Morbidity and growth. Longitudinal periodic measurements of days of selected illness symptoms and weight and height of children under 3 years old were collected in child care villages.

Table 1-3. *Data Collected, 1967-74*

<i>Item</i>	<i>Year</i>	<i>No. of villages</i>
<i>Cross-sectional surveys</i>		
Baseline census	1967-68	22
Second census	1971	22
Baseline census	1972	4 (FPED)
Third census	1973	26
Pregnancy history and present fertility		
1st survey	1968-69	22
2nd survey	1971-72	26
3rd survey	1974	4 (FPWSCC)
Attitudes and beliefs about family planning and child survival		
1st survey	1968-69	22
2nd survey	1971-72	26
3rd survey	1974	4 (FPWSCC)
Knowledge and practice of family planning		
1st survey	1968-69	22
2nd survey	1971-72	26
3rd survey	1974	4 (FPWSCC)
Socioeconomic survey		
1st survey	1967-68	22
2nd survey	1971	22
1st survey	1972	4 (FPED)
<i>Longitudinal data collection</i>		
Family planning practice	1969-74	8
	1971-74	3 (FPCC)
	1972-74	4 (FPED)
Fertility status of eligible women	1969-74	11
	1971-73	7
Vital statistics		
Births and deaths	1969-74	22
	1972-74	4 (FPED)
Marriages	1972-74	26
Morbidity of children	1968-73	10
Anthropometric measurement of children	1968-73	14
<i>Service input information</i>		
Health service utilization	1972-73	26
Sample survey	1973-74	19
Service records	1969-74	18
	1972-74	4 (FPED)
Work sampling	1971-72	18
	1973-74	15
Costs	1969-73	7
	1969-74	11
	1972-74	4 (FPED)

Note: Surveys and studies were carried out systematically in all or selected segments of the study population during the time periods indicated.

Project services. Services to individuals were categorized as: (1) *women's illness care*, which included visits or contacts related to women's illnesses that usually were initiated by ill women or their families and most often occurred in the village clinic; (2) *women's other care*, which included contacts initiated by project health workers through routine home visits to women for fertility surveillance, health education, family planning motivation, and preventive care; (3) *children's illness care*, which included visits to clinics, or other contacts for curative purposes with children in the study villages, usually at the family's initiative and in the village clinic; (4) *children's other care*, which included routine contacts initiated by project health workers for prevention and surveillance (but including early diagnosis and treatment in the home) for children in the study villages; (5) *family planning services and follow-up*, which included contacts with both women and men involving the provision of modern family planning methods or the follow-up of users; and (6) *family planning motivation*, which included contacts by male family planning workers with husbands of women in the study villages (these contacts involved general rapport-generating activities, health-related advice, specific family planning and population education, and motivation to use contraceptives). The first two constitute women's services (WS), the second two children's services (CC), and the third two family planning (FP) and family planning education (ED).

Work sampling and cost analysis. Detailed recording of activity times and costs by functional categories permitted calculation of the minutes per week or costs that were attributable to specific functions, activities, or services. Aggregate time and cost variables were used in analysis at the experimental-group level.

Use of nonproject health services. Sample household surveys monitored the use of government and private services and related out-of-pocket expenditures in study villages.

Project family planning practice. Use of modern methods of family planning by anyone in the family planning villages during the project (1969-74) was recorded by type of method and date of use.

As the services evolved during the course of the study, care was taken to ensure that each activity remained within the program category prescribed for that experimental group. The project services are summarized in table 1-4 and are described in more detail in appendix B. Services were never static but continued to evolve, so that particular

Table 1-4. *Summary of Service Inputs*

<i>Item</i>	<i>Description</i>
Family planning	
Education and motivation	Intense educational efforts were provided in FPED; education was well integrated with health care delivery in FPWSCC and FPWS and less adequately integrated in FPCC
Contraceptive services	Condoms, pills, IUDs, injectable Depo-Provera, vasectomies and tubectomies were provided under similar conditions in all experimental groups
Follow-up	The same method--specific patterns of follow-up were established for all groups
Women's services	
Monitoring fertility and early diagnosis of pregnancy	Routine in FPWSCC, FPWS, and FPCC; carried out in simplified form in FPED
Prenatal and postnatal care and supervision of deliveries done by <i>dais</i> (indigenous midwives)	Well-developed pattern in FPWSCC and FPWS; modified prenatal care provided in FPCC to protect the child
Diagnosis, treatment, and referral of illnesses	Done only in FPWSCC and FPWS
Child care	
Periodic health surveillance and education up to 3 years	Weekly monitoring of morbidity status in FPCC; much less frequent (about every 2 months) home visiting in FPWSCC
Periodic measurement of weight and height	Routine ranged from every month for infants to every 3 months at 3 years of age for FPWSCC and FPCC
Immunization	Routine smallpox and DPT and periodic BCG; polio and measles in FPWSCC and FPCC
Nutrition supplementation and education	Selective provision of supplements to malnourished or faltering children, and education of mothers of all children in FPWSCC and FPCC
Diagnosis, treatment, and referral of illness	Early care emphasized in FPWSCC and FPCC

Note: All services in the health care villages were provided by family health workers (FHWs), who were auxiliary nurse midwives with two years' hospital training beyond high school plus an intensive six to eight weeks' retraining in the project. They were supervised on weekly visits by a doctor and by a public health nurse or lady health visitor. Family planning educators were the peripheral workers in the FPED villages. They were village teachers whose training and supervision paralleled the level and intensity of the FHWs'.

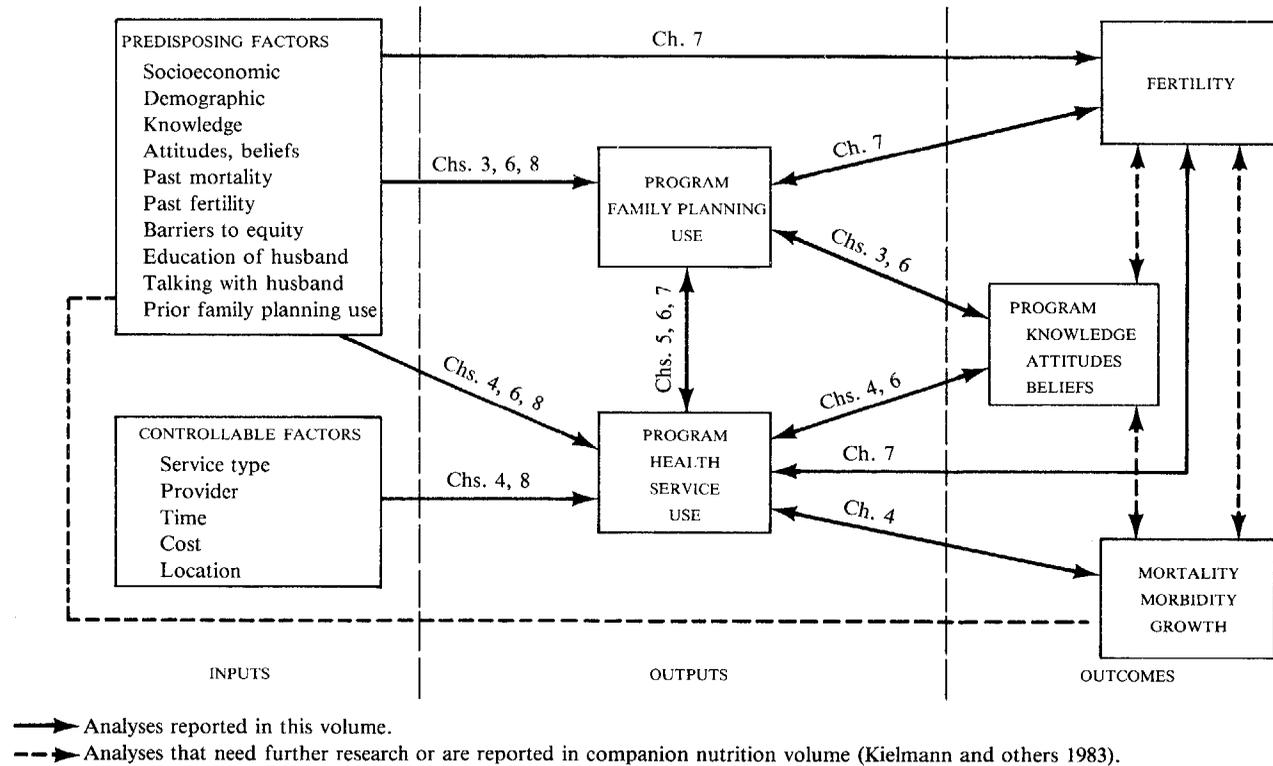
activities would become more relevant and realistic. In addition to this shifting within packages, the analysis was further complicated because we did not start services in all village groups at the same time, and the later efforts benefited from learning gained in the first villages.

Analytic Model

To systematize the analysis of policy and program variables that can promote family planning and reduce fertility requires a complex model. We used the model shown in figure 1-2 to help select the interactions between variables to be tested in the analyses. In figure 1-2, the arrows indicate the subanalyses of the composite interactions among variables. The solid lines were the main focus of the analysis reported in this book; those indicated by dotted lines need more analysis or are part of the analysis in the companion volume on the nutrition project (Kielmann and others 1983). Chapters in this book that deal with each subanalysis are indicated on the connecting lines. We found that we first had to separate conceptually inputs, outputs, and outcomes.

"Inputs" included two groups of variables: those taken as given in our study, and those that we considered appropriate to manipulate experimentally and in service programs. The first group is made up of a cluster of predisposing factors which have been the focus of most family planning research because these data are gathered readily in surveys and have obvious important associations with fertility. They did not receive primary attention in our study, however, because policymakers can do little to change them, except to be aware of their influence in selecting and targeting interventions. One exception is education, which we nevertheless placed in the category of givens because it was outside our competence and constraints. In addition, both prior use of family planning and talking with the husband about family planning were also considered predisposing factors. For analytic purposes the latter variable proved so important that it seemed appropriate to study changes in talking with the husband that took place during the project as well as before. We emphasize that we do not discount the importance of the predisposing variables. Our main interest, however, was to define factors that could be directly influenced in a short time with resources available to health and family planning services in India. These variables include health and family

Figure 1-2. *Diagram of Interactions among Research Variables, with Chapters in This Volume in Which They Are Discussed*



planning services--identified by type, cost, provider, location, and time required (both for the service provider and the people served).

We have used the term "outputs" in a limited way to refer specifically to readily quantifiable behavioral changes or use patterns that were the results of the inputs. The outputs most directly influenced by controllable inputs were the use of health and family planning services and the use of specific contraceptive methods during the project.

The term "outcomes" is used here to refer to substantive changes in status that resulted from outputs. Fertility and mortality are the ultimate outcomes. We also have included knowledge, attitudes, and beliefs about family planning and child survival. Although these in a sense are intervening variables, they needed clear identification because they represented important parts of the effects we tried to achieve and measure.

We placed major emphasis on family planning practice. Because of the early termination of the project, we did not have as many years as we needed to show whether fertility was changing. Fertility data are therefore presented mainly to support family planning data. Similarly, our analysis indicates that only a few of the attitudinal variables changed in the study period. This applies especially to the child-survival variables.

The main question examined in the Narangwal population research was whether integrated services increase the use of family planning. The detailed data presentation starting in chapter 3 show that they do. Differences in the use of family planning are then analyzed to determine how much of that use can be attributed to various combinations of project services. In addition, the chapter investigates intervening and exogenous factors associated with effectiveness in family planning. Because integrated services could divert attention from health services, in chapter 4 it is shown that there was no sacrifice in health services and benefits, and that in many instances there was an improvement in health benefits. In chapters 5, 6, and 7 we analyze the effects of particular services on family planning and fertility; the effects of attitudes, beliefs, and sociodemographic characteristics on family planning and fertility; and the effects of these determinants on each other. Because the greater effectiveness of integrated services would be unimportant if these services were not more cost effective and if they did not reach the groups disadvantaged most by poor access to services, we also examined the efficiency and equity of Narangwal services. Detailed findings are reported in chapter 8, the final chapter.

Policy Questions for Analysis

The need for specification to guide the analysis led us to convert the hypotheses that we used in setting up the experimental design into a series of policy questions. Findings are summarized around three interrelated themes.

The first of these themes is effectiveness:

- Do integrated services increase the use of family planning?
- What is the effect of integrated services on health and on fertility?
- What services should be provided, and who should provide them?
- What managerial and organizational changes are important in integration?

The second theme is efficiency:

- How cost effective are integrated services?
- What are the separate or combined effects of services and socio-demographic variables in influencing family planning?

The third theme is equity:

- What considerations are involved in targeting services to reach disadvantaged groups?
- What is needed to obtain and maintain community support for serving disadvantaged groups?

Obviously there are tradeoffs among the policy objectives implicit in these questions. Special care is needed in balancing considerations of efficiency and those of equity. For example, exclusive attention to cost effectiveness in promoting family planning could lead to a focus on upper socioeconomic groups rather than on the poor, who would receive most attention if attention were focused on equity. The relative strengths of motivational constraints and of facilitating factors thus influence both efficiency and equity--but often in opposite directions.

Chapter 2

Main Research Findings on Policy Issues

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Will the practice of family planning improve if services for family planning are integrated with those for health? That is the central question the Narangwal Population Project examined, and the answer is yes.

Integration of Health and Family Planning

The findings show that the integrated packages of family planning and maternal and child care are associated with increased effectiveness, efficiency, and equity.

- *Effectiveness:* Combined curative and preventive health services for women and for children increased the practice of family planning and probably reduced fertility, with integrated services steadily increasing acceptance beyond 50 percent and continuing use beyond 35 to 40 percent of all couples (use among couples receiving more limited services appeared to reach a plateau at about 20 percent).
- *Efficiency:* Integrated services were two to three times more cost effective than single services in promoting family planning without sacrificing health benefits.

- *Equity*: The usual disparities between socioeconomic groups in the distribution of services were reduced for both health services and family planning; this was done by continued intensive surveillance and preferential care for the underserved population (low-caste villagers).

Detailed data from the study can be used to provide orders of magnitude of expected effects in designing services for other underserved villages around the world.

In chapter 1 it was suggested (in the section "Why Integrate Health and Family Planning?") that health services might increase the practice of family planning in six ways. Two of these involve the health system and the factors that influence the effectiveness of services, the efficiency (or cost effectiveness) of programs, and the attitudes of personnel. Arguments advanced in support of vertical programs have typically been based on the assumption that focusing on a single type of intervention promotes effectiveness and efficiency. We showed, however, that integrated services can be more effective, more cost effective, and organizationally more efficient than family planning services alone. Experience in the single-purpose family planning villages (FPED) indicated that, after two years of providing only family planning services, village project workers were insisting on having something more to talk about with village women, who became bored by repeated discussions of the same family planning topics. Expanding the territory of responsibility of family planning workers to increase coverage would not have reduced the monotony of their activities and would have reduced efficiency because of the greater time needed to travel between villages.

The next two ways in which we postulated that health services might increase the practice of family planning concern the people being served and the improved rapport and patterns of use that integration can promote. Combined activities were more convenient for the people because they were put together to match the need for services as experienced in the village home. Two important features of these services were surveillance to reach those in greatest need and the use of entry points that linked naturally related services so as to accommodate the convenience of families. Such entry points make it possible to use the rapport inherent in such services as curative or maternity care, for which there is continuing demand, to improve the acceptance of family planning and preventive services, for which spontaneous demand is less.

The last two ways that health services might increase the practice of family planning involve the presumption that both immediate and underlying changes in attitudes and beliefs can be encouraged by integration, especially in relation to the child-survival hypothesis.

It had been postulated at the beginning of the project that benefits from integration would be most quickly evident under the first two headings relating to direct service interactions and cost effectiveness. Next would be direct influences on patterns of use and behavior. We assumed that basic changes in attitudes, especially expectations of child survival, would take more than five years to demonstrate. Because the project was terminated early, the findings on changes in attitudes and beliefs were less definitive but were consistent with the postulated expectations.

It should be apparent, then, that if population policy and health policy can be made congruent rather than competitive both will benefit. There is growing agreement that population planning and primary health care must both be considered in the broader context of intersectoral development and that local implementation must rely increasingly on finding ways to promote community participation and self-reliance.

Summary findings from chapters 3 to 8 are brought together in this chapter to provide decisionmakers with a basis for judgments about policy options. Findings related to each policy issue listed at the end of chapter 1 are summarized here around the themes of the effectiveness, efficiency, and equity of integrated services. More detailed data are provided in subsequent chapters.

Effectiveness

The first question posed in developing the project design was whether family planning and health services should be integrated to increase the effectiveness of family planning services. Discussion of this question will be brief because the evolution of public policy seems to have answered this question in the affirmative. For largely political reasons, almost all countries and international agencies have decided that only integrated services are acceptable. The main questions now being discussed are what services should be integrated, and how.

The Narangwal data provide factual evidence to support the growing consensus. Effectiveness was measured by output (defined as use of specific services) and by outcome (results in health and reduced

fertility). Because the time for field observations was short, our most convincing evidence is in the greater practice of family planning, with more tentative fertility data mainly being used to confirm family planning results. Health indices (see the companion volume, Kielmann and others 1983) seem to respond more quickly to service inputs, and therefore both output and outcome results are equally convincing.

Effect of Integrated Services on the Use of Family Planning

During the first year of activities in any group of villages, new acceptors of modern methods of contraception were recruited at essentially the same rate in all experimental groups. (For details on services, see chapter 1 and appendix B.) Then a distinct slowdown in acceptance rates occurred in FPED and FPCC villages during the second year: in both groups the slowdown presumably reflected the fact that initial demand for family planning had been satisfied and that further improvement in rates required an increase in motivation of eligible couples. According to our original hypothesis, it would have taken at least five years to demonstrate the effects of improved child survival on family planning motivation. Because the project was terminated when family planning had been provided for only three years in FPCC villages, the expected secondary increase in acceptance rates did not have time to appear. In both FPWSCC and FPWS villages, four years of family planning services produced steady and continuing rates of increase of new acceptors of family planning. "Current-user" or practice rates reflected patterns similar to the acceptance rates in the various groups of villages.

Three-fifths of prior users of modern methods of family planning became project users, as did two-fifths of the prior users of traditional methods. Fewer than a third of the people who had never used family planning accepted family planning during the project. Prior users of modern methods tended to have the following characteristics: the couples were high-caste; the husbands were more highly educated and in service occupations; the wives were 25-34 years old and of high parity. Subsequent discussions of equity show that integrated services eliminated most of these initial differences in rates among users of family planning.

It is typical that the quickest results in family planning are when people substitute one method for another. The more important impact, which is more difficult to achieve, is to get nonusers to practice family planning. It was in recruiting nonusers that health ser-

vices were most effective. Because prior nonusers of family planning started with the lowest practice rates, they tended to show the greatest increases. Children's other services (mainly preventive) tripled the use of family planning by prior nonusers and almost tripled the use of modern family planning methods by prior users of traditional methods. No significant effect of children's preventive services was observed on prior users of modern methods. Similar but slightly less dramatic effects were observed for women's other (preventive) services. Children's illness care more than doubled family planning practice rates among prior nonusers. Levels of impact that were less dramatic but still significant were observed for both children's and women's illness care for the remaining prior-user categories. In contrast with other care, illness care for both women and children produced a significant increase in the practice of family planning among prior users of modern methods.

The general conclusion seems to be that, because the provision of other services was largely initiated by the project, these services have the potential of having the greatest impact by being targeted to those who have never used family planning or who have used only traditional methods. People with prior experience of family planning were more likely to respond spontaneously to the availability of family planning and health services; therefore, project initiative seemed to be less important, and illness care had the greater impact.

Integration of services facilitated consistent movement from less effective to more effective contraceptive methods. As indicated above, among couples who had never used family planning, a third became project users; among those who had previously used traditional methods, just under a half became project users; among those who had previously used modern methods, nearly three-fourths became project users. Eventually more than a quarter of all project users accepted permanent contraceptive methods. Among this group, 36 percent had been sterilized before the project started, 33 percent shifted from modern to permanent methods, 16 percent shifted from traditional to permanent methods, and 15 percent went directly from no use to permanent methods.

How does all this compare with the experience of the single-purpose family planning program? Even though preliminary review of our data suggested that concentrated family planning education and services (FPED villages) produced a greater acceptance over the first one year of implementation, more careful analysis shows that these impressions were misleading. The apparent rapid initial increase in acceptance and practice of family planning was largely due to sub-

stitution based on higher initial rates of family planning in these villages. People simply shifted to using project sources of supply. A further indication that acceptance in FPED villages was less effective than in other groups was in the balance of modern methods being used at the end of the project: 48 percent were condom users, compared with 29 to 35 percent in other village groups.

*Effect of Sociodemographic and Attitudinal Variables
on the Use of Family Planning*

Sociodemographic variables, the focus of most previous research on family planning, showed the expected relationships in our study population. (See table 1-1 in chapter 1 for a list of the sociodemographic variables and the discussion under "Design and Data Base. Summary of Variables" for a description of the attitudinal variables.) But family planning practice showed much lower significance in their association with these variables than with health services or prior use of family planning. Furthermore, their effect tended to be additive to the effects of health services use. The strongest attitudinal influence was general expression of approval of family planning, and this had an especially clear additive relationship with the use of health services. Couples who were nonusers of illness services and who expressed disapproval of family planning, when compared with women who used illness services and approved of family planning, showed twice the project use of family planning. The difference was even more marked in comparison with those who said they were uncertain about family planning, a group that in many ways showed more negativity to family planning than those who openly expressed disapproval. For women who said they were uncertain about family planning, the use of health services had twice as much effect on family planning as did the attitudinal variable by itself.

Specific components of health services had varying effects on family planning practice when compared with attitudinal variables. Women's other services had three to twelve times more impact than the approval of family planning variable, children's illness care six to seven times more, and children's other care four to eight times more. Most clear-cut was the finding that children's services consistently increased the acceptance of family planning regardless of the women's initial attitudes and beliefs. A strong indication of the source of this impact is that the use of child care services was highest among women who initially disapproved of family planning

and were uncertain about whether more children die now than thirty years ago, yet the effect of these services on the use of family planning by those women was just as strong as that on women with more positive attitudes. Child care services thus proved to be a useful vehicle for health and family planning education to change negative attitudes and encourage family planning use.

Throughout the analysis an attitudinal variable that emerged as an important indicator of behavior was whether women said they had talked with their husbands about family planning. We consider this to be a proxy for women's participation in family decisionmaking. It had a stronger association with the practice of family planning than any other attitudinal variable except general expression of approval for family planning, and it was almost as significant as the use of health services. The strongest association of this variable was with both illness care and other services for children, with sevenfold differences between women who did not use children's services and did not talk with their husbands (10 percent) and those who used services and talked with their husbands (70 percent). The policy significance of this finding is that it may be possible to promote family communication about family planning by starting with children's health care as a channel for such discussions.

A demographic variable that was consistently significant in its association with contraceptive practice was the number of a woman's children who had died. The relation between child deaths and resistance to family planning was one of the strongest indicators that the child-survival hypothesis works in the way we postulated, and that it is susceptible to manipulation by a deliberate program to increase awareness of current activities to improve child survival in order to promote the use of family planning.

The relation was further defined by the patterns of responses to questions about whether women thought that child deaths are more frequent today than thirty years ago. Beliefs about child survival were significantly associated with use of family planning. Among nonusers of children's services, the use of family planning was about 45 percent higher among those who believed that fewer children are dying today than among those who believed that more or the same number are dying. The use of child care services overcame these differences so that the practice of family planning was essentially the same regardless of earlier beliefs about child survival. The quantitative effect was somewhat greater for those who made most use of children's other services. In regression analyses, this variable of

beliefs about child deaths was not significant, perhaps because of its association with other variables such as actual experience of child death.

Other socioeconomic variables of caste, income, landownership, material possessions, and husband's education were much less strongly associated with the use of family planning, especially when compared with use of health services, which seemed to overshadow other differences. This was especially true of children's services. Special effort to motivate husbands showed a similar (highly significant) additive effect in its relationship with approval of family planning and talking with wives.

Further analysis was done to see if project services might have directly modified attitudinal factors. The only measurable change was an indication that both women's services and children's services limited any tendency to move toward disapproval of family planning, but these services did not increase movement toward approval. Children's services nevertheless facilitated movement toward the belief that fewer children die ($p < .02$) but did not specifically strengthen the belief that more survive--perhaps because of the differences perceived between the immediate connotations of children dying and the long-range connotations of children surviving. These basic attitude changes would presumably have been greater if the project services could have continued longer and would then have influenced family planning practice curves directly. It was also observed that, although the consistency of response between the first and second surveys was only about 50 percent on most sociocultural variables, it was about 75 percent for the question dealing with expectations about "insurance" births and intent to have more children. When attitudes about insurance births did change, more than three in four changed in the direction of the belief that no insurance births were needed.

Effect of Integrated Services on Fertility

A measured decline in fertility at Narangwal has to be considered in the context of the general decline over time in the Punjab. Our experimental groups were kept small because of the need to concentrate service resources and to get definitive data. Recognition of the fallibility of fertility measurements in any small population led us from the beginning to deemphasize the importance of fertility as an outcome measure. Official government figures, analyses of our pregnancy history data, and the results of the ten-year follow-up of

the Khanna Project all indicate that the general secular rate of fertility decline in the Punjab in the 1960s and the first half of the 1970s was about 1 percent a year. The rate of fertility decline in our integrated service villages was about 5 percent a year.

Specific analyses related fertility to whether a couple practiced family planning during the previous year. The probability of a birth among contraceptive users was found to be half that among nonusers. Although we achieved an equitable distribution in the use of family planning and health services, caste differences in fertility remained. In all experimental groups, there were distinct differences in fertility between users and nonusers of family planning: these differences were greatest ($p < .005$) in FPWS and FPWSCC villages, significant only in one year in FPCC villages, and insignificant in FPED villages.

A regression analysis of variables influencing the probability of a birth in any year showed that three variables were most significant: previous parity, the time since a previous live birth, and whether the couple had practiced family planning in the preceding year. Caste was barely significant; education and occupation were not significant. It was estimated that in the final full year of project activities (1973), fewer than 20 percent of women in all experimental villages had a birth. Without contraceptive use, this figure would have been at least 12 percent higher--with a fertility rate of 224 per thousand women, not 198. Age-specific fertility rates showed that declines were mainly for women over 30 years old, but that fertility among the young remained high.

Effect of Integrated Services on Health

The number of stillbirths, the infant mortality rate, and the death rate for children 1 to 3 years old were 50 percent lower in FPCC villages than in CONT-P villages. In FPWSCC villages, results were more caste specific, with reductions in stillbirths greatest among low-caste women, which seems reasonable because the greater need of low-caste women, as identified through surveillance, made them the target population for project initiated interventions. Reductions in the infant mortality rate were greatest among higher castes, probably because child care services depended more on parent initiative in bringing children to clinics.

Child morbidity improved in villages with health care, as evidenced by the shorter duration of the most common illnesses, which were reduced 14 to 33 percent. This amounted to a 20 percent reduc-

tion in total days of illness for each child, or an average of twenty-two fewer days of illness a year.

Growth increased dramatically, with average weight differences of 0.5 kilograms and height differences of 2 centimeters between all children in study villages with nutrition services compared with children in control villages. The effect of sex and caste on growth was additive to these effects of project services: a high-caste male child from a study village was on average 2 kilograms heavier and 6 centimeters taller at age 3 than a low-caste female child from a control village. The number of siblings living also had an additive effect: a child with two male and two female siblings was on average 0.5 kilograms lighter than a child with one living brother or none. This is a powerful argument for the health benefits of family planning. (For further data on child mortality, morbidity, and growth, see chapters 4-7 of the companion volume, Kielmann and others 1983.)

Considerations in Integrating Services

Analyses of the timing and sequence of relationships between the use of health services and the practice of family planning showed that the association was strongest when services were concurrent. For women's illness care, the relationship with the number of visits in 1969-71 was strongest for those who practiced family planning only in 1969-71, less for those who practiced family planning throughout 1969-73, less still for those who practiced family planning only in 1971-73, and least for those who did not practice family planning at all. For children's illness care, the same order of relationships was found, but the range was greater.

The project-initiated other services for surveillance and prevention had much more universal coverage and showed less of a direct concurrent relation with the use of family planning than did illness services. The only apparent association was that new recruits to family planning late in the project seem to have received somewhat more children's other services during the period of successful recruitment to family planning. A converse relation--early acceptance of family planning leading to greater use of health services--was not demonstrated.

These findings strongly support the intensive procedures the project developed to promote the use of entry points to introduce family planning into health service routines. A systematic process of defining activities in the care of both women and children that could be used to promote concurrent practice of family planning was

shown to be readily incorporated into the day-to-day work of family health workers (FHWs).

The Narangwal experience also showed that delegation of activities as far to the periphery as possible improves coverage and effectiveness. Interventions should be as simple as possible, limited in number, kept within local resources, and organized to encourage participation of the individuals involved, especially the mothers.

Mothers and other family members are the most important health workers in the world. They provide more child health care than all other types of health workers combined. Their regular home responsibilities include a wide range of health activities to maintain nutrition, to improve home sanitation and personal health habits, to monitor their children's health, and to institute early treatment when needed. The Narangwal results support the conviction that the most important changes needed in primary health care are in routine health practices in the home, backed up by acceptable village-level auxiliary health care and only then by referral to professionals. Health and family planning practices in homes were directly modified by systematic services, with the result that they became part of a new pattern of social behavior.

Efficiency

The better the balance of services in an experimental group, the more efficient they became. "Efficiency" is used here to relate output to input and is a measure of cost effectiveness. Input is measured by the time of personnel and the cost of resources used; output can be defined in many ways, such as by the number and duration of service contacts, by the overall utilization rates, or by coverage. No attempt is made here to distinguish the quality of output when services are provided separately or in combination with others. Nor is the quality of a unit of output distinguished on the basis of who uses it. Efficiency could also relate outcome to input, but, because we have less confidence in our fertility measurements, we did not make those calculations, although in the accompanying nutrition volume we were able to provide evidence on the relative cost of improving mortality at various ages, the reduction in duration of morbidity, and the cost for average increments in height for all children in a village (see Kielmann and others 1983, chapter 9).

By combining various activities in a single visit, significant economies were achieved in both time and money. In addition, when the

combinations made sense in the village home, there appeared to be a natural synergistic interaction in creating rapport and changing behavior patterns. These synergistic benefits are possible if services are developed in response to parents' concerns and in a manner designed to promote community involvement--two things that are not usually done with top-down, categorical programs.

Time in Relation to Output

Next to mothers, the most important providers of health care at Narangwal were FHWs. They were responsible for 90-95 percent of all health service contacts. All other resources and services were designed to support their activities. FHWs put in three-fourths of the service time in the project. Male family planning workers put in 13 percent of the service time; family health supervisors, 4 percent; and physicians, 6 percent for in-service supervision and consultation.

If the FHWs had collected no research data and had limited their activities to service, it is estimated that population coverage could have been increased to one worker for 2,000 to 3,000 people rather than the coverage for 1,000 to 1,500 people actually provided. Further simplification of services and greater involvement of community health workers would be needed to increase coverage to 5,000 people, as has been planned in the national primary health care program.

In integrated women's and children's (illness and other) services, there was a 20-34 percent saving in time spent on family planning compared with either women's or children's services provided alone with family planning. A 35 percent saving in time was observed for women's other services when provided with child care, a 24 percent saving for children's other services when provided with women's services. It is apparent that careful planning of services as worked out in the field by the project increased the efficient scheduling and combining of services. Illness care tended to take about twice as much time as other services in each experimental group, mainly because several preventive services could be carried out together in the same service contact.

By 1974 the input of FHWs and family planning educators to the various service packages, after considerable streamlining of their services, averaged between six to eight hours of direct service time a week per 1,000 population. The rest of their time went into maintaining rapport, records, and data collection for research. For

family planning activities the weekly distribution of time per 1,000 population for each group was 37 minutes in FPWSSC villages, 57 minutes in FPCC villages, 83 minutes in FPWS villages, and 249 minutes in FPED villages. The time taken to maintain friendly relations and rapport took 113 minutes in FPED villages, compared with 43-49 minutes by FHWs in the other experimental villages. Further evidence on the differences in efficiency is provided by the time per average service contact in 1973-74, which was shortest where integration was greatest: 4.4 minutes in FPWSSC villages, 5.7 minutes in FPWS villages and FPCC villages, and 14.3 minutes in FPED villages.

Cost in Relation to Output

The cost of all integrated services at Narangwal (in FPWSSC villages) was US\$2.20 (Rs16.7) per capita a year. By comparison, the cost of services in FPWS villages was US\$1.80 (Rs13.5) per capita a year, that in FPCC villages was US\$2.80 (Rs21.3), and that in FPED villages was US\$1.20 (Rs8.7). Because of the marked differences in output, however, these costs should be related to particular output indicators to obtain a more accurate picture of efficiency. All such calculations unequivocally showed the greater cost effectiveness of integrated services (table 2-1).

These analyses permitted calculations of relative cost effectiveness. The cost per new family planning acceptor was US\$12.27 (Rs92) in FPWSSC villages, twice that amount in FPWS villages, and three times that amount in FPCC and FPED villages. The cost per couple-year of family planning was US\$10.27 (Rs77) in FPWSSC villages, 1.7 times that amount in FPWS villages, 2.5 times that amount in FPCC villages, and 3 times that amount in FPED villages.

Detailed calculations separately allocated costs to reductions in mortality and to improvements in morbidity and nutrition in FPCC villages. The cost per perinatal death averted was US\$9.87 (Rs74), that for an infant (age 0-1) death averted was US\$37.33 (Rs280), and that for a child (age 1-3) death averted was US\$101.47 (Rs761). The portion of the costs attributed to reductions in morbidity was calculated as the cost of a day of illness averted: that cost was US\$0.53 (Rs4) for an infant and US\$0.40 (Rs3) for a child 1-3 years old. Finally, by using the portion of costs attributable to nutrition, we could calculate the cost per additional centimeter of growth at 36 months of age: it was US\$26.27 (Rs197).

In the integrated (FPWSSC) package, the cost component for drugs was 10 to 15 percent, and that for other supplies was 6 percent. This

Table 2-1. *Comparative Efficiency of Narangwal Services*
(U.S. dollars; US\$1 = Rs7.5)

<i>Service</i>	<i>CONT-P vil-lages</i>	<i>FPED vil-lages</i>	<i>FPWS vil-lages</i>	<i>FPCC vil-lages</i>	<i>FPWSCC vil-lages</i>	<i>Government services</i>
<i>Annual cost per capita</i>						
Child care	-	-	0.05 ^a	1.07	0.56	} 0.08 ^b
Nutrition care	-	-	-	0.87	0.60	
Women's services	-	0.07 ^a	0.88	0.13 ^a	0.60	
Maternity care	-	0.01 ^a	0.44	0.11 ^a	0.23	
Family planning	-	1.08	0.44	0.67	0.24	
<i>Cost per service contact</i>						
Women's services	-	-	0.36	0.29	0.29	} { 0.21 ^c 0.13 ^d
Child care	-	-	-	0.23	0.19	
Maternity care	-	-	1.31	1.21	0.79	
Family planning	-	1.45	0.77	1.92	0.51	
<i>Expenditure per capita</i>						
Private services	2.12	3.05	2.09	2.20	1.76	-
Government services ^e	0.89	0.45	0.39	0.20	0.20	0.25

- Not applicable or not available.

a. These reflect cost for supportive services (related to either the main services or incurred to maintain rapport).

b. For curative and maternal child health care combined.

c. For care of illness.

d. For maternal and child health preventive services.

e. Average cost of government health services within a primary health center area (Johns Hopkins 1976).

supports the conclusion that these essential expenses can be readily funded and indicates the inefficiency of continuing present practices in government services where the lack of drugs and supplies is one of the greatest single obstacles to effective services. It also shows that the very high costs for drugs in studies of government health care, which may range as high as 50 percent, are probably an indication of overemphasis on curative activity, particularly in hospitals, and excessive medication. Similarly, 7 to 11 percent of costs were for vehicles and transport. These expenses are also essential, because the supervision, referral, and support that make services effective depend on the realistic provision of transport. Finally, the allocation to amortize building costs (estimated where buildings were donated) was only 1 to 2.5 percent of total costs, or

about US\$25 (Rs200) per subcenter a year. It is clear from this that village facilities that are simple but adequate should be a minor part of primary care costs. The people took pride in providing the facilities, and some healthy competition developed between villages. Most important, people felt comfortable using the facility because it was compatible with the local culture.

Our experience raises questions about current patterns of international and national funding for health services, in which investments in building and the pretense of providing drugs seem mainly to be designed to get political credit for politicians and donors. The tendency of political leaders to provide items for which there is existing demand basically contradicts the Alma Ata principle of promoting self-reliance (WHO and UNICEF 1978). People would gladly pay the costs of those activities for which local awareness and demand are high, which almost invariably includes facilities and drugs for curative services. When the project was being terminated and services were being transferred to the teaching health center of the Ludhiana Christian Medical College or to local government primary health centers, discussions with village people indicated that they were eager to pay directly or through local insurance to continue support for the services. For instance, they said that they had more confidence that the quality of drugs provided would be good if they could pay for them rather than having the government provide them free. In all the talk about community involvement, it has become evident that if people were permitted to choose what they contribute, rather than being asked to pay for activities which are low in their scale of priorities, they would enthusiastically pick up much of the cost. Such an approach would permit the government to use its money for things that people do not spontaneously want to pay for, such as transport, salaries, supervision, and supplies for preventive services.

Equity

Of the three parameters used to measure performance--effectiveness, efficiency, and equity--it is the last about which least is known. Equity is used in the general sense of measuring the provision of services to target groups that are underserved or disadvantaged. A clear-cut finding from this research is that--if adequate coverage of health services, education, and nutrition can be provided--the poor seem to be as willing to limit their fertility as the rich.

Collaboration between the health system and the community is needed to measure current disparities in need, to adapt interventions to those in greatest need, and to take the initiative in preferentially meeting those needs.

Measurements of equity should be based on the concepts of coverage and surveillance. All measurements of coverage require calculations based on population denominators. Surveillance requires identifying those who are most at risk and monitoring key indices to identify problems early and to apply appropriate interventions. We have used the term "surveillance" to apply to monitoring needs both in population units and in individuals. Women and children in villages, who in the past have been most discriminated against, continue to have great difficulty in traveling to formal facilities and do not feel comfortable when they get there. Therefore, it is essential that all activities be brought as close to the homes of the poor as possible. Because all efforts should be within the scope of local resources, a simple package of essential services should be regularly provided by the simply trained, peripheral workers.

Considerations in Targeting Services

Health and fertility surveillance--done by using lists of all married women of reproductive age (eligible couples) and children under 3 years old--proved to be an outstandingly important activity that can be built into routine services. About half the service time at Narangwal was devoted to preventive services, with surveillance being the main instrument of effective outreach. Surveillance was not limited to data gathering but resulted in prompt and appropriate responses to problems identified. Working routines ensured that outreach services were not subordinated to clinical emergencies, because frequent canceling of outreach services to care for clinical emergencies can quickly destroy a surveillance system. To keep preventive services from being overwhelmed by demand for clinical care, it would be necessary either to reduce the size of the population or to limit the range of clinical responsibilities.

To obtain a locally appropriate mix of services, a basic management question is deciding how to target specific activities to reach particular populations. Some population characteristics were identified in these studies that may be used in developing indicators for selecting target groups. First, prior users of family planning tend also to be spontaneous users of health services and therefore require less concentrated outreach efforts. They will come for ser-

vices anyhow. Second, nonusers of family planning require much more focused outreach. Our evidence shows that both women's and children's other services were important in reaching individuals who had not previously used or did not approve of family planning. Behavior will not automatically change with all outreach services, but change can be promoted by using entry points to link health and family planning services.

Some demonstrated associations with attitudinal factors can also help define target populations for service activities. Attitudinal variables were studied mainly in relation to family planning, but there were also distinct differences in patterns of association with the use of health services. An understanding of these associations can help show how integrated services might be packaged to reach particular groups.

Women's illness care was used most by those who approved of family planning and least by those who were uncertain. People who said that fewer children die now than thirty years ago used women's illness services most. Women who talked with their husbands about family planning, presumably indicating a greater role in family decision-making, also made more use of women's services. With children's illness care, a similar pattern was observed--with the least use of services by families in which women were uncertain about whether they approved of family planning and thought that more children die now than thirty years ago.

The use of women's other services was not related to other variables because essentially complete coverage had been achieved. The only significant difference was that for women under 35 years of age in FPWS villages: 95 percent of the low-caste women received care, compared with 87 percent of high-caste women.

Other care for children under 3 years old also showed good coverage of more than 90 percent and no significant differences by subgroups. The use of children's services seems to have been almost universally acceptable, regardless of the user's initial attitudes or socioeconomic group, and therefore proved to be a good way of gaining access to resistant families for health and family planning education.

Effect of Targeting Services on Equity

The most evident shift toward equity in our findings was in the percentages of new recruits to family planning. Concentrating services on those in greatest need eliminated disparities so that no significant differences were found in the practice of family plan-

ning. When the project started, 21 percent of high-caste couples, but only 13 percent of low-caste couples, had practiced modern family planning at some point in time. At the end of the project, this gap was equalized: 46 percent of couples from both caste groups practiced family planning at some point during the project.

The use of curative services also was essentially equalized, with the only significant differences being the slightly greater use of women's illness services by landowning families and by families with educated husbands. For children's services, a slightly greater use of services by low-caste and low-income families was consistent but not significant. In addition, there was a distinct difference in that high-caste families continued to use private services, whereas low-caste families tended to shift largely to using project services.

Project-initiated preventive and surveillance activities demonstrated the ability of the project to move beyond merely providing equality of access to achieving equity through preferential allocation of services to those in greatest need. Fewer than 10 percent of the families were not covered. For children's other services, differences were shifted in favor of low-caste children ($p < .001$), low-income families ($p < .01$), landless families ($p < .001$), and those with the fewest material possessions ($p < .01$). The differences in favor of more educated families, however, remained ($p < .05$).

Gaining and Maintaining Community Support for Targeted Services

People in greatest need do not spontaneously seek health care because of a long tradition of psychological, geographical, and social barriers--barriers that make the pretense of equal access little more than a deception even though services are supposed to be available and free. Outreach is needed to overcome the long-standing reluctance of poor people to open themselves to the possibility of being rebuffed if they ask for help. At Narangwal, the achievement of equitable coverage followed naturally when village decision-makers began to see how serious the health needs of the poor were and why it was in their own best interests as community leaders to have a general improvement in health conditions. Community participation grew naturally as a sense of partnership between the project and village leaders developed. A simplified system of gathering and feeding back information from the project helped to identify the problems in every home and in groups where problems were most severe. These findings helped village leaders to understand why those in greatest need must have the most services. A natural result was that

village leaders then spontaneously undertook to convince reluctant families to cooperate in preventive services.

Surveillance will gain public cooperation only if it includes mechanisms for rapid response when needs are identified. When the use of family planning entry points caused a couple to indicate that they were ready to start a family planning method, the appropriate service response was prompt. If complications were reported, they were rapidly cared for. If regular monitoring of illness and growth indicated an early disease problem or a lack of weight gain, established routines provided appropriate interventions. Equity can be achieved most readily when programs are efficient and effective.

Framework for Implementing Integrated Services

Integrated services have been criticized for being vague and conceptually diffuse because they seem to promise everything. The greatest need in planning, therefore, is to set priorities and to focus limited resources in ways that have the most effect. From the field experience at Narangwal we developed two approaches to focusing activities, one general and one specific. The general framework is a series of eight steps that were defined to integrate services. The specific framework is a set of fourteen entry points used to introduce family planning in routine health services.

Practical Steps in Developing Integrated Services

A sequence of eight steps can guide the development of community-based primary health care:

- Clearly defining priority problems in the local community
 - Epidemiologically determined needs
 - Community demand (perceived need)
- Selecting specific interventions that are most cost effective in meeting problems
- Functional analysis
 - Reallocating tasks in health team, delegating responsibility to the periphery (including community workers)
 - Shifting activities as close to homes as possible
- Retraining and supervising all personnel
- Designing programs of surveillance for equitable coverage and defining high-risk groups

- Establishing management systems for support and referral
- Balancing responsibility and authority between the health system and the community
- Monitoring and evaluating programs to improve services.

The first step is to define local health problems and priorities, balancing two sources of information. One source is professionally determined definition of need that uses epidemiological methods to identify problems that are common, serious, and preventable. This should be balanced by a parallel process of defining community demand. Priority setting should start with the local preferences and concerns, recognizing that by doing what the people want it will be possible to educate them about the less apparent needs that have been determined epidemiologically. It helps to have members of the community assist in data gathering and interpretation because this leads to more understanding of long-term effects and the possibilities of prevention.

The second step is to select for each of the priority problems the most appropriate interventions that can be applied under local constraints. If possible, these should be sufficiently safe, cheap, simple, and locally maintainable to be taken over by community health workers, family members, or peripheral health workers. Judgment must be balanced in choosing between methods that can be carried out in the home and methods requiring technical expertise and special facilities reached through referral.

The third step is to decide who should perform the selected interventions. The main criterion for determining a reallocation of tasks is this: tasks that can be readily made routine should usually be delegated to the periphery if they are sufficiently common to justify focused training and logistic input. At the local level, a package of perhaps a half dozen simple services can be chosen for routine implementation, services that fit together naturally according to what makes sense in the home and how people view their problems. This reallocation of tasks requires clear specification in standing orders.

The fourth step is training (or retraining) for the new package of tasks. One of the most essential features of a smoothly functioning team is a system of supervision that is more supportive than punitive and that provides a basis for continuing education.

The fifth step is to establish routines for surveillance to monitor the total population and to ensure complete coverage and preferential attention to those at greater risk or with early problems.

The sixth step, and perhaps the most difficult and essential, is to provide a management system that supports all staff members. Rather than becoming less available at the periphery, drugs, supplies, and record forms--as well as transport, housing, and salary payments--should be made available even more regularly for those in the most difficult situations than for those in larger health facilities. This support should include provisions for referral of clinical and public health problems that cannot be handled locally.

The seventh step is to balance responsibility and authority between the health system and the community.

The eighth step is to set up a simple system for reporting information that cycles back to problem definition, program evaluation, and a progressive, stepwise improvement in the whole system. The sequence of steps should ensure prompt feedback locally to identify and resolve problems early, with careful monitoring to ensure equity for those most at risk. Relevant, selected information should also be reported centrally in the system to maintain standards and protect against the common problem of local elites appropriating the greatest use of services.

Use of Family Planning Entry Points in Routine Services

Much of the field research effort at Narangwal went into working out entry points that build natural links between services and the daily routines of FHWs. The list below gives the fourteen entry points that were defined for family planning services (the original list had more than thirty entry points, but field tests made it possible to streamline the entry points to those that seemed most effective):

- During the routine fertility survey of nonpregnant menstruating eligible women
- At the time of confirmation of pregnancy
- At the time of postabortion care, if a pregnancy ended in abortion
- At about the thirty-sixth week of pregnancy, during the antenatal visit
- At the fourteenth-day postpartum and neonatal examination
- At the sixth-week postpartum examination, combined with the well-baby checkup
- During the fifth to sixth month after delivery--before daughters of the village left their mother's home and when daughters-in-law returned from their maternal homes (this was combined

- with the well-baby checkup, immunization, and weighing of the child)
- During the seventh month of lactation, combined with the well-baby checkup
 - During the ninth and tenth month of lactation, combined with the well-baby checkup
 - At all routine health checkups of children under 3 years old
 - At the routine weighing of children under 3 years old
 - At the time dietary advice for a child was given
 - After completion of a child's basic immunizations
 - After identifying or treating health problems, including malnutrition, prematurity, anemia, congenital disease, accidents, and severe illness of children.

These entry points were built into the work records, especially the ones for care during the pregnancy cycle, with a box to be checked to indicate that the family planning motivational message had been delivered. As part of the basic training, peripheral workers readily learned work patterns designed to help them remember routine statements of motivational messages. It seemed harder to augment these integrated functions into the routines of auxiliaries who had previously been indoctrinated in a categorical system of work, but our evidence on this is anecdotal rather than systematic.

What Special Projects Can Do

Field research contributes to human welfare only if findings are put into practice--that is, only if results are extended to services generally. An unfortunate connotation has grown out of use of the term "replication." This distortion implies that the package of services developed by a project can be reproduced in recognizable form in general services, and this rarely happens. The important process of moving systematically from projects to general use depends on *adaptation* rather than replication. The best implementation occurs when the flow of decisionmaking cannot be traced, and local leaders feel that a new idea is their own.

At Narangwal it was recognized from the beginning that our package of services would never be fully implemented elsewhere. Even though much effort went into trying to ensure that all interventions tested were inexpensive and simple enough for mass use, it was clear that,

to have the most impact, the lessons from this kind of research should unobtrusively permeate the entire health system. The research had many important influences on government services, in part because there was a healthy and continuing interchange with officials at all levels during each phase of field activities. Our periodic conferences at Narangwal produced numerous examples in which specific findings and observations were rapidly implemented in general services when they met special needs. In addition, the findings on FHWs contributed to further adaptations in other projects in India and to the thinking of policy groups and high-level government committees as they defined new roles for multipurpose and community health workers in national services.

The long-range pattern of implementation planned at Narangwal was that findings from this research would be applied next in demonstration and training projects in various regions and states. In adapting procedures and methods, the emphasis would then have to be even more directly on placing activities in the framework of regular services. Services would be streamlined and redistributed, with community health workers taking on much of the responsibility that FHWs had at Narangwal. In the years since the Narangwal field work stopped, several dozen good demonstration projects have applied and expanded our findings (ICMR 1981).

This research has left us with a sense of optimism about the possibilities of providing both family planning and health care to village people. Methods are available to accelerate the current decline in both fertility and mortality. They are feasible and cost effective, but they face the long, hard task of implementing much of the rhetoric of recent years. Of special significance is the potential, demonstrated at Narangwal, for equitable distribution: the most needed services can reach the most deprived people in villages.

That the Narangwal Project was conducted in the Punjab, an area of rapid socioeconomic development, naturally raises some question about the relevance of our findings to other parts of India and to other countries. The reality, however, is that development is now rapid in at least half the states of India and in many developing countries. With the increasing pace of development in all areas and in more countries, our results should be widely applicable soon, if they are not already. The effects we demonstrated in less than four years can be achieved elsewhere, even if the time to produce change has to be longer. General principles derived from this analysis of interactions between the components of health and family planning services will, of course, require appropriate adaptation in local

implementation. Our prediction, however, is that the quantification we have produced--of such things as relative cost effectiveness and the indices of the effects of specific activities--will be fairly representative of average conditions in most developing countries for the next two decades. As we used to say at the Narangwal conferences, our objective has been to provide a cafeteria of specific health measures, with suggestions for implementation and with price tags--a cafeteria from which planners and administrators can select the best combination for their area.

PART TWO

*The Detailed
Findings*

Chapter 3

The Use of Family Planning

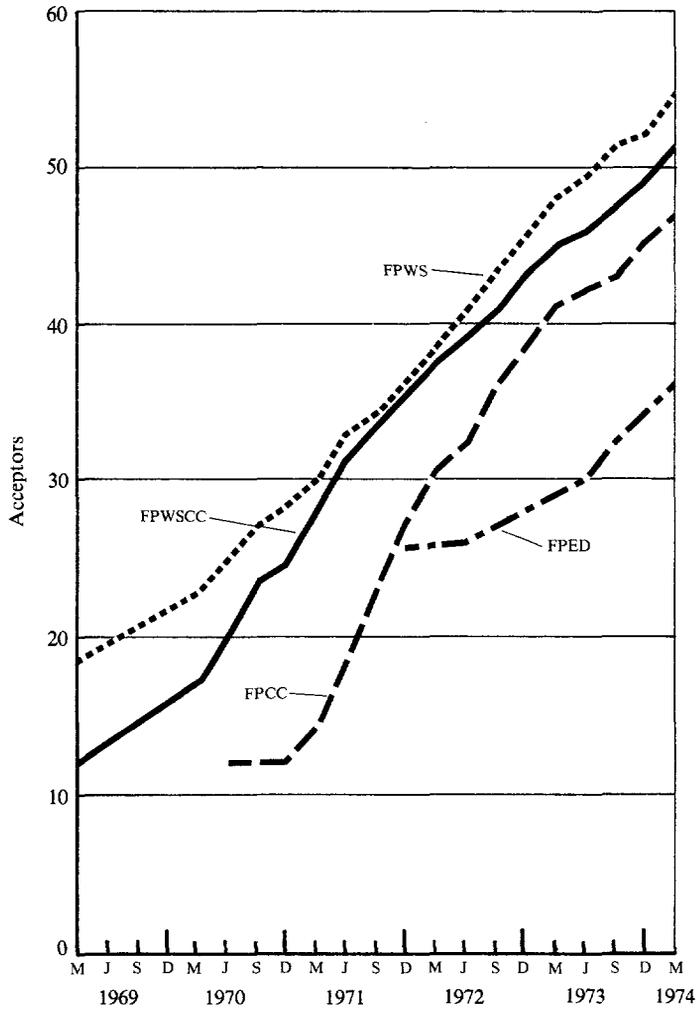
R. S. S. Sarma and Rashid Faruquee

The practice of family planning was the most important measurement of outcome in the Narangwal population experiment. In this chapter trends in the acceptance and practice of family planning in the four experimental groups of villages (FPWSCC, FPWS, FPCC, FPED) are compared. Differences in achievements are analyzed to determine how much of the use of contraception can be attributed to the various combinations of project services. Contraceptive practice in control villages remained low and unchanged throughout the project. The influence of prior use of traditional or modern methods of family planning is carefully assessed, as is the shift from these methods to those supplied under the project. This chapter also investigates intervening and exogenous factors associated with effectiveness in family planning, factors that fall under four headings: attitudes and beliefs, knowledge and prior practice of family planning, socioeconomic status, and demographic factors.

Use of Contraceptives

In the Narangwal experiment several modern methods of family planning were offered, some temporary, some permanent: condom, intrauterine device (IUD), oral pill, injectable Depo-Provera, vasectomy, and tubectomy. These will be referred to as project methods. Data were systematically collected on couples--with wives in a current married state and in the 15-49 age group--who practiced modern contraception. Shifts in the use of contraception were recorded when couples switched from one method to another, even if they waited for some time without protection before again using the same method

Figure 3-1. *Currently Married Women Age 15-49 Who Had Accepted Modern Family Planning Methods at Any Time, by Experimental Group, Including Prior Acceptors* (percent)



M = March; J = June; s = September; D = December.

or another method. About two-thirds of all project users confined their contraceptive practice to one segment of use. On the average, a couple using contraception had 1.5 segments of use during the project, with 1.6 in FPWSSC villages, 1.5 in FPWS and FPCC villages, and 1.4 in FPED villages.

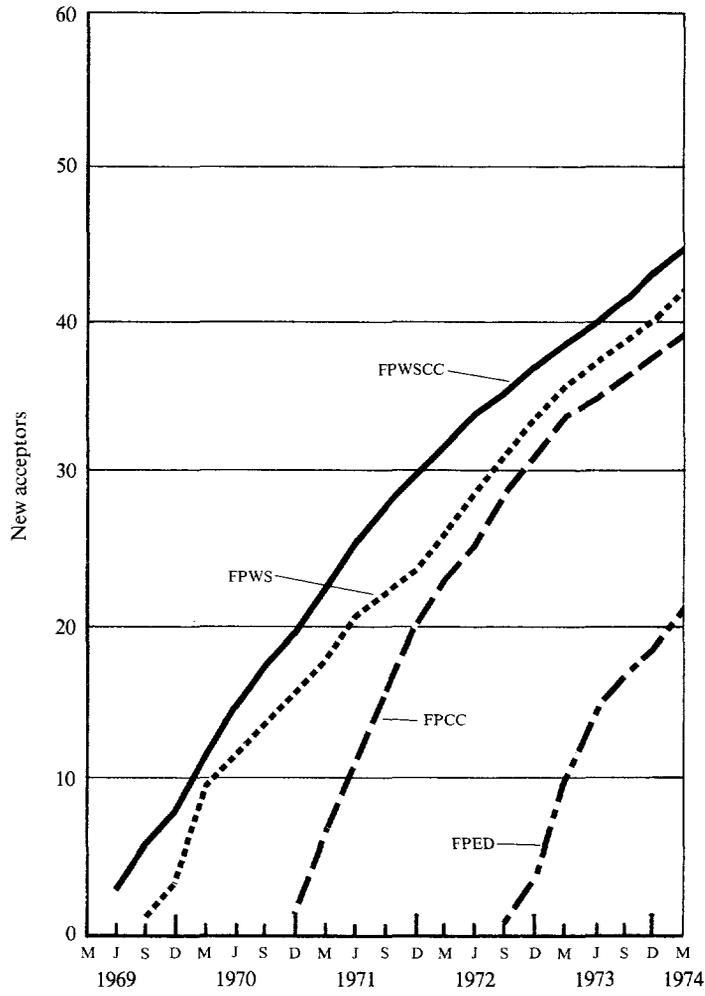
Two simple indices of contraceptive use are the "current-user" rate and the "ever-user" rate. The current-user rate is the prevalence of contraception practiced by couples at a specified time. The ever-user, or acceptance, rate includes prior users as well as current users and reflects cumulative acceptance of family planning. The ever-user rate was calculated both for those who used contraception only after the start of the project and also to include contraception before the project. Acceptance of project contraceptive methods included only those who used project sources for supplies and services. Since only modern methods were provided in the project, the ever-user rate for the project included only modern methods. In estimating the preproject ever-user rate, the use of traditional methods was included, and the transition to project (modern) methods was analyzed.

Acceptance of Project Contraception

As explained in chapter 1, family planning services were started at different times in the four experimental groups: September 1969 in FPWSSC and FPWS villages, December 1970 in FPCC villages, and June 1972 in FPED villages. The services were phased in gradually, as methods for integrating services in a package were worked out in one village and then extended to the others in that group. In 1969, when the project started, it took four to six months to get services to all villages in an experimental group. It took considerably less time to phase in services for the third group in 1970 and the fourth group in 1972.

With only modern methods of family planning included in the analysis, acceptance rates at the beginning of the project ranged from 12 percent in FPWSSC and FPCC to 26 percent in FPED experimental groups. With allowance made for differences in starting times, the acceptance curves are almost parallel for the four groups (figure 3-1). The FPWSSC and FPWS groups, after more than four years of family planning services, had acceptance rates of 51 and 54 percent. The FPCC group, with more than three years of family planning services, reached 46 percent. A little less than two years of project operation in the FPED group produced an acceptance rate of 37 percent. Data

Figure 3-2. Cumulative Rates of New Acceptors in Experimental Groups during Project, 1969-74 (percent)



will be presented to show that much of the acceptance in FPED villages was associated with a combination of substitution from uniquely high preproject use and with the higher levels of development in these villages. Since longitudinal family planning service records were not maintained in the control villages, a repeat cross-sectional survey was carried out midway through the project in 1972 which showed no change from the baseline current-user rate of 9 percent in these villages.

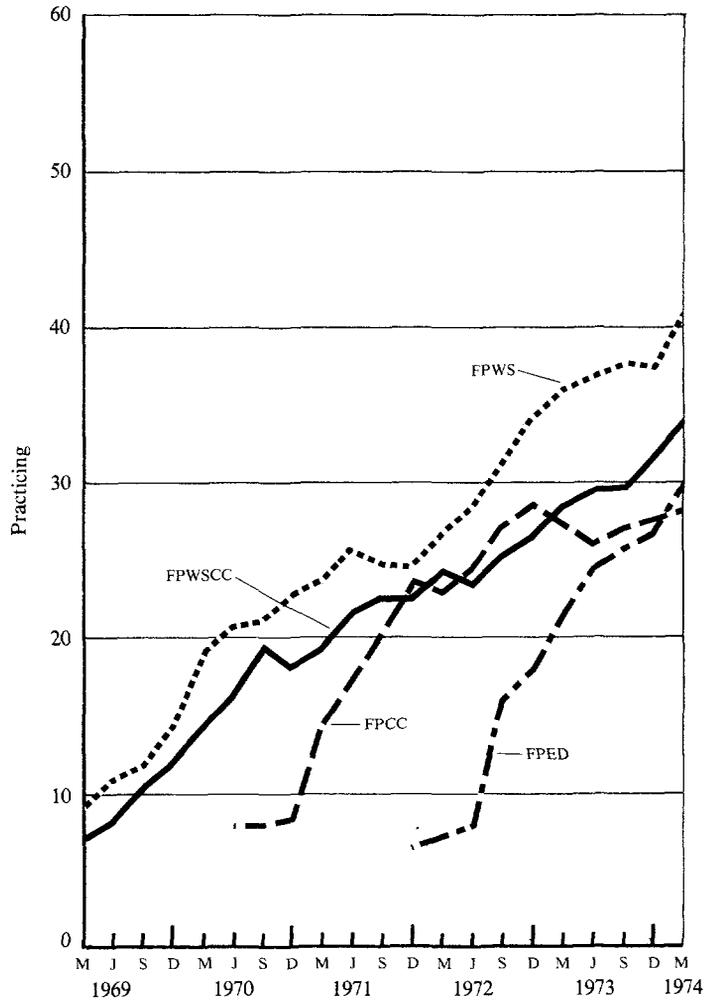
The acceptance curves in figure 3-1 are for all acceptors, with no distinction made between whether preproject users had used traditional or modern methods. As will be shown later, the proportion of preproject users who had used modern methods varied in the four experimental groups, and this clearly influenced subsequent practice. Figure 3-2 shows acceptor rates for couples that used modern methods for the first time or started to use them, again as a result of project activities, whether or not they had used traditional methods earlier. Cumulative project acceptance rates at specified times, computed for the four experimental groups and in comparison with figure 3-1, show a reversal in relations, with higher acceptance rates in FPWSCC villages than in FPWS villages. The relation between the curves for FPCC and FPED villages remained essentially the same. We feel that figure 3-2 is a more accurate portrayal of the project results than figure 3-1.

The results at Narangwal compare favorably with achievements in family planning by other experiments and special projects in India. For example, family planning acceptance rates in the integrated health services project at Jamkhed rose from 2.5 percent of eligible couples in the preproject period to 50 percent over a period of five years (Arole and Arole 1975). Project Miraj in Maharashtra reported a threefold increase in family planning acceptance after three years (Faruqee and Johnson 1982). The effects of the nationwide family planning campaign had a major influence on the responses in each project, but the similarities in results indicate what can be achieved by special effort.

Practice of Project Contraception

The acceptance curves, essentially parallel in the first two years of project activities, indicate that the project succeeded in getting couples to start contraception more or less at the same rate in all the experimental groups. More important, however, is a comparison of trends in current-user rates. The proportions of women

Figure 3-3. *Proportion of Married Women Age 15-49 Who Currently Were Practicing Family Planning at Specified Times, by Experimental Group*
(percent)



practicing project contraception at specified times are shown in figure 3-3 for the four experimental groups. The curves for FPWSCC and FPWS groups had steady increases, but the curves for FPCC and FPED groups showed more tendency to reach a plateau in the second year after an initial parallel rise. These visual impressions of the curves for family planning practice were checked by fitting quadratic equations to obtain statistical verification of the onset of the plateau. The quadratic terms in the polynomials fitted to practice rates were significant and confirmed the apparent plateau reached in the FPCC and FPED groups. The quadratic terms in the regression equations for the FPWSCC and FPWS groups were not significant. The smoothed curves are shown in figure 3-4. Since the curves for FPCC and FPED are based on fewer observations than those for FPWSCC or FPWS, one must interpret these results with caution. Similar tests of ever-user rates showed no significant differences. The findings in figure 3-4 fit the original hypothesis that family planning practice curves would reach a plateau first in villages without integrated services. In the FPCC group we expected a lag period following an initial rise to meet existing demand, after which the influences of improved child survival would become evident and the curve would begin to rise again.

*Adjustment for Differences in Effectiveness
of Contraceptive Methods*

The demographic impact in experimental groups was greatly influenced by differences and fluctuations in contraceptive mix. To calculate practice rates that reflect the expected demographic impact from these different mixes of family planning methods, we developed a new measure, the "effective-user" rate, that adjusted for differences in the effectiveness of contraceptive methods.

Table 3-1 shows that toward the end of the project almost half of those practicing contraception in the FPED group were still using only condoms. At the other extreme, more than 40 percent of those practicing contraception in the FPCC group were sterilized. So the expectations for demographic impact would be reduced for the FPED group and increased for the FPCC group. The high general demand for injections resulted in a rapid response to the availability of Depo-Provera, even though it produced a high rate of amenorrhea and intermittent bleeding. Variation among experimental groups seemed greatest for IUDs. Our impression is that this variation was caused by local rumors of complications (after the government's mass program

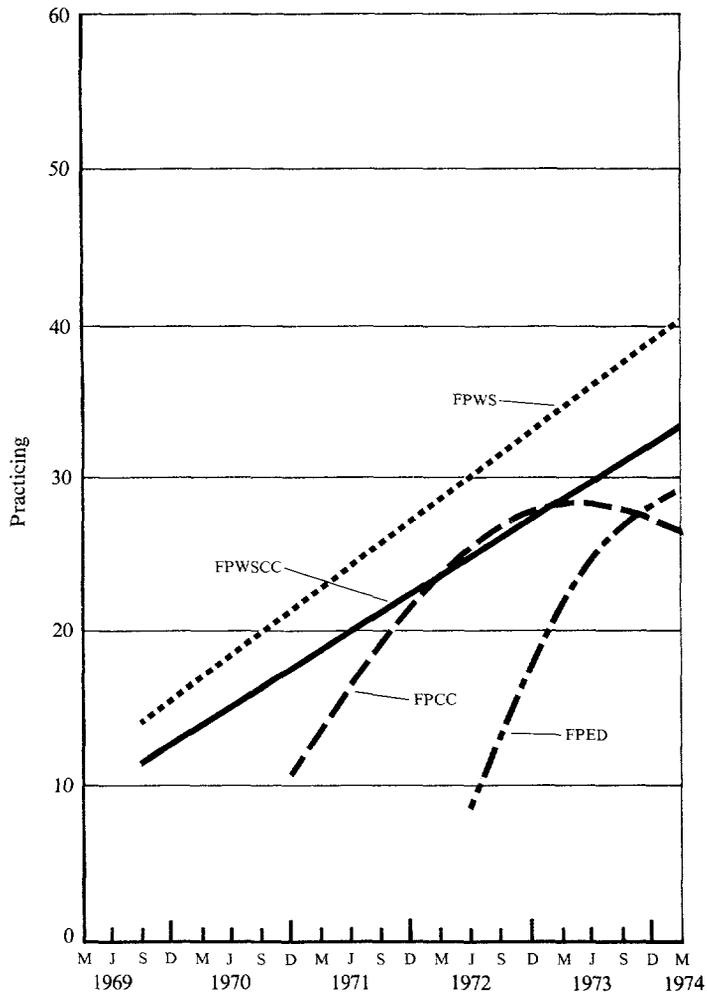
Table 3-1. *Percentage Distribution of Current Users of Family Planning by Method Currently Used, as of March 31 of Each Calendar Year, by Experimental Group*

Method currently used	FPWSCC					FPWS					FPCC					FPED				
	1970	1971	1972	1973	1974	1970	1971	1972	1973	1974	1970	1971	1972	1973	1974	1970	1971	1972	1973	1974
Condom	18.0	25.4	33.0	35.3	34.8	20.6	25.7	24.5	31.8	28.7	0.0	18.1	43.2 ^a	37.5 ^a	30.7 ^a	5.5	7.1	6.6	41.9	47.7
Pill	3.8	5.4	2.6	4.8	5.5	1.9	1.6	2.8	1.0	0.9	0.0	1.9	5.7	4.9	4.7	0.0	0.0	0.0	1.1	0.4
IUD	18.8	16.8	14.6	9.2	8.2	13.5	16.0	21.3	25.7	25.1	0.0	0.0	0.6	1.0	3.3	18.2	17.9	16.4	10.6	7.0
Injectable																				
Depo-																				
Provera	30.8	27.0	27.0	27.2	29.9	27.7	20.3	17.6	12.7	20.0	0.0	22.9	13.6	14.6	19.8	1.8	1.8	3.3	12.8	19.4
Vasectomy	9.8	7.6	6.9	8.1	6.7	25.2	21.9	19.9	15.8	13.7	58.6	31.4	19.9	24.9	23.6	32.7	32.1	32.8	17.9	12.8
Tubectomy	18.8	17.8	15.9	15.4	14.9	11.0	14.4	13.9	13.1	11.6	41.4	25.7	17.0	17.1	17.9	41.8	41.1	41.0	15.6	12.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: In this and subsequent tables in the chapter, entries may not add to 100 because of rounding.

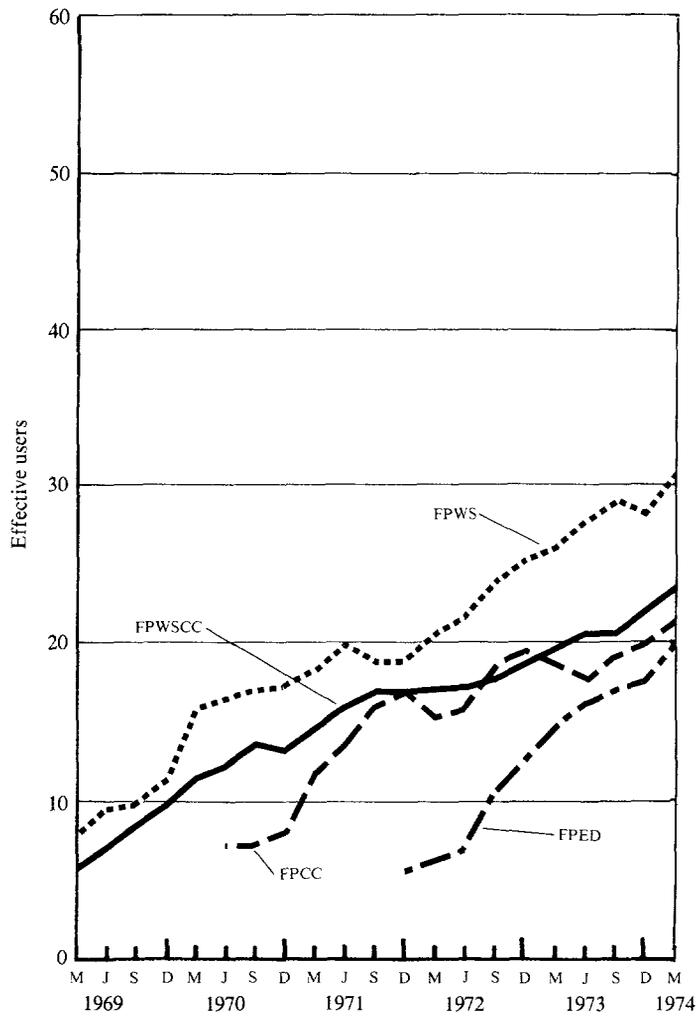
a. Includes one user of diaphragm and spermicidal cream.

Figure 3-4. Trends in Contraceptive Practice Rates in Experimental Groups (percent)



Note: Smooth curves obtained by fitting quadratic equations to "continuing-user" rates.

Figure 3-5. *Currently Married Women Age 15-49 Who Were "Effective Users" of Family Planning at Specified Times, by Experimental Group (percent)*



some five years earlier) and by the differing attitudes of staff members. The highest rate of using IUDs was in FPWS villages, perhaps because a nearby government primary health center had an especially effective program.

Table 3-2 shows the pregnancy rate and relative effectiveness for each contraceptive method for all users at Narangwal. The pregnancy rate is the number of pregnancies per hundred woman-years of use; the relative effectiveness is equal to: $1 - [\text{pregnancy rate}/\text{pregnancy rate for no contraception (40.7)}]$. Condoms and oral pills were only about 30 percent effective; IUDs and Depo-Provera were about 90 percent effective; sterilization was 97 percent effective.

To calculate effective-user rates, current practice rates were adjusted according to the relative effectiveness of each method used. An adjustment factor was constructed for each experimental group at each point in time. The relative effectiveness rate for each method was applied to the number of users of that method. The overall effective-user rate was obtained by summing effective users of all methods. The adjustment factor was the ratio of effective users to the total users.

This yielded an estimated rate reflecting the proportion of married women protected from pregnancy. The curves of effective-user rates in figure 3-5 are both lower and flatter than those in figure 3-3. Fitting quadratic equations in figure 3-6 to these data showed that effective-user rates had started to reach a plateau in FPCC and FPED groups. There was no evidence of a plateau in the FPWCC and FPWS groups, even though they had been exposed to project services for a

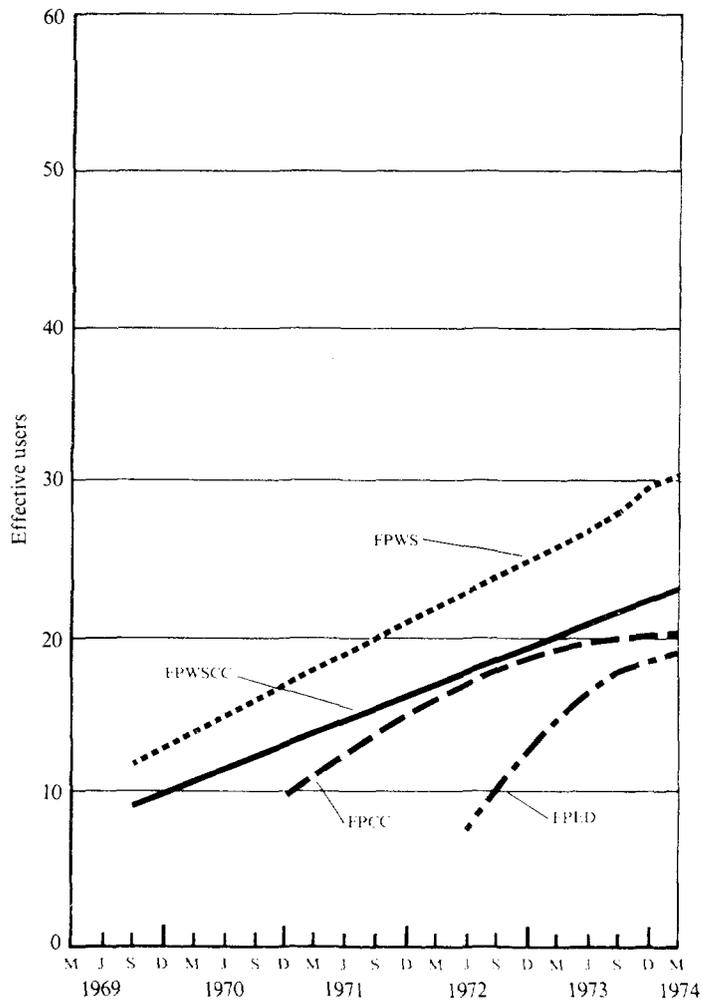
Table 3-2. *Pregnancy Rate and Relative Effectiveness of Contraceptives* (percent)

<i>Contraceptive method</i>	<i>Pregnancy rate^a</i>	<i>Relative effectiveness^b</i>
No contraceptives	40.7	0.0
Condom	26.8	34.2
Oral pill	29.2	28.3
IUD	5.2	87.2
Depo-Provera	3.1	92.4
Vasectomy	1.0	97.5
Tubectomy	1.1	97.3

a. Pregnancies per 100 woman-years of use of contraceptive method.

b. Equal to: $1 - [\text{pregnancy rate}/\text{pregnancy rate for no contraceptives (40.7)}]$.

Figure 3-6. Trends in Effective-user Rates in Experimental Groups (percent)



Note: Smooth curves obtained by fitting quadratic equations to effective-user rates.

considerably longer time and had reached higher effective-user rates (figure 3-6).

Adjustment for Differences in Duration of Project

Because the four groups were not exposed to services for equal periods, achievements in family planning cannot be directly compared: project performance in March 1974 reflected the differences in duration of project services. About twenty-one months of project activities produced ever-user rates (of modern methods) of 36 percent and 37 percent in the FPCC and FPED groups, compared with 31.5 percent and 33.1 percent in the FPWSCC and FPWS groups. Continuing-user rates in the FPCC and FPED groups were also higher (27.3 percent and 29.8 percent) than those in the FPWSCC and FPWS groups (21.6 percent and 25.2 percent). Even though the start of services in FPCC and FPED groups was delayed, they then progressed more rapidly, and therefore the differences between experimental groups at twenty-one months probably are unimportant. The higher rates of acceptance and practice in FPED groups were evidently achieved by more aggressive promotion of the less effective contraceptive methods in a situation where there was no health care input. In all groups there was a consistent policy of using acceptance of less effective methods to educate couples to move on to more effective contraceptives.

Preproject Contraception

Contraceptive use before the project strongly influenced subsequent practice. The three categories were: those who had used modern contraceptives, those who had used traditional methods of contraception, and those who had not used contraception. Presumably, it would require a greater shift in motivation to move from nonuse before the project to the use of modern methods under the project. To move from prior use of modern methods to modern methods supplied by the project merely required a shift in the source of supply, or a change to more effective methods.

Of the twenty-six villages covered by the Narangwal study, fifteen received family planning services, eleven did not. Continuing information on contraceptive practices was obtained in the fifteen villages with family planning services. Cross-sectional surveys were used to obtain information on family planning practices in all villages in 1968-69 and in 1971-72. To measure preproject practice

of family planning, the 1968-69 cross-sectional survey provided information in the eleven villages that received no family planning and in the eleven villages in which services started in 1969 and 1970. For the four FPED villages in which project activities started in 1972, the 1971-72 survey was used to measure preproject contraception. Information was obtained on whether a method of family planning had been used, when, and what method. About half the women responded that they or their husbands had previously practiced some kind of family planning. Of these couples, about a third had used modern methods, and two-thirds had used traditional or indigenous methods.

Table 3-3 shows the distribution and use rates of indigenous methods in 1968-69, before project activities started. The most commonly reported methods in current use were withdrawal, abstinence, and safe period (based on local cultural beliefs that the uterus after menstruation is like a freshly plowed field waiting for seed and that it slowly closes by midperiod, when fertility is thought to decline). Many knew of indigenous medicines and herbs, but relatively few said they used them. A variety of women's home methods--such as washing, douching, sponging, simply squatting to let the semen flow out, or walking around a sacred tree--were considered useful but were seldom used. Many people also knew about condoms from army experience, but they were considered more useful for preventing venereal

Table 3-3. *Preproject Knowledge and Practice of Family Planning (First Survey 1968-69, Mutually Exclusive Percentages)*

<i>Contraceptive method</i>	<i>Never heard</i>	<i>Heard only</i>	<i>Knows use</i>	<i>Prior use</i>	<i>Current use</i>	<i>Total</i>
Nondevice methods ^a	27	2	28	18	25	100
Indigenous medicine and herbs ^b	33	-	65	2	-	100
Home methods ^b	64	-	23	8	5	100
Abortion	37	44	19	-	-	100
Device methods ^c	50	16	25	6	2	100
IUD	12	80	0	5	3	100
Oral pill	81	12	7	0	0	100
Sterilization	13	83	-	-	3	100

- Not applicable or not available.

a. Safe period, withdrawal, abstinence.

b. Wash, douche, sponge, get out of bed and squat, or walk around a sacred tree.

c. Condom, foam tablet, cream, diaphragm.

disease than for contraception. The national campaigns for IUDs and sterilization had produced a high awareness of these methods. There seemed to be a social stigma to admitting to their use, so that we later found that prior use was greater than initially reported.

A comparison of preproject use of permanent, temporary, and traditional methods of family planning for the four experimental groups is shown in figure 3-7. Combined prior use rates for both modern and indigenous methods were similar in all groups of villages and ranged from 46.4 to 51.2 percent. Overall preproject use of modern methods was 17.6 percent, but this varied greatly among the four groups, depending mainly on the proximity of villages to government primary health centers: the rate was 26 percent in the FPED group, 19.1 percent in the FPWS group, 18.1 percent in the CONT-P group, 11.9 percent in the FPCC group, and 11.7 percent in the FPWSCC group. Modern contraceptives accounted for about half the prior contraception in the FPED group and more than a third in the FPWS and control groups. In the FPWSCC and FPCC groups, modern contraception was used by only a fourth of those who had practiced family planning, and the reported use of traditional methods was correspondingly greater.

More than one method of contraception was frequently used. Thirty-two percent of couples had used only traditional methods; another 11 percent had used both modern and traditional methods. Modern-temporary methods had been used by 4 percent of couples, with an additional 10.6 percent having used these methods in combination with other methods. Similarly, permanent methods had been used by 1.8 percent of couples, with another 2.3 percent turning to permanent methods after having used other methods.

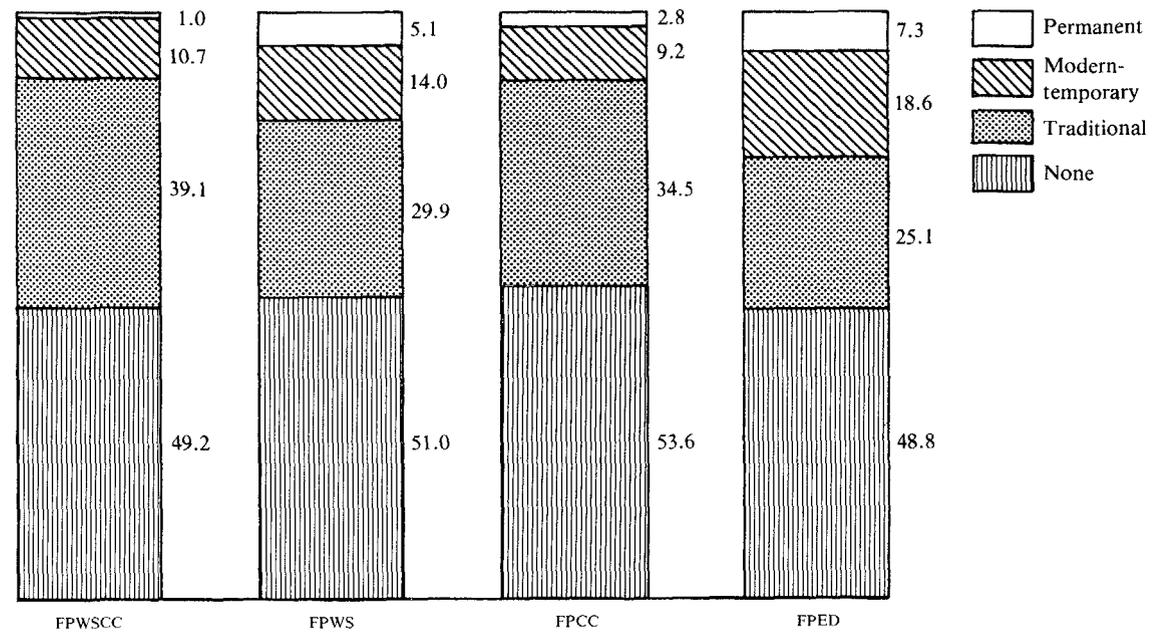
Preproject Sociodemographic Differences in Contraceptive Use

Attention to equity in the distribution of project services required measurements of coverage in relation to the following sociodemographic variables: religion-caste, education of husband, occupation of husband, age of wife, and number of living children.

Religion-Caste

Before the project, contraceptive practice was least for scheduled Sikhs, the lowest castes (45.7 percent), next highest (50.9 percent) for the Jat-Sikhs, and highest (54.4 percent) for other

Figure 3-7. Preproject Use of Permanent, Modern-temporary, and Traditional Family Planning Methods among Experimental Groups (percent)



caste groups. The main reason for these differences was highly significant differences in the use of modern-temporary and permanent methods, with high-caste couples having almost twice the reported use among low-caste couples (21 percent versus 13 percent). The use of traditional methods was not significantly different in the three groups.

Education of Husband

Husband's education also was related to the practice of family planning, with nonusers ranging from 51 percent of those with no formal education to 30 percent for those with eleven or more grades of education. These highly significant differences were entirely in the use of modern-temporary methods. For both traditional and permanent methods, practice rates were not significantly different for educational groups.

Occupation of Husband

Preproject contraception also differed by occupational group, ranging from 55 percent for those employed in government and other services to 50 percent for farmers and 46 percent for laborers. These categories paralleled the educational and caste distributions. The use of traditional methods was approximately equal in the four groups.

Age of Wife

Prior use was closely associated with the age of the wife at the time of the baseline survey. Preproject contraceptive practice was lowest among women under 25 years old (41.5 percent) and highest among women 25-34 years old (56.9 percent). Half the women over 35 years old had been prior users. Again, modern-temporary methods showed the greatest variation (18 percent in the 25-34 age group, 12 percent in the other two age groups). The use of permanent methods increased progressively with age. No differences were found in the use of traditional methods.

Number of Living Children

A direct association between the number of children at the time of the survey and prior practice of family planning was more significant than any of the other variables. Thirty-eight percent of cou-

ples had fewer than three children, 45 percent had three to five, and the remaining 16.7 percent had more than five. Preproject contraception (with modern and traditional methods combined) was least (38 percent) among women who had fewer than three children; it was 58 percent for the other two groups. Differences in practice of traditional methods was significant, increasing from 26 percent for those with fewer than three children, to 37 percent for three to five children, and 34 percent for more than five children. The use of permanent methods increased from 1 percent for couples with fewer than three children to 5 percent for those with three to five and 10 percent for those with six or more. Prior use of modern-temporary methods, which presumably includes spacing, was highest for couples with three to five children and lowest for those with fewer than three.

Transition from Preproject to Project Contraception

Information on prior contraceptive practice was available for 2,603 couples in the fifteen villages where family planning services were offered and for 1,339 couples in the eleven villages where no services were offered. In the first set of villages, 49.9 percent of the couples reported that they practiced one or more methods of contraception (modern or traditional) before the project; in the second, 52 percent. Four categories were defined: permanent methods, modern-temporary methods, traditional methods, and no method. Because no transition was possible once a permanent method (vasectomy and tubectomy) had been used, only the remaining categories have been analyzed.

Overall, 53.9 percent of preproject users of temporary methods (traditional or modern) practiced contraception during the project. The transition from preproject to project use was highest in the FPWS group (61.7 percent) and lowest in the FPED group (49.5 percent), probably because of the length of exposure to project activities.

An important finding is the relation between the probability of accepting project contraception and prior contraceptive practices. In all service villages, 35.3 percent of couples who had earlier used no contraception became acceptors of contraception during the project, compared with 46.2 percent of couples who had used traditional methods and 72.7 percent of couples who had used modern temporary methods. Transition from preproject to project use showed a pro-

gressive shift to increasingly effective methods. Table 3-4 shows the pattern of transition among nonuse, modern-temporary, permanent, and combined methods. Transition to permanent methods was especially important, with 24 percent of the couples eventually using sterilization. Of these, 36 percent had sterilizations before the project started, 33 percent shifted from modern methods, 16 percent shifted from traditional methods, and 15 percent had not previously used family planning.

Of the project acceptors, 61.6 percent were prior users. The FPED group had the highest transition rate (70.5 percent), to be expected because of the high rate of prior use of modern methods. The transition rates for the FPWSCC, FPWS, and FPCC groups were between 59.3 percent and 57.4 percent. Included in these figures is a simple substitution in the source of supply of contraceptives. Overall, the rate of project acceptors who had previously used modern methods was 29.5 percent, but the differences between village groups were dramatic: 48.1 percent for the FPED group, 31.4 percent for the FPWS group, 21.5 percent for the FPCC group, and 17.9 percent for the FPWSCC group.

Project impact on fertility presumably was greater where acceptors had not been prior users. Recruitment of new cases was greatest in the FPWSCC villages; FPCC villages came next, followed by the FPWS

Table 3-4. *Transition from Prior Use to Project Use by Type of Contraceptive Method in the Family Planning Villages*

Prior use of methods	Nonuse of project methods ^a	Use of project methods			Total
		Modern-temporary	Permanent	Modern-temporary then permanent	
None	852 (64.7)	401 (30.5)	44 (3.3)	19 (1.4)	1,316 (100.0)
Traditional	450 (53.8)	317 (37.9)	47 (5.6)	23 (2.7)	837 (100.0)
Modern	94 (27.3)	195 (56.7)	31 (9.0)	24 (7.0)	344 (100.0)
Permanent	0 (0.0)	0 (0.0)	106 (100.0)	0 (0.0)	106 (100.0)

Note: Family planning villages are FPWSCC, FPWS, FPCC, FPED; parentheses indicate percentages.

a. Includes use of traditional and indigenous methods as well as nonuse of any methods.

Table 3-5. Sociodemographic Differences in Transition from Preproject to Project Contraception

Sociodemographic groups	Traditional methods			Modern-temporary methods		
	No. of pre-project users	No. shifted to project modern methods	Percent	No. of pre-project users	No. shifted to project sources	Percent
Religion-caste						
Jat-Sikh	386	174	45.1	199	144	72.4
Scheduled Sikh	294	139	47.3	92	70	76.1
Others	151	70	46.4	57	41	72.0
	$\chi^2_{(2)} = 0.33 \quad p = .8504$			$\chi^2_{(2)} = 0.51 \quad p = .7760$		
Education of husband (no. grades)						
0	473	210	44.4	151	118	78.2
1-5	95	46	48.4	37	22	59.5
6-10	204	105	51.5	116	84	72.4
11+	22	11	50.0	30	23	76.7
	$\chi^2_{(3)} = 3.07 \quad p = .3916$			$\chi^2_{(3)} = 5.67 \quad p = .1361$		
Occupation of husband						
Farming	317	149	47.0	128	95	74.2
Labor	221	109	49.3	54	40	74.1
Service	102	48	47.1	78	51	65.4
Other	157	68	43.3	78	64	82.1
	$\chi^2_{(3)} = 1.33 \quad p = .7224$			$\chi^2_{(3)} = 5.64 \quad p = .1378$		
Age of wife						
<25	157	90	57.3	63	46	73.0
25-34	297	161	54.2	153	122	79.7
35+	298	98	32.9	109	73	67.0
	$\chi^2_{(2)} = 36.70 \quad p < .010$			$\chi^2_{(2)} = 5.47 \quad p = .0688$		
Number of living children						
<3	234	107	45.7	99	70	70.7
3-5	385	185	48.1	170	127	74.7
6+	133	57	42.9	56	44	78.6
	$\chi^2_{(2)} = 1.14 \quad p = .5731$			$\chi^2_{(2)} = 1.21 \quad p = .5523$		

villages, with considerably less effect in the FPED villages. What seemed at first to be a remarkably rapid acceptance of family planning in FPED villages was therefore largely due to substitution because of high rates before the project.

Sociodemographic differences associated with the transition from preproject use of traditional and modern temporary methods are presented in table 3-5. The important finding is that patterns of transition were much the same for the various social and demographic subgroups of the population. Transition from the use of modern methods before the project occurred equally, regardless of religion-caste, education of husband, occupation of husband, age of wife, or number of living children. Transition from the use of traditional methods also did not show significant association with any variables, except the age of the wife. Couples with wives over 35 years old had a lower transition rate from nonuse to project use.

A major reason for analyzing differences in family planning practice before and during the project was to identify subgroups on which project efforts could be concentrated. These data provide a quantitative base for judging probable patterns of impact. A distinction needs to be made: if the main objective is to increase overall program acceptance rapidly, it is easier to reach couples who previously used modern methods of contraception, more difficult to reach preproject users of traditional methods, and most difficult to reach nonusers. But if the objective is to equalize contraceptive practice among subgroups of the population and presumably to have greater long-term demographic impact, integrated services can more effectively reach subgroups underserved before the project, such as scheduled castes, lower educational levels, laborers, younger women, and women with fewer living children.

Attitudes, Beliefs, and Practice

The research objectives included specific attention to influences on the practice of family planning of attitudes about family planning and beliefs about child survival. Our results do not fit the opinion occasionally expressed that a change in attitude is a prerequisite for a change in practice.

Efforts have been made to test possible causal relations through sequential analysis. Attitudes and beliefs were measured by verbal responses to two cross-sectional surveys in all the villages. (FPED villages were excluded from this analysis because the short period

Table 3-6. *Distribution of Women by Their Preproject Responses about Attitudes and Beliefs toward Family Planning and about Child Mortality and Their Contraceptive Behavior during Project*

Attitude and belief	Preproject response	Accepted during project			Total
		Permanent methods (vasectomy or tubectomy)	Temporary methods only	Did not accept any method during project	
Approval of family planning	Approve	57 (8.1)	310 (44.0)	338 (47.9)	705 (100.0)
	Disapprove	11 (2.8)	167 (42.6)	214 (54.6)	392 (100.0)
	Uncertain	4 (1.7)	74 (32.1)	152 (66.1)	230 (100.0)
Approval of family planning for newlywed couples	Approve	44 (8.5)	237 (45.7)	238 (45.9)	519 (100.0)
	Disapprove	16 (3.8)	175 (41.8)	228 (54.4)	419 (100.0)
	Uncertain	11 (3.0)	131 (35.7)	225 (61.3)	367 (100.0)
Chance of child survival compared with 30 years ago	No response	1 (4.5)	8 (36.3)	13 (59.1)	22 (100.0)
	More chance	31 (7.2)	185 (43.1)	213 (49.7)	429 (100.0)
	Less chance	11 (4.3)	115 (45.1)	129 (50.6)	255 (100.0)
	Same chance or uncertain	30 (4.7)	248 (39.0)	358 (56.3)	636 (100.0)
Less/more children die now than before	No response	0 (0.0)	3 (42.9)	4 (57.1)	7 (100.0)
	Less die	29 (7.4)	169 (43.3)	192 (49.2)	390 (100.0)
	More die	14 (4.1)	132 (38.8)	194 (57.1)	340 (100.0)
	Same as before or uncertain	29 (4.8)	250 (41.8)	318 (53.3)	597 (100.0)
Communication with husband about family planning	Talked with husband	51 (7.5)	325 (48.0)	301 (44.5)	677 (100.0)
	Did not talk with husband	20 (3.1)	224 (34.8)	399 (62.0)	643 (100.0)
	No response	1 (14.3)	2 (28.6)	4 (57.1)	7 (100.0)

Note: Parentheses indicate percentages.

of observation did not permit a second survey in this experimental group.) Analysis focused on the responses of 1,327 women whose attitudes and beliefs were recorded in the first and second cross-sectional surveys, with an interval of about two years; who were currently married at both surveys; who were from villages where family planning services were offered during the project; and who had not practiced contraception up to the time of the first survey of attitudes and beliefs. They were asked whether they approved of family planning and whether they approved of the use of family planning by newlywed couples: 53.1 percent of the women approved of family planning, 29.5 percent disapproved, and 17.3 percent were uncertain; 39.1 percent of the women approved of family planning for newlywed couples, 31.6 percent disapproved, and 27.7 percent were not sure.

Of the 1,327 couples in the analysis, 5.4 percent accepted a permanent method through the project, and 41.5 percent practiced a temporary method at some time during the four years of the project.

The women were also asked whether they thought the chances of children surviving were better than thirty years ago and whether they thought more children were dying: 32.3 percent of the women said that the chances of survival had improved, 19.2 percent that the chances had deteriorated, and 47.9 percent were uncertain or thought there was no change. When the question was reversed, 29.4 percent of the women said fewer children were dying, 25.6 percent said more, and the remaining 45 percent were either uncertain or thought there was no change.

In response to a question about whether the wife had talked with her husband about family planning, 51 percent of the women said that they had, 49 percent that they had not.

Approval of Family Planning

The effect of approval of family planning on subsequent contraception was slight (table 3-6). Among those who approved of family planning, 52.1 percent started to practice family planning during the project. Among those who initially disapproved of family planning, 45.4 percent subsequently started practicing contraception. Of those who were uncertain in their attitude to family planning, only 33.9 percent started contraception. The relation between approval and practice was especially strong among those who accepted permanent methods of family planning. Of women who approved of family planning for newlywed couples, 54.2 percent started practicing contraception during the project; of those who disapproved, 45.6 percent; of those who expressed uncertainty, only 38.7 percent.

The three categories--approve, uncertain, and disapprove--are usually treated as falling on an ordinal scale, with "uncertain" in the middle. With great consistency, however, the uncertain group has proved to be more negative than those who said they disapproved. These differences were significant. The differences in contraceptive practice rates among those who approved and those who disapproved were marginally significant, but so many women who originally disapproved started to practice that the differences do not seem particularly important.

Beliefs about Child Survival

The contraceptive practice rate among those who believed that child mortality had gone down was 50.8 percent, followed by 46.7 percent among those who believed there was no change, and 42.9 percent among those who believed it had increased. These differences were significant but perhaps unimportant because more than 40 percent of people who believed that child mortality had increased still began to practice family planning.

When the question was turned around, however, and asked in terms of whether more or fewer children survive, the results were more equivocal. The contraceptive practice rate was 50.3 percent for women who said that the chances of child survival had increased over the preceding thirty years; 49.4 percent for those who said that the chances had decreased. Among those who were uncertain or who said the chances were the same, the contraceptive practice rate was 43.7 percent. The relation seemed especially strong among those who accepted permanent methods of family planning.

Communication with Husband about Family Planning

A question that was a particularly good predictor of family planning practice was whether a woman had talked with her husband about not getting pregnant. Even though it is behavioral, this indicator is included with the attitudinal variables because it seemed evident that this was the best indicator of husband-wife communication and of the wife's role in family decisionmaking. We also consider this question to be our best indicator of the relative liberation or independence of women. Almost half the women said they had talked with their husbands about family planning; 55.5 percent of them started contraception during the project. Of those who had not talked with their husbands about family planning, only 38 percent started contraception.

*Associations between Attitudinal Variables
and Family Planning Practice*

A wife's communication with her husband about family planning had the strongest statistical association with subsequent practice of contraception, her attitude toward the practice of family planning by newlywed couples the next strongest. The difference in contraceptive practice between those who approved or disapproved of family planning was barely significant statistically, but the uncertain group practiced considerably less contraception than those who disapproved of family planning (and this difference was highly significant). Couples who believed that the chances of children dying were less than before were more likely to practice family planning (and this association was statistically significant). But the association was not significant when women were asked whether more children were surviving.

Among those who accepted permanent methods, the most significant differences were found between those who talked with their husbands about family planning and those who did not, between those who approved or disapproved of family planning, and between those who approved or disapproved of family planning for newlywed couples. A barely significant difference was found, with somewhat greater acceptance of sterilization by those who believed child mortality had improved compared with those who believed it had gotten worse; the difference was not significant when the question was asked in terms of survival.

Summary

In Narangwal villages before the project, about half the couples had used some kind of contraception, but only about a sixth had used modern methods. Village groups differed significantly in the use of modern contraception: the FPED group had the highest preproject use, the FPWSCC group the lowest. This difference explains the rapid initial rise in project acceptance in the FPED group.

Ever-user (acceptance) rates at the beginning of the project were between 7 and 14 percent in the experimental groups. The acceptance rates in FPWSCC and FPWS villages, after more than four years of family planning services, rose to between 51 and 54 percent. Those in FPCC villages rose to 37 percent after about two years. These increases relate to all acceptors. A more relevant indicator of the

effect of the project is the "new-acceptor" rate, for those that used modern methods for the first time as a result of project activities. Cumulative new-acceptor rates in the FPWSCC, FPWS, FPCC, and FPED villages respectively were 45, 42, 39, and 22 percent by the end of the project.

The current-user rates also increased substantially. In all groups, the current-user rates were less than 10 percent at the beginning of the project; these rates increased to 40 percent in FPWS villages, 35 percent in FPWSCC villages, 29 percent in FPED villages, and 27 percent in FPCC villages by the end of the project. Because the mix of contraceptives differed widely for the four experimental groups, a more appropriate set of calculations that allowed for differences in the effectiveness of the methods was also used. This effective-user rate reflected probable demographic impact and was about 31 percent in FPWS villages, 24 percent in FPWSCC, 21 percent in FPCC, and 18 percent in FPED. More than half the preproject users became acceptors of project contraception.

Chapter 4

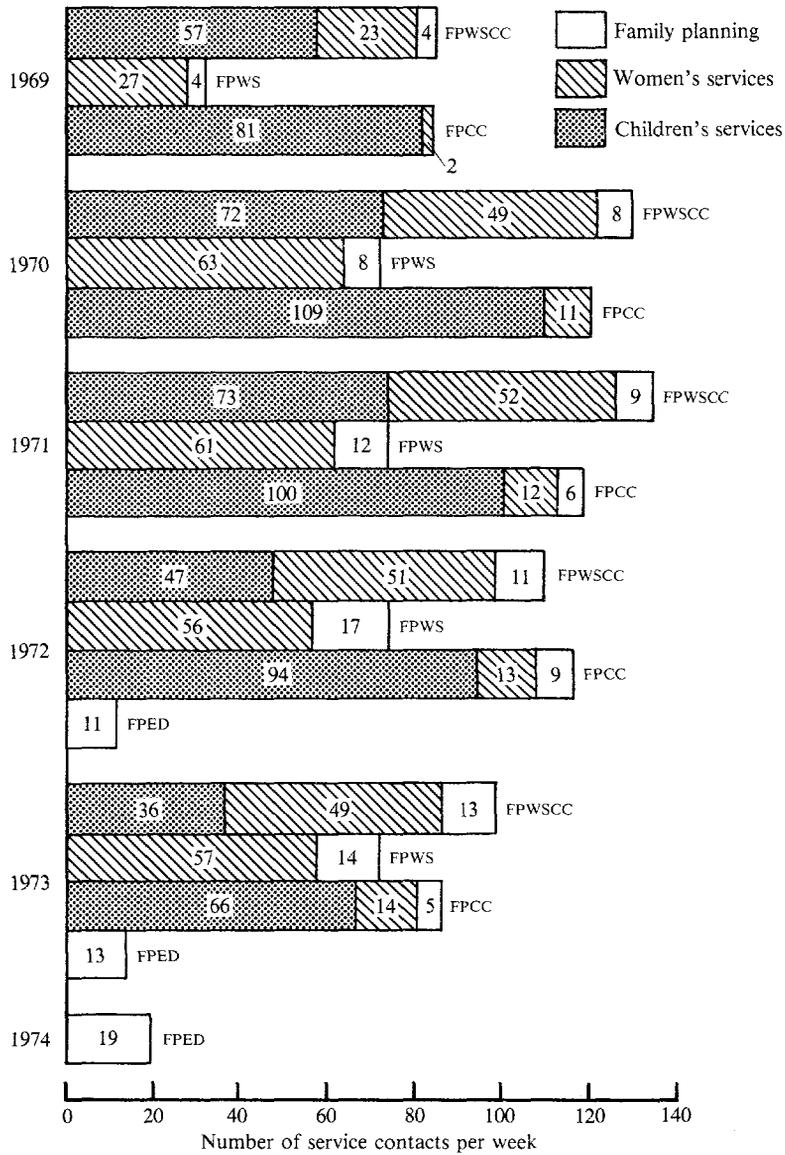
The Use of Health Services

Robert L. Parker and William A. Reinke

The Narangwal Population and Nutrition Projects provided an exceptional opportunity to measure the effect of different packages of service inputs. In contrast to most studies concerned primarily with results of health care or family planning interventions, we obtained data for detailed input-output-outcome analyses to establish the quantitative relations between the inputs of services, the practice of family planning, the use of health services, the decline in fertility, and the improvement in health status. These data have also permitted analysis of the content, cost, and effect of the different packages of services, so that health planners using these data can select the components most appropriate for meeting their objectives.

In this chapter we describe service inputs in each experimental group, including both the service contacts provided by the project and the care received from outside the project. The use of project and non-project health services is then related to socioeconomic characteristics of individuals and their families and to attitudes and beliefs already shown to be important determinants of family planning. Last, the effect of health services on selected attitudes, beliefs, and health indicators is examined. In chapters 5, 6, and 7 these service contacts are related to measures of outcome to find out the effect of these services on the use of family planning and on fertility. In chapter 8 measurements of the cost and time of service inputs are presented to demonstrate the efficiency of the different service combinations, especially in their cost effectiveness, and evidence for the equitable distribution of services among population subgroups is also presented and discussed. For further analysis of health and nutrition data, see the companion volume (Kielmann and others 1983).

Figure 4-1. Average Number of Recorded Service Contacts by All Staff Working in Each Experimental Group, per 1,000 Population per Week for Each Year of the Project, 1969-74



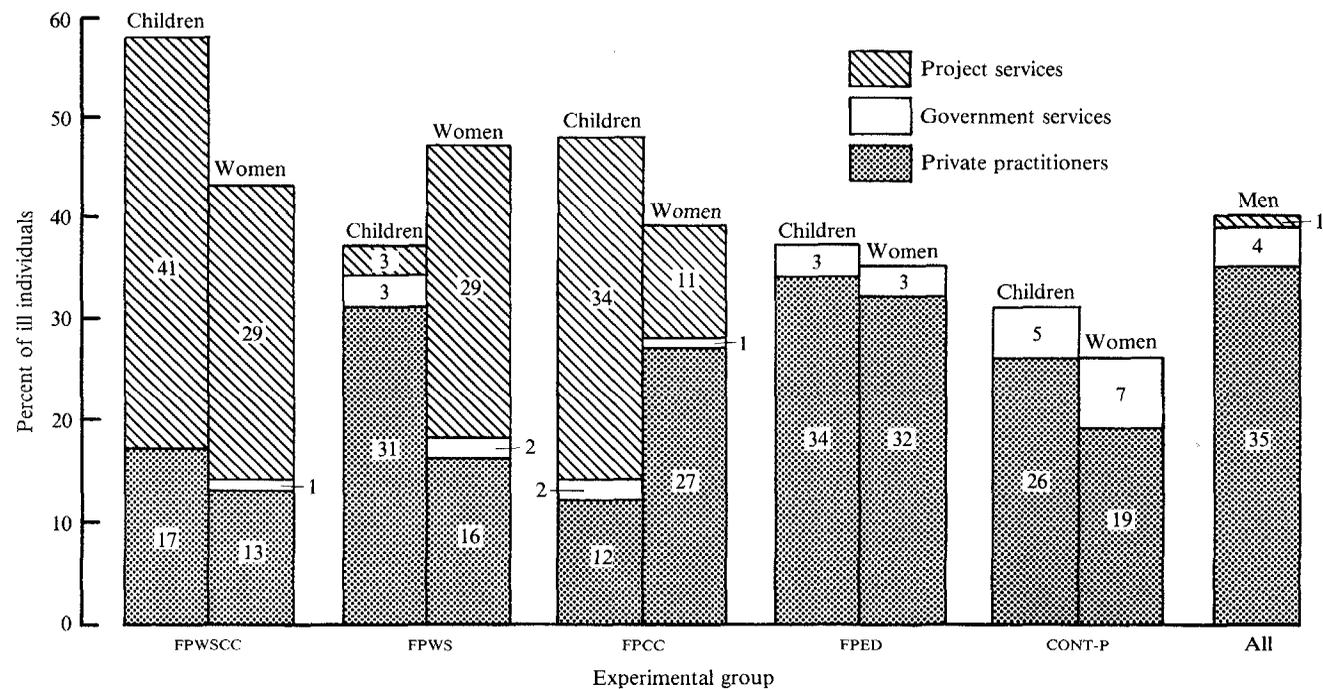
Service Contacts

Detailed records on patients and services gave information about services that spanned the life of the project. The service contacts indicated the home or clinic visits provided weekly per 1,000 population. Figure 4-1 summarizes the contacts by all staff in FPWSSC, FPWS, and FPCC villages from 1969 to 1973 and in FPED villages from mid-1972 to early 1974. Health services were being built up in 1969 and reached a peak in 1970-71; except for FPWS villages, service contacts declined in 1972-73. In FPED villages the recorded service contacts per week were still expanding at the end of the project.

Explanations for some shifts in the volume of services can be found by examining specific services. After 1970 the weekly service contacts per 1,000 population for women's services were fairly constant in each experimental group, ranging from 56 to 63 in FPWS villages, 49 to 52 in FPWSSC villages, and 11 to 14 in FPCC villages (mainly pregnancy surveillance visits in the FPCC villages). In addition, family planning contacts steadily increased in FPWSSC villages (from 4 a week in 1969 to 13 in 1973), in FPWS villages (from 4 a week in 1969 to 17 in 1972), in FPCC villages (from 6 in 1971 to 9 in 1972), and in FPED villages (from 11 in 1972 to 19 in 1974). The only declines in family planning contacts were in 1973 in FPWS and FPCC villages, where they came down to 14 and 5 a week, respectively.

Large shifts in service contacts were almost entirely due to changes in children's services. In FPWSSC villages a significant decline in children's service contacts occurred between 1971 and 1972, when they dropped from 73 a week to 47. This decline was maintained in 1973, when there were 36 such contacts. After children's services had been developed in these villages, a deliberate decision was made to simplify them for replication in a national program. Service contacts that were empirically found to be less essential were gradually eliminated after mid-1972. The main reduction was in the frequency of surveillance contacts during the child's first year of life. In FPCC villages there was a small decline in children's services between 1970 and 1972 (109 contacts a week to 94), but a large decline in 1973 (to 66). This change came after the completion of the overlapping nutrition project in 1973, when the decision was made to adjust the frequency of children's service visits in these villages to make them more closely approximate those in FPWSSC villages. But some differences between the frequency of children's visits in FPCC and FPWSSC villages were deliberately

Figure 4-2. *Percent of Ill Individuals Receiving Treatment from Different Sources of Care in Each Experimental Group, 1973-74*



maintained to examine the relation of surveillance visits to infant mortality (Kielmann and others 1983).

Most service contacts were provided by family health workers (FHWs) and family planning educators. FHWs were responsible for 90 to 95 percent of all children's and women's contacts. Almost all the remaining contacts were referrals to physicians for complicated or emergency cases. Similarly, for family planning services, doctors provided only 5 to 10 percent of the contacts. The distribution of other family planning contacts varied considerably, with male family planning workers averaging about 20 percent of the contacts in FPWSCC villages, 35 percent in FPWS villages, 60 percent in FPCC villages, and 5 to 10 percent in FPED villages. FHWs and family planning educators provided the remainder of the family planning contacts, ranging from an average of 30 to 35 percent in FPCC villages to 80 percent in FPED villages.

Use of Nonproject Services

Sample household surveys in 1973 and 1974 estimated the prevalence of illnesses as reported by mothers for the two weeks before the interview. During this two-week period, 56 percent of the children under 3 years old, 30 percent of children 3-14 years old, 50 percent of the women, and 27 percent of the men were reported to have been sick. These two-week prevalence rates did not significantly differ among the experimental groups.

The surveys also determined what proportion of individuals received some health care for their illnesses and identified the source of care (figure 4-2). Almost 60 percent of the ill children in FPWSCC villages and about 50 percent in FPCC villages received some care; only 30 to 40 percent of ill children received care in CONT-P villages or in project villages that had no children's services. Although project services were concentrated on children under 3 years old in all villages, FPWSCC villages provided more services than FPCC villages to children age 3-14. The proportion of ill women who were treated ranged from 26 percent in control villages to 35 percent in FPED villages, 38 percent in FPCC villages, 42 percent in FPWSCC villages, and 47 percent in FPWS villages. Forty percent of the men received some treatment.

Project services were primarily responsible for the better coverage of children in FPWSCC and FPCC villages, where our staff accounted for more than two-thirds of the care. But other sources of care, primarily indigenous private practitioners, continued to be used by a third of the children--an illustration of the continuing influence of traditional care despite the effective and easily accessible project ser-

vices. When compared with the use of health care in control and FPED villages, project services for children in child care villages replaced about half the care usually received from other sources.

The effects of project services on the use of services by women in FPWSCC and FPWS villages were similar to the effects on children's services. About 30 percent of ill women received care from the project in both these experimental groups, or between 60 and 70 percent of all care. Again, the use of other sources of care was about half that in CONT-P and FPED villages. The project provided care to about 10 percent of ill women in FPCC villages (mostly symptomatic treatments to maintain rapport). The small amount of project child care services in FPWS villages did not seem to affect the use of other sources of care.

In villages without access to project care, more men obtained services outside the project than did women. This pattern was strongest in CONT-P villages and was probably related to the greater travel by men to nearby market towns or cities, where there were many private practitioners. Because of the higher prevalence of illnesses among women, however, the total numbers of consultations were similar for men and women. Where women's services were provided by the project, the use rates for women were slightly higher than those for men.

Government primary health centers did not provide much care in any of the villages. The greatest amount of treatment by government sources was in CONT-P villages, where 5 percent of ill children and 7 percent of ill women used the primary health center, located within 3 kilometers of these villages. In contrast, private practitioners, most of whom were traditional and had no formal training, provided 80 to 90 percent of the consultations for illness in villages without project services. In these same nonproject villages, the amount of self-care or home care was found to be nearly equal to the use of private practitioners.

Relations between Individual or Household Characteristics and the Use of Health Services

In chapter 2 several predisposing factors were shown to be associated with the practice of family planning. Some of these demographic and socioeconomic characteristics, such as caste and the woman's age, presumably affect the use of health services, too. But a second set of predisposing factors--related to the use of contraceptives and including attitudes toward family planning, beliefs about child death, and communication with husbands about family planning--would not appear to be as directly related to the use of health ser-

vices. It might be hypothesized, however, that they could have indirect links to the use of services through association with some general characteristics, such as modernization or willingness to change.

In any case, we felt it important as the first step in clarifying the relation between health services and the practice of family planning, to identify the extent to which variables that influence family planning also affect use of health services. These factors would then have to be controlled in analyzing links between services and family planning. Two cross-sectional surveys measuring attitudes, beliefs, and socioeconomic characteristics of women permitted a two-stage analysis. The first, in 1969, measured attitudes, beliefs, and socioeconomic status before exposure to project services; the second, in 1971, measured attitudes and beliefs after two to three years of project services.

Women's Illness Services

A review of the many tabulations relating predisposing variables to care of women in 1969 and 1970 revealed that:

- The analysis had meaning only in the FPWSSC and FPWS villages, which had all the women's services (see table 1-4 for a description of services).
- There was no evidence of complex interaction effects between the different predisposing factors.
- Although the use of services increased between 1969 and 1970, the basic relations of predisposing factors to services stayed the same.

Analysis of service information for 1969 showed that 54 percent of married women 15-49 years old used illness care services at least once during the year. In FPWS villages the use rate was 55 percent; in FPWSSC villages it was 54 percent. For those under 35 years old, the use rate was 55 percent; for those over 35 it was 52 percent. Neither difference was significant. This finding, coupled with the evident absence of interaction effects, led to a series of one-variable-at-a-time analyses of attitudes, beliefs, and socioeconomic characteristics to provide systematic analysis.

All variables except religion-caste proved to be significant. Although not significant, there also was an indication that non-scheduled (high) castes had a somewhat higher rate of use than scheduled (low) castes. (In this analysis religion-caste was a dichotomous variable, with all high-caste Sikhs and Hindus lumped together

and all low castes combined without regard to religion.) Other differences were in the expected direction. For example, those who expressed approval of family planning had a relatively higher rate of service use than those who expressed disapproval. But persons uncertain about family planning used services the least, indicating that they may be a special group whose vague response hides a more negative attitude to use of services than overt disapproval of family planning. Beliefs about child deaths were linearly related to use: those who believe that more children die now used services less than those who believe fewer die now; those who were uncertain or said the same number die now as before used services between the extremes. Finally, women who talked more with their husbands about family planning, women who had more possessions, and women whose families owned land were more likely to use services.

In 1970 the use rate rose to 69 percent, an increase of 16 percentage points over 1969. The increase was remarkably similar in all population subgroups--none of the differences in change was significant. The net result of the uniform increases in use was that differences in attitudes, beliefs, and socioeconomic characteristics in 1969 were much the same in 1970.

Women's Other Services

Three-quarters of married women 15-49 years old received "other care" (fertility surveillance and preventive services) in 1969. Unlike the pattern for illness care, differences were significant by cohort and age. Younger women and those in FPWSOC villages had higher rates of service use. Subsequent analysis of differences in attitudes, beliefs, and socioeconomic characteristics was accordingly conducted separately by age group and cohort. It yielded three findings of significance:

- Younger women in FPWS villages who were uncertain about differences in deaths of children between the present and the past had a higher rate of service use than was generally associated with that cohort and age group; otherwise this belief was unrelated to use of women's other care services.
- In contrast, uncertainty about approval of family planning was associated with a relatively low rate of service use among almost all groups of women, but the difference was significant only for older women in FPWSOC villages.

- A woman's communication with her husband about avoiding pregnancy was associated with an especially high rate of use among older women in FPWSSC villages. One negative finding was important: socioeconomic differences, unlike their effect on patient-initiated illness care, did not have any significant effect on the use of other services in 1969. It is possible that project-initiated services effectively overcame any initial socioeconomic barriers to use. In other words, considerable equity was achieved in the provision of project-initiated women's services, a finding explored in greater depth in chapter 8.

Use of women's other care increased in 1970 by a scant three percentage points. But the increase was much larger among younger women, especially in FPWS villages, where coverage reached 90 percent in 1970. The analysis for 1970 shows only one significant socioeconomic difference in services that was not seen in 1969: in FPWS villages, nearly 95 percent of low-caste women under 35 years old received services, compared with 87 percent of high-caste women under 35. This finding probably reflects a concerted effort to reach low-caste women with these services, an effort originating in the assumption that they were in greater need of health care and family planning.

In general, age differences affected the use of services more than differences in attitudes, beliefs, and socioeconomic characteristics. This was particularly true for other care services, which showed a striking reduction from 1969 to 1970 in the use of services by older women in FPWSSC villages and an increase during that period in service levels for women under 35 years old in FPWS villages. These changes must have been results of the growing emphasis between 1969 and 1970 on family planning in FPWS and FPWSSC villages, and on children's services in FPWSSC villages, which deliberately shifted the focus away from older women. This decision was made when it became evident that the FHWs were overloaded with tasks, especially in FPWSSC villages, and that a deliberate reallocation of time was needed.

Average Number of Visits by Users of Women's Services

In addition to determining the percentage of women using illness care and other care services, the volume of such use was examined. The average number of visits for illness care in 1969 was 4.0 per woman in FPWSSC villages and 5.1 in FPWS villages. The difference between the two experimental groups was significant and became even greater as the

average number of visits increased more rapidly in 1970 in FPWS villages than in FPWSCC villages. The average number of contacts per woman receiving other care was almost the same in both experimental groups in 1969. By 1970 women in FPWS villages averaged 5.9 contacts, compared with 5.4 in FPWSCC villages, a difference that was significant. Age did not have a significant effect on the average number of visits per woman, except in 1970 for other care in FPWS villages: women under 35 years old averaged 6.1 contacts, and those 35 years and older averaged 5.5.

Children's Illness Services

This analysis was limited to experimental groups that provided child care--the FPWSCC and FPCC villages--and mainly involved family-initiated clinic contacts. In examining the 1969 data, we found that about 67 percent of the women with children of any age had children who received curative services in the village clinics. The difference between the experimental groups in coverage of all children was significant (75 percent for FPWSCC villages and 58 percent for FPCC villages). This difference was mainly due to the design of services in FPCC villages, where there was a concentration on care of children under 3 years old that entailed frequent home visits. Of women with a child under 3 years old, 79 percent took their children to a clinic for care; of women with children 3 years and older, 53 percent took their children to a clinic in 1969.

Unlike women's illness care services, the variables of caste, owning land, or having more modern possessions were not associated with significant differences in the use of children's services. Among the measures of attitudes and beliefs, approval of family planning and beliefs about child death were associated with significant differences in the use of services. Interestingly, although the least frequent users of services were children of women uncertain about family planning, the children of disapprovers used services more than those of approvers, probably because disapprovers had more children. Women who believed that more children die now than before used services for their children significantly less than women who were uncertain or said fewer children die now. A wife's talking with her husband about family planning seemed to make no difference in the use of children's services. Despite large differences in service patterns, analyses for each age group in the separate experimental groups showed similar associations between these predisposing variables and the use of clinic services.

Use of children's illness care services in 1970 rose only slightly--to 69 percent. Differences in use by age of the children remained basically unchanged, but the difference between experimental groups diminished, with rates of 72 percent in FPWSCC villages and 65 percent in FPCC villages. The differences in use related to attitudes, beliefs, and socioeconomic characteristics were much the same as in 1969.

Children's Other Services

Because these services (preventive services and regular surveillance and early care for infections and malnutrition) were for children under 3 years old, only women with children in this age group were included in this part of the analysis. The services were worker-initiated, and more than 91 percent of these women had children who received this type of care. Coverage in the two experimental groups was about the same--90 percent in FPWSCC villages and 93 percent in FPCC villages. Attitudes, beliefs, and socioeconomic characteristics had at best only small effects on rates of use. In 1970 use was almost the same--at 92 percent--as were associations with attitudes, beliefs, and socioeconomic characteristics.

Service Contacts with Users of Children's Services

The average annual number of illness care visits was about 10 in FPWSCC villages and 7 in FPCC villages; that of other care (both home and clinic) visits was slightly less than 20 in FPWSCC villages and 40 in FPCC villages. These findings, and especially the figures on service contacts, further document the different patterns of child care in the two experimental groups--FPCC villages received much more intensive inputs of child care than did FPWSCC villages because of the inclusion of FPCC groups (as NUTHC villages) in the parallel nutrition project. Because of the large variance in contacts per family, the differences in attitudes and beliefs are not significant. But the general patterns are very similar to comparisons involving use or nonuse of services in any year. For example, those uncertain about family planning used fewer services than did approvers or disapprovers.

The use of children's services seems to have had only a limited relation to attitudes and beliefs, probably because these services were more acceptable to families regardless of their initial attitudes or beliefs. These services therefore have more potential for being useful for education in health and family planning.

Evidence of Changes in Attitudes and Beliefs Resulting from Use of Health Services

Analyses in subsequent chapters demonstrate the strong direct relation between the use of health services and the practice of family planning, with attitudes and beliefs held constant. It is also important to identify whether direct effects on attitudes and beliefs mediated some of the effect of health services on family planning.

Women interviewed in both cross-sectional surveys were included in this analysis. Their attitudes toward family planning and their beliefs about child deaths in the two surveys were compared and classified as shown in table 4-1. Earlier analysis indicated that "uncertain" responses were a mixed category, and they often seemed to represent the most negative attitudes and beliefs. A second classification, therefore, involved only women who had clear-cut changes in attitude: for example, from "disapprove" to "approve," from "approve" to "disapprove," from "more" to "fewer," and from "fewer" to "more."

Table 4-1. *Patterns of Change in Attitudes and Beliefs about Family Planning and Child Mortality*

Change	Cross-sectional survey	
	1969	1971
Positive change in attitude toward family planning	Disapprove	Uncertain
	Disapprove	Approve
	Uncertain	Approve
Negative change in attitude toward family planning	Approve	Uncertain
	Approve	Disapprove
	Uncertain	Disapprove
Positive change in belief about child deaths	More die	Uncertain/ Same die
	More die	Fewer die
	Uncertain/ Same die	Fewer die
Negative change in belief about child deaths	Fewer die	Uncertain/ Same die
	Fewer die	More die
	Uncertain/ Same die	More die

In addition to identifying changes in attitude and beliefs, women or their children were grouped in three ways: those having used services in all three years (1969-71) between the cross-sectional surveys, those having used services in one or two of the years, and those not having used services. For each category the analysis compared the percentage of women who had a positive or negative change in attitudes only in relation to the women who could change their attitudes in that direction. For example, women already approving family planning did not appear in the denominator representing women with a potential for positive change.

Both classifications produced similar results, but only a few were significant. Some results nevertheless suggested that services may induce a change in attitudes and beliefs.

Changes in Attitudes and Beliefs Related to Women's Services

Users of women's illness care services had a greater positive change and smaller negative change in attitudes toward family planning than did nonusers. The effect on negative change comes closer to being significant, and both effects are strongest for women more than 35 years old. The proportions of women who did not use services but changed their attitudes in a positive or negative direction were 60 percent and 28 percent, respectively. Of women who used services in all three years, the proportion with positive change was 68 percent, and that with negative change 23 percent. Users of services for one or two years showed fewer favorable changes than those who used services for three years. In this analysis we combined two similar questions about women's beliefs related to the death and survival of children. There was no consistent pattern relating use of women's illness care services to changes in beliefs about child death.

Other care services for women did not consistently follow the pattern of illness care services in their effect on attitudes and beliefs. Significant effects occurred only in the negative change of the variable for the approval of family planning. Users of services for one or two years showed the least change (18 percent); users of services for three years showed about the same negative change as nonusers. In this case users for three years may have included more older women. Positive change in the variable for belief about child death was related to other care services in a manner similar to illness care services. But users of other care services for one to two years showed almost twice the amount of negative change in beliefs about child death as users of these services for three years (31 percent compared with 18

percent). The change by nonusers was in between. The main effect of services, when identified, seems to have been to prevent a negative movement in attitudes and beliefs.

Changes in Attitudes and Beliefs Related to Children's Services

Changes in the approval of family planning were not significantly related to children's illness care, but changes in a positive direction followed a pattern consistent with a service effect similar to women's illness care. In this case 57 percent of nonusers showed a positive change, as did 63 percent of three-year users. This pattern was predominantly for families with children all over 3 years old. Three-year users of children's illness care had significantly less negative change in their beliefs about child death (15 percent) than nonusers (27 percent) and users for one to two years (28 percent).

Because of the small number of nonusers of children's other care, testing for significance would not be fruitful. Users of children's other care, however, had basically less negative change in the variables for approval and child deaths, a finding that parallels the effect of women's services.

The contacts or visits by users of children's services from 1969 through 1971 were compared with changes in approval of family planning and in beliefs about child death--only for children of women with definite changes ("approve" to "disapprove," "disapprove" to "approve"; "more" to "fewer," "fewer" to "more"). Although not significant, the results tended to support the patterns of change established when comparing users with nonusers and are therefore felt to have practical implications (table 4-2). In the FPWSCC group, positive change both in the approval of family planning and in the beliefs about child death were related to a higher average number of contacts than were negative changes in these attitudes or beliefs. This was true of both illness care and other care. In the FPCC group, the same pattern was shown for the child-death variable, but the average use of services was higher for those who had a negative change in attitudes about family planning, a finding that is not surprising because family planning education and services were not incorporated with the services of this group of villages until 1971.

In summary, there is evidence that health services may have induced some small positive changes in attitudes or beliefs about family planning. But the predominant detectable effect appears to be preventive, supporting the continuation of positive attitudes and beliefs and limiting the extent of negative change. In the short period of the

Table 4-2. *Relation between Volume of Children's Services and Change in Attitudes and Beliefs*

Factor	Average number of services during 1969-71 per family, by experimental group and type of service			
	FPWSCC		FPCC	
	Illness care	Other care	Illness care	Other care
Approve of family planning				
Positive change	38.3	74.2	15.8	113.8
Negative change	36.3	60.4	26.7	148.8
Belief about child deaths				
Positive change	50.0	68.8	17.8	83.3
Negative change	27.1	39.1	16.2	77.1

Note: Definitive changes only (for family planning, from "approve" to "disapprove" or from "disapprove" to "approve"; for belief about child deaths, from "more" to "fewer" or from "fewer" to "more").

project, therefore, the effects of services on the practice of family planning were most likely direct and only weakly mediated, if at all, by changes in attitudes and beliefs. Such mediation may, however, have become more important over a longer period.

Effects of Services on Health

Measuring the health benefits of project services was important for two reasons: first, to test the effect of various experimental inputs on health indices; second, to test the child-survival hypothesis, which required a program of health care that improved child health enough to make benefits apparent to families and the village community. The services constituting that program had to be "replicable" under the financial and manpower constraints in India and other developing countries.

Data gathering on changes in health status concentrated on children under 3 years old. This focus reflects the emphasis on care of young children in FPCC villages, which were also a part (NUTHC) of the Narangwal Nutrition Project. Data were collected on all deaths through the special surveys and from registers of vital statistics in all study

Table 4-3. Effects of Children's Services on Mortality Rates by Age, Caste, and Experimental Group, 1970-73

Experimental group	Stillbirths by caste ^a		Infant mortality ^b						Child (1-3 years) mortality by caste ^c			
			< 1 month by caste		1-12 months by caste							
	High	Low	High	Low	High	Low	High	Low				
Control villages ^d	47.0	(57.0)	71.0	81.0	(78.0)	84.0	52.0	(51.0)	52.0	7.0	(19.0)	26.0
FPWSCC villages	52.0	(44.0)	39.0	58.0	(64.0)	86.0	40.0	(54.0)	66.0	3.0	(7.0)	10.0
Percent difference ^e	+10.6	(-22.8)	-45.1	-28.4	(-18.0)	+2.4	-23.1	(+5.9)	+26.9	-57.1	(-63.2)	-61.5
FPCC villages	27.0	(37.0)	37.0	67.0	(47.0)	48.0	28.0	(34.0)	33.0	12.0	(13.0)	18.0
Percent difference ^e	-63.8	(-35.1)	-47.9	-17.3	(-39.7)	-42.9	-46.2	(-33.3)	-36.5	+71.4	(-31.6)	-30.8
Khanna study villages ^f		(36.0)			(74.0)			(83.0)			(48.0)	

Note: "High" caste were the Jat-Sikhs, the landowning farmers, and "low" caste were the scheduled Sikhs, predominately landless laborers. These castes made up between 75-85 percent of the population. Total mortality rates including other castes are shown in parentheses.

Source: Kielmann and others 1983.

- a. Rates are stillbirths per thousand live births and stillbirths combined.
- b. Rates are infant deaths per thousand live births.
- c. Rates are deaths per thousand children 1-3 years old.
- d. Combined rates from the control villages (CONT-N and CONT-P) of the population and nutrition projects.
- e. $b(\text{or } c) - a/a \times 100 = \text{percent difference}$.
- f. From Wyon and Gordon (1971).

and control villages. Although data were available for all age groups, the numbers of deaths occurring in the study population were large enough for analysis only for children under 3 years old. An important measure of the effect of women's services would have been changes in maternal mortality rates, but the number of maternal deaths in the study villages and control villages was too small for analysis.

Special morbidity and anthropometric data were collected for all children under 3 years old in villages in the nutrition project (see Kielmann and others 1983, chapters 4, 5, and 7). These data were used to demonstrate the effect of services for child health and nutrition on measures other than mortality in FPCC villages. Special studies were not carried out to measure changes in women's morbidity, but perinatal mortality rates are a proxy for adequate prenatal care.

Mortality

Mortality rates in the control villages of the population and nutrition studies during 1970-73 are the base against which the effects of services in the two child-care experimental groups are compared. The percentage differences in rates were calculated by caste and by age at death, but only those for the two predominant castes are shown in table 4-3. Rates are also shown (in parentheses) for the total population, which includes all other castes and combines high-caste and low-caste groups.

Table 4-3 also includes figures from the Khanna Project (Wyon and Gordon 1971), conducted nearby in Ludhiana District in the late 1950s and early 1960s. During the decade after the Khanna Project, Punjab's economy developed dramatically because of the Green Revolution. Comparisons of mortality rates in Khanna villages and in our control villages show an increase in stillbirth rates (possibly related to improved reporting), no decline in neonatal death rates, a decline of 39 percent in postneonatal death rates, and a decline of 60 percent in the mortality rate of children 1-3 years old. The decline in the last two rates presumably was primarily attributable to socioeconomic changes during the intervening decade.

The stillbirth rate per 1,000 live births and stillbirths was 57 in the control villages, 44 in FPWSSC villages, and 37 in FPCC villages. This rate presumably measures the effect on the fetus of prenatal care for the mother, especially the provision of iron and folic acid (for anemia) to all mothers and the provision of nutritional supplements to poorly nourished mothers. Effects were comparable in both FPWSSC and FPCC villages in the low-caste group, but only in FPCC villages was

there a measured effect among high-caste families. The more intensive services in FPCC villages appear to have encompassed all caste groups. Workers in FPWSSC villages had more to do and may have concentrated their prenatal care, especially supplementation, on low-caste mothers.

Infant mortality rates were split into neonatal death rates (for the first month of life) and postneonatal death rates (for the next eleven months). The neonatal death rate in control villages was 78 per 1,000 live births, that in FPWSSC villages was 64, and in FPCC villages it was 47--reductions of 18 percent and 40 percent, respectively. The high-caste children in FPWSSC villages benefited from the services, but the low-caste children did not. This was in contrast to FPCC villages, where the low-caste groups appeared to benefit most. Apparently, in FPWSSC villages, where services were less intensive, high-caste families sought care from the project or from other sources and moderately reduced neonatal mortality. But low-caste children benefited only in FPCC villages, where the outreach into homes was much more intensive. During the postpartum period, home visits were weekly in FPCC villages, monthly in FPWSSC villages. The basic pattern was the same for postneonatal children: high-caste children in FPWSSC villages and all children in FPCC villages received significant benefits from the child care. The obvious program implications of these findings are not only that frequent surveillance of infants is important in reducing mortality, but that such care must be focused in special outreach programs on the lower socioeconomic groups to compensate for their greater needs and the constraints affecting their use of services.

Although there were fewer deaths of children 1-3 years old, the effect of services on reducing such deaths per 1,000 children was as great as that on reducing infant deaths at an earlier age. The mortality rates per 1,000 children 1-3 years old were 7 in FPWSSC villages and 13 in FPCC villages, compared with 19 in control villages. For this age group the effect was greater in FPWSSC villages (63 percent lower than controls), and services had an equal impact on all castes. Interestingly, services for older children in FPCC villages had no effect on high-caste children. This finding is difficult to explain, but it is possible that high-caste children in these villages may not have used nutrition supplements. Results from the nutrition project showed that health care had a major effect both on the mortality rates of infants (under 1 year) and of children 1-3 years old, whereas nutrition care was most effective only for children 1-3 years old (Kielmann and others 1983, chapters 1 and 7).

In general, the differences in the number of deaths are statistically significant only if castes are combined. But caste differences are important in gauging the relative effect of child health services on subgroups of the population. On the whole, the combined services in FPWSSC villages had a moderate and caste-selective effect on infant mortality rates and more effect on child death rates of all caste groups. The more intensive child care in FPCC villages had a more consistent effect on age-specific mortality rates, with caste differences showing up only after 1 year of age.

Interviews ("verbal autopsies") with mothers of children who died provided additional insights that help to explain some of the differences in death rates between castes. Almost all children received treatment for illnesses that led to death. But high-caste families tended to seek care earlier than low-caste families: 68 percent of high-caste children who died received care in the first twenty-four hours of their terminal illness, compared with 49 percent of low-caste children. That may help explain the improvement in infant mortality rates among high-caste children and the lack of decline in death rate in low-caste infants when services were accessible, as in FPWSSC villages, but not intensively delivered in the homes, as in FPCC villages.

To get information on the influence of a child's death on the motivation for family planning, parents were asked in the verbal autopsies whether they intended to have another child. No association was found between affirmative responses and the sex, age, caste, or nutritional status of the deceased child. The stated intent to have another child was strongly associated, however, with the number of living siblings. Ninety-five percent of mothers who had no living child or only one said they intended to have more children, compared with 54 percent of those who had two or three living children and 11 percent of those who had four or more.

Morbidity

Weekly surveillance of morbidity was part of the nutrition study (see Kielmann and others 1983, chapter 7). Data therefore are available to measure the effect of child care on the illnesses of children in the FPCC experimental group and in the nutrition project's control group (CONT-N; see table 4-4). Conditions were selected for their frequency and importance for children 0-3 years old. The average duration for each condition was less in FPCC villages: differences were 14 to 33

Table 4-4. *Effects of Children's Services on Morbidity Levels, 1970-73*

Condition	CONT-N villages (days)	FPCC villages (days)	Percent difference
<i>Average duration in days per episode</i>			
Fever	3.9	2.9	-25.6
Cough	11.4	8.5	-25.4
Pneumonia	3.6	3.1	-13.9
Diarrhea	6.3	5.1	-19.1
Vomiting	5.2	3.5	-32.7
Eye infection	8.3	6.3	-24.1
Skin infection	8.7	7.2	-17.2
<i>Annual average days of illness per child by age of child</i>			
For all above			
< 1 year	135	113	-16.3
1-3 years	105	83	-21.0

percent less than in the controls, depending on the condition. By using the average durations and an average incidence rate for each condition, the total annual days of illness due to these conditions per child could be calculated for infants (children under 1 year old) and for children 1-3 years old. Because the incidence of disease was under-reported in the control villages, the average incidence across all villages was used. Because within-group analyses showed a reduction of incidence in some conditions for children with better nutritional status, the results probably understate the effect of children's services on morbidity.

Services in FPCC villages reduced the amount of illness by 22 days a year in each age group, a reduction of 16 percent for infants and 21 percent for children age 1-3 years old. Reducing the number of days of illness by more than three weeks a year presumably reduced the metabolic drain of nutrients in children and presumably contributed to improved nutritional status.

Growth

The effect of services on the growth of children was analyzed only for the FPCC/NUTHC group of villages. As for the analysis of morbidity,

the data come from the nutrition project and can be compared with the CONT-N data (see Kielmann and others 1983, chapters 4 and 5).

Starting at 17 months, children in FPCC villages had significantly higher average weights and heights than children in control villages. These differences were found both for males and females and for high and low castes. Average weights, adjusted for unequal sex-caste composition in the various groups and expressed as a percentage of the Harvard standard weight, are shown in figure 4-3 for ages above 1 year. Differences between the service and control villages were about 3 to 4 percentage points, corresponding to 0.4 and 0.6 kilograms, beyond two years of age. Differences in average weight at ages below 13 months were significant only at birth, when the control averages were higher (probably due to underreporting of birth weights of low-birth-weight babies, and perhaps also because of the better socioeconomic conditions in control villages).

For children 21 months old and above, average height was significantly greater in the service villages than in control villages (figure 4-4). Differences in heights between the FPCC and control groups appeared just before the second year of life and averaged about 1.5 to 2.5 percentage points, or 1 to 2 centimeters.

Sex and caste showed a highly significant effect on weight at every age. Males on average weighed 0.6 to 1 kilogram more than females, with the largest differences for those 5-17 months. Beyond the age of 1 year, average weights of high-caste children were about 0.75 kilogram more than those of low-caste children. Sex and caste also had a strong influence on height. Males on average about 2.7 centimeters taller than females from 9-17 months old; differences then decreased to slightly less than 2 centimeters at 27 months and above. Differences in average height between high and low castes increased from 1.4 centimeters at 9 months to about 2.5 centimeters after 2 years of age. In summary, these relations between services, sex, and caste were additive: a high-caste male in a service village on average weighed 2 kilograms more and was 6 centimeters taller than a low-caste female in a control village.

The number of siblings alive at the time of the child's birth had a significant influence on mean weight and height. Children with two or more male siblings had the lowest average weights and heights, regardless of the number of female siblings. Those with two female siblings and two or more male siblings were particularly low in weight and height, about 0.4 kilograms lighter and 1.3 centimeters shorter than those with one or no living brothers.

Figure 4-3. *Effect of Children's Services on Average Weight, Adjusted for Sex and Caste and Expressed as a Percent of Harvard Median Weight Standard, 1970-73*

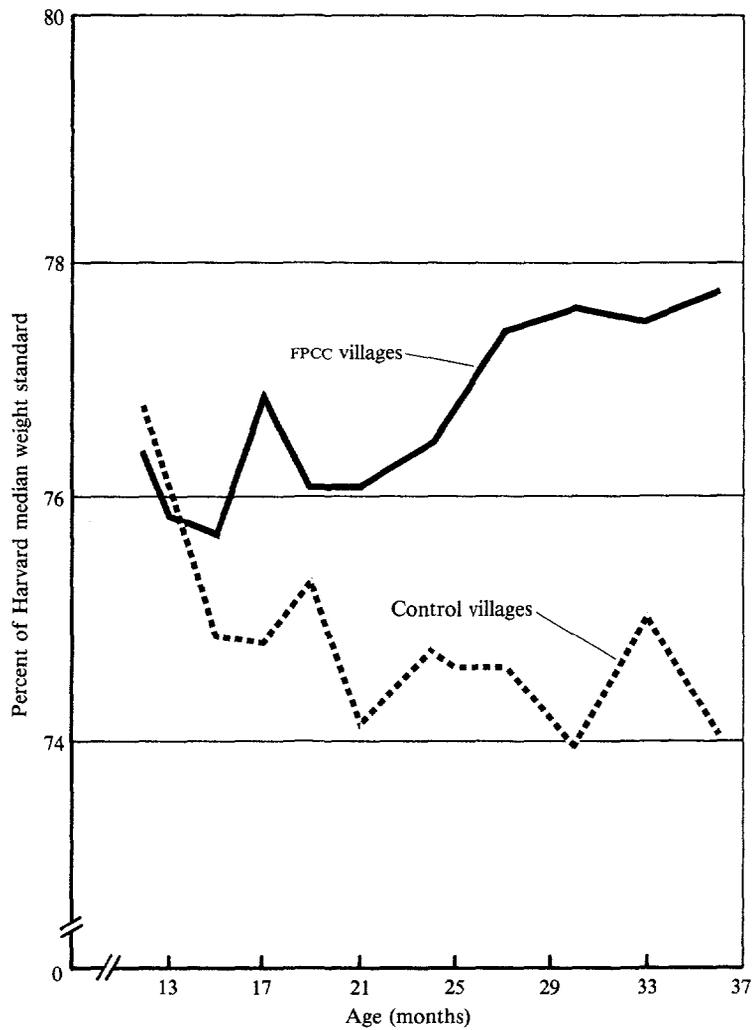
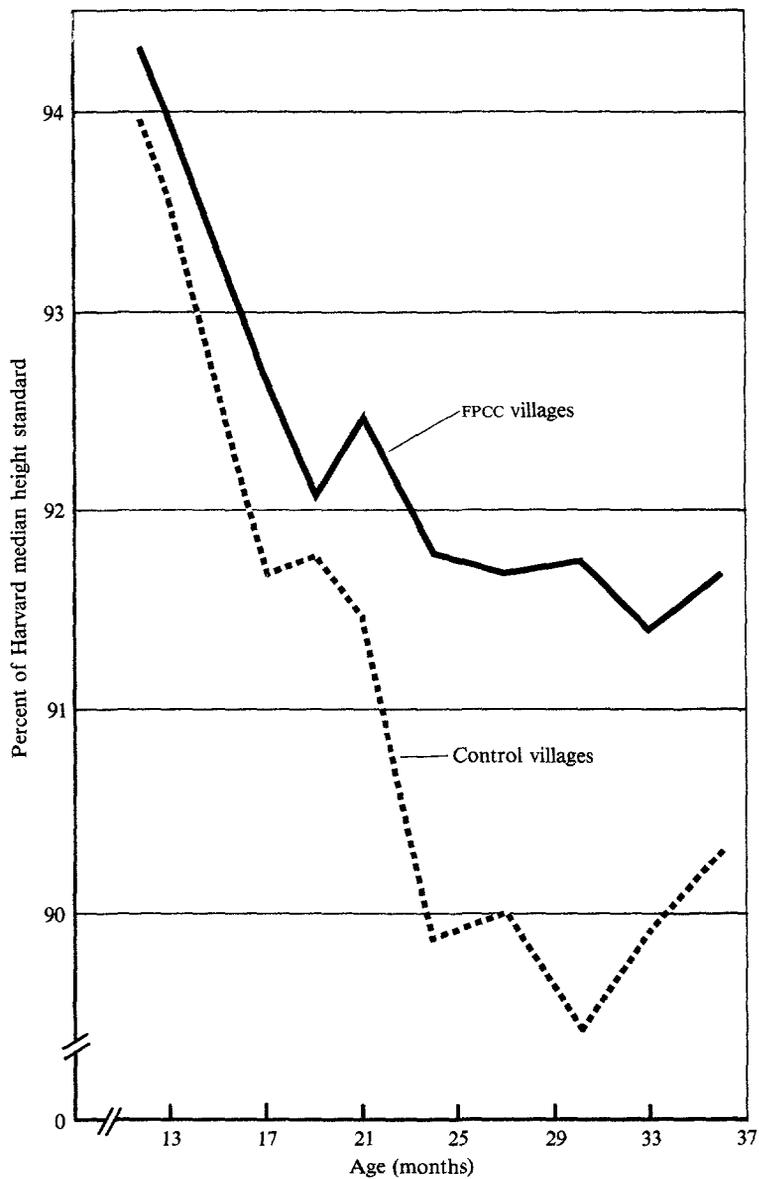


Figure 4-4. *Effect of Children's Services on Average Height, Adjusted for Sex and Caste and Expressed as a Percent of Harvard Median Height Standard, 1970-73*



Summary

The use of health services in the study villages included both project and nonproject services (for the latter, primarily use of private traditional practitioners). The project provided 50 to 60 contacts with women's services per 1,000 population weekly in villages providing such services. In contrast, the contacts with children's services varied from about 40 to 110 per 1,000 population weekly, depending on the year of the project and the experimental group. Family planning services increased from about 4 to 6 contacts per 1,000 population per week early in the project to about 13 to 19 late in the project. About 90 to 95 percent of all contacts were provided by the village-level FHWs. Outside services in villages with project services were used in about 14 to 18 percent of illnesses, compared with 30 to 40 percent in villages without project services.

Attitudes, beliefs, and socioeconomic factors had some impact on the use of health services. There was significantly greater use of women's illness services by women who approved of family planning, who believed that fewer children die now than in past years, who talked with their husbands about family planning, and who came from households with more possessions or with more land.

Any effect that health services may have had on attitudes and beliefs within this short period was small. The predominant effect was supportive, favoring continuation of positive attitudes and beliefs and more definitely decreasing the development of negative attitudes.

The provision of children's services produced well-defined effects on child health. Infant mortality was reduced more than 35 percent in FPCC villages, child mortality more than 60 percent in FPWSCC villages. The average annual number of days of illness per child was reduced 16 percent for infants under a year old and 21 percent for children 1-3 years old in FPCC villages. Children in villages with nutritional supplementation services on the average were 2 centimeters taller and 0.5 kilograms heavier by age 3 than children in control villages.

Chapter 5

Relations between the Use of Health Services and Family Planning

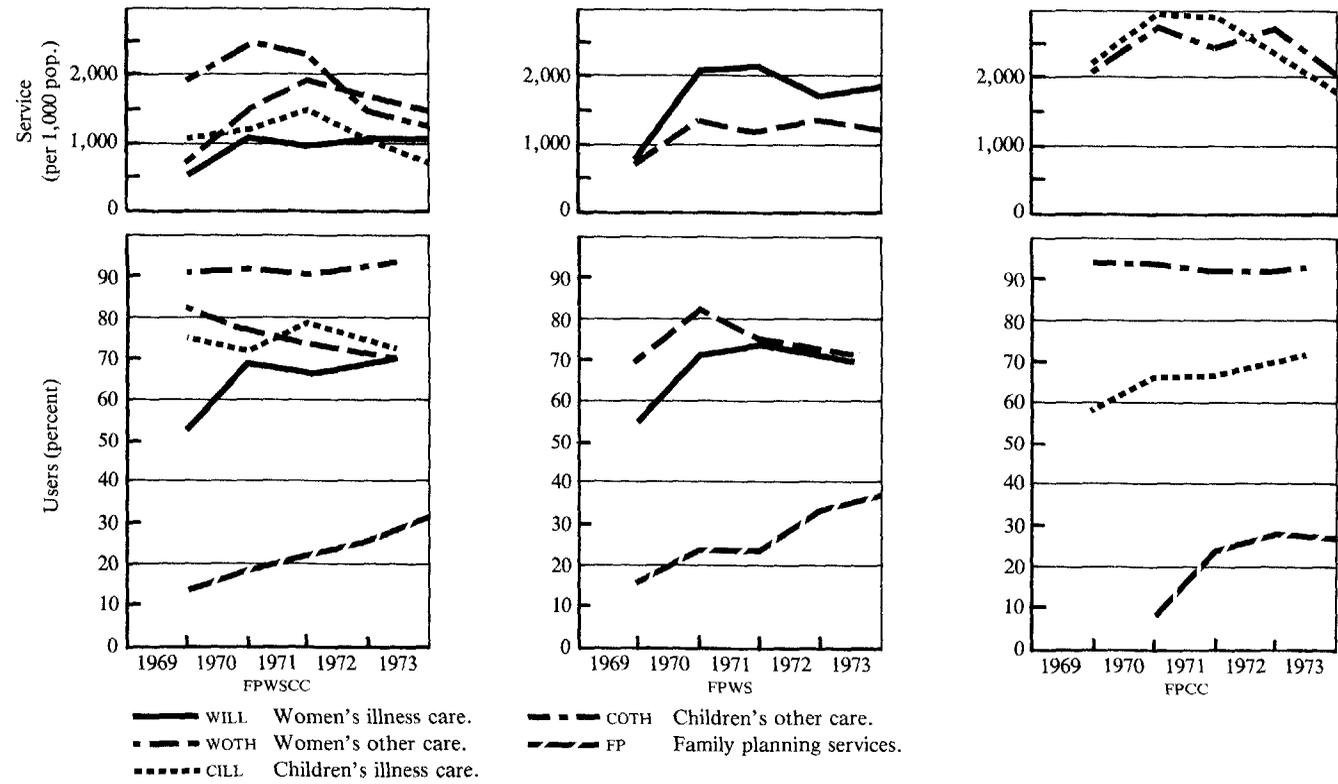
William A. Reinke and Robert L. Parker

The main hypothesis of this study was that the use of health services contributes first to the practice of family planning and later to the reduction of fertility. The first effect was felt to be mediated in two ways: by better rapport of health and family planning workers with the community, and by introducing family planning education and reinforcing the motivation to use contraception at spontaneous or predetermined "entry points" in the health services (see chapter 2, the subsection "Use of Family Planning Entry Points"), at occasions when health workers could reasonably introduce family planning in discussions with clients. For example, a worker, when caring for and showing concern for the health of a mother or child, could readily convey arguments for longer spacing between children.

It was also postulated that improving the general health of children and reducing infant and child mortality could indirectly influence couples to change their beliefs and behavior associated with the expectation that by having many children some would survive. It was hoped that the period needed for this indirect effect would be shortened by demonstrating to parents the improved health of the children. The project used entry points to encourage use of family planning as awareness of the survival of more children increased. A clear relation between health services and the use of family planning emerged and is documented in the following pages.

That relation gives rise to corollary questions relevant to policy. What is the sequence of using services? Is there a long lag between re-

Figure 5-1. Health Services and Family Planning Use, by Experimental Group, 1969-73



ceiving health services and accepting family planning? Is continuing, intensive provision of health services needed to sustain contraceptive use? Do users of health services tend also to be prior users of family planning? Does health care lead to the recruitment of new acceptors of family planning or merely induce prior users to change from traditional to modern methods?

These questions are addressed in this chapter, and the discussion is further elaborated in the next. Variables in the analyses include the following:

- Project family planning practice, which refers to the use or non-use of contraception or sterilization by women (or their husbands) at any time during the project
- Prior family planning practice, which refers to the use or nonuse of traditional or modern methods of family planning before the start of the project
- Women's illness care
- Women's other care
- Children's illness care
- Children's other care.

Visits or service contacts under these headings were measured during a specified period according to whether such visits occurred--or by the average number of visits or contacts per person who received any services. Where appropriate, the years in which services were provided were separately analyzed.

Analysis of the effects of health services was done for three of the experimental groups of villages: FPWSSC (family planning plus women's services plus children's services); FPWS (family planning plus women's services); and FPCC (family planning plus children's services). The CONT-P and FPED villages were excluded because the analysis was focused on the relation of health services to the use of family planning, and these villages did not receive women's or children's health services.

The relation between health services and family planning was first compared for the three experimental groups (figure 5-1). The use of family planning, measured by the percentage of current users, tended to increase. For all types of health service, the project succeeded early in reaching a majority of the target population, and the coverage was sustained. As was described in chapter 4, the contacts per 1,000 population peaked near the middle of the project and then tended to decline--slightly for women's services, more markedly for children's services.

Community-level analysis of the different packages of health services provided a crude first approximation of the relation between use of health services and that of family planning. No time-phased association between the use of health services and family planning is clearly discernible when relations are tabulated in aggregate experimental groups. The relation depends more directly on the use of services in the community. Subsequent analyses are based, therefore, on the sequence and continuity of use of specific types of service by the family and its members, regardless of their experimental group. In other words, we will distinguish between use and nonuse of individual services, regardless of whether nonuse was due to the absence of--or lack of exposure to--services. Disregard for this distinction in availability dilutes the effects derived in subsequent analyses, but it had to be done to provide enough observations for analysis.

In each of four categories of health services, eligible women are distinguished by whether they used a specified service for themselves or their children at any time during the project (table 5-1). The results reveal consistently higher rates of family planning practice among users of health services than among nonusers. Except for

Table 5-1. *Relation between Use of Project Health Services and Acceptance of Family Planning*

<i>Service</i>	<i>n</i>	<i>Percent family planning acceptors</i>	χ^2	<i>Significance</i>
Women's illness (WILL) care				
Use	1,063	51.7	28.60	$p < .001$
Nonuse	178	29.8		
Women's other (WOTH) care				
Use	1,101	52.5	59.56	$p < .001$
Nonuse	140	17.9		
Children's illness (CILL) care				
Use	929	51.3	56.33	$p < .001$
Nonuse	130	16.2		
Children's other (COTH) care				
Use	828	55.0	96.79	$p < .001$
Nonuse	231	18.6		

women's illness care, acceptance rates among users of services were about three times the rates among nonusers: more than half the users became family planning acceptors, whereas fewer than a fifth of the nonusers did. Although less striking, the difference in acceptance rates between users and nonusers of women's illness care still was significant; the main feature of this comparison was the somewhat higher acceptance rate among nonusers of health services, which suggested that many women were being reached through other service channels.

Continuity of Use

What is the importance of the timing and continuity of health services? To explore the question of continuity, the project was divided into two periods: 1969-71 and 1972-73. Health service users who became family planning acceptors were distinguished by whether they received services in one period or both. In each service subgroup, the percentage of acceptors who practiced family planning in both periods was compared with that of acceptors whose practice was in one period.

Except for women's other care, differences in family planning practice between part-time and continuing users of health services were not significant. The results suggest that, although acceptance of family planning is associated with some use of health services, continuing contraceptive practice depends more on factors other than repeated exposure to health services. The exception is noteworthy because it suggests, perhaps surprisingly, that part-time recipients of women's other services were more likely to be continuing users of family planning than full-time recipients: 86 percent of the part-time service users were continuing users of family planning. But the exception is not as surprising as it may at first appear: those sterilized became full-time users of family planning, while their continuing need for women's other services (mainly focused on surveillance for pregnancies) diminished.

Sequence of Use

Because the simple use of health services is more critical for the acceptance of family planning than continuity of use, timing becomes a concern. Is the receipt of health services associated with nearly

Table 5-2. Relation between Family Planning Practice and Average Number of Health Service Contacts during Early and Late Portions of Project

Recipient, type of service, years of use	Average no. of health service contacts by years of family planning use				Subtotals	
	None (1)	1969-71 only (2)	1972-73 only (3)	1969-71 and 1972-73 (4)	1969-71 [(2)+(4)] (5)	1972-73 [(3)+(4)] (6)
WILL						
1969-71						
n	493	68	111	364	432	475
x	16.1	23.9	18.0	20.7	21.2	20.1
1972-73						
n	393	60	98	323	383	421
x	10.6	11.9	14.7	16.3	15.6	15.9
WOTH (< 35 yrs.)						
1969-71						
n	241	42	97	215	257	312
x	13.1	14.9	13.0	14.0	14.1	13.7
1972-73						
n	217	38	97	189	227	286
x	13.0	13.2	13.6	13.0	13.0	13.2
CILL						
1969-71						
n	448	51	123	297	348	420
x	17.9	38.9	24.6	36.8	37.1	33.2
1972-73						
n	359	45	126	278	323	404
x	9.7	15.8	15.6	16.7	16.6	16.4
COTH (< 3 yrs.)						
FPWSCC						
n	96	25	44	137	162	181
x	59.7	75.7	68.3	80.8	80.0	77.8
1969-71						
FPCC						
n	134	10	63	98	108	161
x	121.2	167.4	143.9	158.0	158.9	152.5
FPWSCC						
n	81	19	48	87	106	135
x	25.5	29.3	30.5	25.2	25.9	27.1
1972-73						
FPCC						
n	84	6	57	54	60	111
x	69.8	75.8	100.6	95.8	93.8	98.3

n Number of health service contacts.

x Average number of health service contacts.

<i>Subtotals</i>		<i>Differences</i>					
<i>Anytime</i>	$[(2)+(3)+(4)]$	$[(7)-(1)]$	$[(5)-(3)]$	$[(6)-(2)]$	$[(4)-(2)]$	$[(4)-(3)]$	$[(5)-(3)]$
	(7)	(8)	(9)	(10)	(11)	(12)	(13)
543							
20.5	4.4	3.2			-3.2		
481							
15.4	4.8			4.0		1.6	0.9
354							
13.8	0.7	1.1			-0.9		
324							
13.2	0.2			0		-0.6	-0.6
471							
33.8	15.9	12.5			-2.1		
449							
16.3	6.6			0.6		1.1	1.0
206							
77.5	17.8	11.7			5.1		
171							
153.4	32.2	15.0			-9.7		
154							
27.4	1.9			-2.2		-5.3	-4.6
117							
97.1	27.3			22.5		-4.8	-6.8

concurrent acceptance of family planning, or is there a long lag? Did the acceptance of family planning precede the use of health services, or vice versa?

We examined the relation between the volume and timing of health services received by a woman or her children and her practice of family planning (table 5-2). The investigation excluded those who received no health services during the project. Average numbers of health service contacts in either 1969-71 or 1972-73 were related to four mutually exclusive categories of family planning practice: none, practice only in 1969-71, practice only in 1972-73, or practice in both 1969-71 and 1972-73.

The average number of illness care visits by women was 24 for those who practiced family planning only in 1969-71, 21 for those who practiced family planning in both periods, 18 for 1972-73 practitioners, and 16 for nonpractitioners. In contrast, more visits for women's illness care in 1972-73 were by those practicing family planning at that later time, especially if they were earlier users as well. The pattern of other care was more uniform for women under age 35.

The contacts with children's illness care were more variable but showed patterns about the same as those for women's illness care. The average number of child visits during 1969-71 ranged from 18 for non-acceptors to 39 for those who practiced family planning only during 1969-71. (The corresponding range of visits for women's illness care was 16 to 24.)

The analysis of children's other services was limited to children under 3 years old and was done separately for the two experimental groups with child care (FPCC and FPWSCC). The reason is that the scheduled home visits differed substantially between them (surveillance visits were monthly in FPWSCC villages and weekly in FPCC villages). In both experimental groups the volume of children's other services was higher than that for other types of service. For example, children of nonacceptors of family planning in the FPWSCC villages received, on the average, 60 children's other care visits in 1969-71; the average number of women's other care visits was 13. Despite the higher volume, the receipt of children's other services was fairly uniform for the family planning groups, as was the receipt of women's other services. In general, then, variations in illness care were found to be more closely associated with the use of family planning than was the receipt of other services. Presumably, the reason is that illness care was initiated by patients and reflected the natural predilections of families.

Many of the foregoing findings, although striking, barely bordered on significance because of large variances and the small number in each category. Further appraisal produced noteworthy patterns.

- Acceptors of family planning at any time during the program averaged 20.5 contacts with women's illness services during 1969-71, nonacceptors 16.1. Women who never practiced family planning invariably received fewer services than other women, and their children received fewer services than other children.
- Family planning users who concurrently received health services in 1969-71 received more health services of all types than women whose practice of family planning began later.
- Women who practiced family planning in 1972-73 tended to be greater concurrent users of health services than earlier family planning users who had discontinued by 1972-73.

These three findings support the conclusion that use of family planning under the project is positively associated with the volume of health services.

- The use of health services in 1969-71 improved the chances for family planning acceptance in that same period. But did heavy early use of health services help to sustain family planning practice in 1972-73? For reasons that are unclear, the continuing users, if anything, received fewer health services early in the program than those who discontinued family planning (column 11 of table 5-2).
- Did new recruits to family planning exhibit a different pattern from previous users? The results are inconclusive, except to suggest that the new recruits perhaps received more children's other services during the period of successful recruitment to family planning (column 12 of table 5-2). While not significant, the results tend to reinforce the importance of concurrence in the receipt of health services and the practice of family planning.
- The issue so far has been: how does the use of health services lead to the practice of family planning? We now ask the obverse: does early contact with the system through the acceptance of family planning lead to increased subsequent use of health services? In other words, was the use of health services in 1972-73 greater among earlier acceptors of family planning than among those who first accepted in 1972-73? There is little evidence to support

this proposition. The analysis is confounded, however, by the concurrent association between health services and the use of family planning in 1972-73. The findings (column 12 of table 5-2) removed this factor because they were limited to users of both health and family planning services in 1972-73. Nevertheless, considering columns 12 and 13 of table 5-2 together, we see no suggestion that the practice of family planning leads to the use of health services.

Use of Family Planning in Relation to Period of Using Health Services

The use of health services at the midpoint of the project (1971) was compared with earlier (1969-71) and later (1972-73) use of family planning, and with nonuse of family planning. As in earlier analyses, nonacceptors clearly differed from acceptors in their use of health services. In no case, however, are prior and subsequent users of family planning statistically different in their receipt of health services in 1971. For example, 59 percent of women who did not practice contraception during the project used illness care services--compared with 76 percent of women who practiced family planning early in the project and 78 percent late in the project. The difference between 76 percent and 78 percent is not significant.

Because sterilized women (or women whose husbands were sterilized) received other care at a much reduced rate after 1970, they were excluded from the analysis of other care. The remaining family planning users were almost completely covered by these other health services (91 to 93 percent), in contrast to nonusers of family planning (62 percent). Use of children's services followed similar patterns: children of family planning acceptors had higher coverage by health services in 1971 than nonacceptors, especially by other care services, but coverage was not distinguishable by the time of practice of family planning.

The most striking finding continues to be the importance of concurrent use of health and family planning services. The implications of this finding for program management are clear. If health services are to sustain their effect on the practice of family planning, those services must be well coordinated and combined with contraceptive services. The finding gives credence to the postulated importance of the direct linking of integrated health and family planning services.

Use of Health Services: Controlling for Prior Family Planning Use

Prior users of family planning are more likely to become program users. That has been established. But these prior users might have been generally inclined to respond to a variety of modern services, including health care, when it was convenient. If that were so, acceptance of family planning under the project might have merely been a response to a prior felt need for family planning--and the causal role of health services use would have been spurious. We therefore investigated the three-way relation between prior use of family planning and the use of health services and family planning under the project.

A prior history of family planning practice was indeed associated with greater use of project health services for women, although not with use of those for children (table 5-3). Women who had not used family planning before the project had a use rate of illness care of about 63 percent in both 1970 and 1971. The rates for users of traditional family planning methods were 74 percent and 70 percent; for prior users of modern contraceptives, they were 75 percent and 76 percent. Although more women received other care than illness care, the pattern was similar for prior users and nonusers of family planning, except for prior users of modern methods in 1971. Only 64 percent of the prior users of modern methods used services for other care, compared with 76 percent of prior users of traditional methods. Because this was not seen in 1970, it most likely represents a decline in coverage originating in changes in guidelines of the project. Most prior users of modern methods had been sterilized and therefore did not need visits to assess their fertility. Although women of different ages used health services at different rates, their use of family planning produced such similar effects on use of health services that all ages have been combined in table 5-3 (and in subsequent tables, unless specified otherwise).

In the analysis of children's services, women with children under age 3 were analyzed separately because other care was targeted exclusively on this group of children. There was little difference in the use of children's services between 1970 and 1971. Thus, only services in the second year are shown in table 5-3. Although the children of women who had never practiced family planning used children's services slightly less than the children of prior users of family planning (whether traditional or modern), the differences were not sig-

Table 5-3. Relation of Prior Family Planning Practice to Use of Health Services during Project

Year and recipient	Prior family planning use	n	Health Service			
			Illness care (clinic)		Other care	
			Percent using	χ^2	Percent using	χ^2
1970						
Women	No use	649	63.6	16.17	73.8	20.02
	Traditional	412	74.0	($p < .001$)	83.5	($p < .001$)
	Modern	185	74.6		85.1	
1971						
Women	No use	649	63.0	13.89	68.5	10.03
	Traditional	412	70.4	($p < .001$)	75.5	($p < .01$)
	Modern	185	76.2		63.8	
1971						
Children (< 3 yrs.)	No use	254	84.6	0.52	88.2	1.50
	Traditional	183	86.3	(n.s.)	91.8	(n.s.)
	Modern	35	88.6		100.0	
1971						
Children (≥ 3 yrs.)	No use	246	57.3	3.57		
	Traditional	192	64.6	(n.s.)		
	Modern	87	66.7			

n.s. Not significant.

nificant. The use rates for illness care services and other care were almost identical. Findings were similar for women with children over age 3, but the use rates for these services were lower.

The main differences in the use of health services were between non-users and prior users of family planning. Differences between prior users of traditional and modern methods were significant in only one case (women's other care in 1971). Women who used family planning before the project must have been more open to using health services as well as family planning under the project (see chapter 3). The nonusers of family planning before the project may represent a more resistant population that calls for special efforts to ensure coverage, at least by women's services.

Use of Health Services: Controlling for Prior and Project Family Planning Use

In the combined relation between prior and project family planning use and use of health services, the largest and most significant

Table 5-4. Combined Effect of Prior and Project Family Planning Practice on Use of Health Services in 1971

Recipient and type of family planning use	n	Health service			
		Illness care (clinic)		Other care	
		Percent using	χ^2	Percent using	χ^2
Women					
None	387	55.3	52.42	56.6	82.71
Prior, nonproject	256	64.1	($p < .001$)	67.6	($p < .001$)
No prior, project	467	75.2		84.4	
Traditional prior, project					
Modern prior, project	136	81.6		63.2	(90) ^a
Children (<3 yrs.)					
None	106	76.4	11.06	76.4	32.49
Prior, nonproject	69	82.6	($p < .005$)	87.0	($p < .001$)
No prior, project	269	89.6		95.9	
Traditional prior, project					
Modern prior, project	28	89.3		100.0	
Children (≥ 3 yrs.)					
None	178	50.0	22.84		
Prior, nonproject	158	59.5	($p < .001$)		
No prior, project	134	73.9			
Traditional prior, project					
Modern prior, project	55	74.5			

a. Number in parentheses indicates percent using services when sterilized women are excluded from the analysis.

variations were for women's services (table 5-4). (Use of family planning at any time during the project was considered to be project use.) For women's illness care, for example, use in 1971 ranged from 55 percent for women who were neither prior nor project acceptors of family planning to 82 percent for women who used modern methods in both periods. Among women whose practice of family planning was confined to one period, project users had a somewhat higher rate of using health services (75 percent) than prior users (64 percent). Prior users of traditional methods were combined with prior nonusers in

this analysis because they were comparable in their use of health services. Age had no effect on the differences noted above.

Women categorized according to their family planning experience used other care much as they used illness care. Project family planning users who had used modern methods before the project were found to use other care at a rate of 63 percent, but that rate rose to more than 90 percent if couples who used a permanent method (tubectomy or vasectomy) were excluded from the analysis. Women age 35 and older used other care less than younger women, but the trend was in the same direction.

More than 76 percent of the children (under 3 years old) of women who had not used family planning used either illness care or other care. Use of these services was between 83 and 87 percent for children whose mothers were prior users of family planning but not project users and between 90 and 100 percent for children of mothers who were project users. The use of illness care by older children (over 3 years old) varied in much the same way--from 50 percent by those whose mothers did not use family planning to 75 percent by those whose mothers were project family planning users.

Among nonusers of project family planning, there was a significant difference between prior users and nonusers in the way they used women's health services. For example, the use of illness services by 64 percent of the prior users is significantly greater than the 55 percent use for nonusers. But corresponding differences with respect to child care are not significant. Among project users of family planning, there were no significant differences in the use of any category of health services according to prior family planning use.

To summarize the findings, prior use of family planning contributed to the use of project health services, especially those for women. Even stronger, however, was the association between project use of family planning and health services. In fact, the use of project family planning essentially obscured any effect that prior use of family planning had on the use of health services.

Use of Family Planning: Controlling for Prior Practice and for Use of Health Services

The more important question for service programs deals with the possible influence of the use of health services on the practice of project family planning, controlling for prior use of family plan-

ning. This was examined by using the percentage of women practicing contraception as the dependent variable (table 5-5).

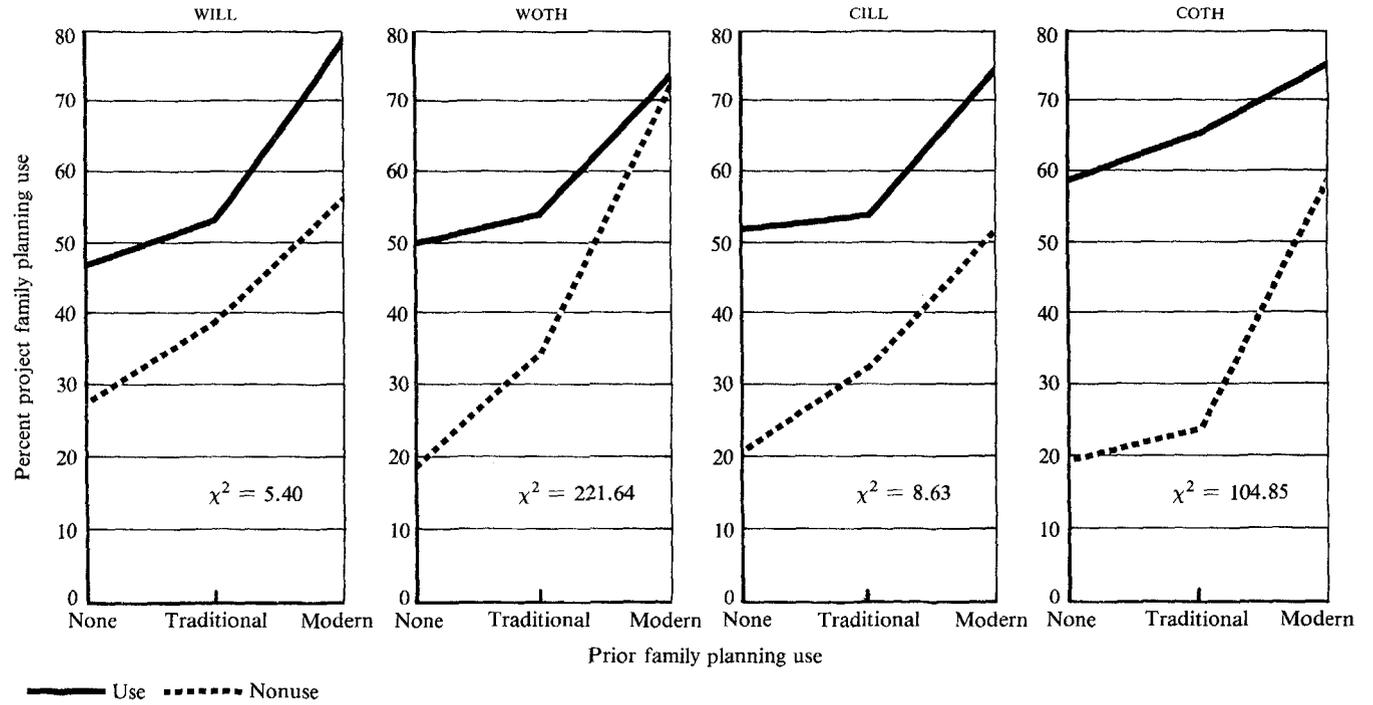
A strong association between the use of health services and project family planning was again shown, but this time the effect of prior use of family planning was more clearly defined. Among nonusers of

Table 5-5. *Relation of Project Family Planning Practice to Prior Family Planning Practice and Use of Health Services in 1971*

Recipient and type of family planning use	Health service					
	Use of illness care (clinic)			Use of other care		
	No	Yes	χ^2	No	Yes	χ^2
Women's services (WILL + WOTH)						
No prior (n)	240	409		206	443	
			24.53 (p < .001)			60.26 (p < .001)
Percent project use	27.9	47.7		18.4	50.6	
Traditional prior (n)	122	290		101	311	
			6.38 (p < .05)			12.21 (p < .001)
Percent project use	40.2	53.8		34.7	54.7	
Modern prior (n)	44	141		67	118	
			8.26 (p < .01)			0.07 (n.s.)
Percent project use	56.8	78.7		74.6	72.9	
Children's services (CILL + COTH)						
No prior (n)	144	356		204	296	
			41.23 (p < .001)			78.16 (p < .001)
Percent project use	20.8	52.2		19.6	59.5	
Traditional prior (n)	93	282		145	230	
			10.23 (p < .001)			62.60 (p < .001)
Percent project use	34.5	54.8		24.1	66.1	
Modern prior (n)	33	89		57	65	
			5.67 (p < .05)			3.46 (n.s.)
Percent project use	51.5	74.2		59.6	75.4	

n.s. Not significant.

Figure 5-2. Relations between Project Family Planning, Prior Family Planning, and Health Service Use



women's illness services in 1971, for example, the acceptance rate for project family planning was 57 percent among prior users of modern methods and 28 percent among those who were not prior users. Use of health services raised the acceptance rate to 79 percent for prior users of modern methods and to 48 percent for those who were not prior users. Results for prior use of traditional methods were in between.

In general, patterns were similar in other categories of health service. The results tend to reconfirm the effects of both the prior use of family planning and the project use of health services on the project use of family planning. But are these effects separate and independent? The chi-square (χ^2) values of table 5-5 suggest that they may not be, for the use of health services invariably produced more significant chi-square values among those who were not prior users of family planning than among prior users of modern methods. In fact, the use of other health services produced a negligible, or at least nonsignificant, increase in acceptors of project family planning among prior users of modern methods.

The question of independence is examined more closely in figure 5-2. If the effect of using health services were constant, regardless of prior experience of family planning, each pair of curves in the figure would be parallel. That is, the solid line for users of health services would lie at a fixed distance above the broken line for nonusers. Such a pattern is not observed for users of women's other health services.

Deviations from expected results, hypothesizing independence, have been tested to produce the chi-square values shown in the figure. Consider the results for use of women's illness services: for nonusers of women's illness services, irrespective of prior use of family planning, the rate of project use of family planning was 35 percent. For users of those services, the rate was 55 percent. If the effect of using health services were hypothesized to be constant at 20 percent (55 percent minus 35 percent), the acceptance rate among those who were not prior users of family planning would be expected to go from 28 to 48 percent with the receipt of health services. Similarly, the acceptance rates with use of health services should be 60 percent for prior traditional users of family planning and 77 percent for modern users. The comparison of results with these expectations yields a chi-square value of 5.40. Application of the procedure to all categories of health services confirms--dramatically--the difference in effect between services for illness care and other care.

Although the chi-square values associated with illness care are small, they suggest a characteristic of prior users of traditional

methods of family planning. Without illness care, such women were more likely than nonusers to become project acceptors. Among health service users, however, there was little difference between those who had not used family planning and users of traditional methods in the acceptance of project family planning. Thus the incremental effect of using health services on the acceptance of family planning was small for those with previous experience of traditional methods. This is shown in figure 5-2 by steeper slopes for nonusers of illness care than for users.

Prior experience of family planning increased the rate of use of project health services. The use of health services in turn increased the likelihood of acceptance of project family planning. What was the combined effect of this prior experience? Results of the investigation of this question are shown in table 5-6. Consider women's illness care. Of 649 women who were not prior users of family planning, 409 (63 percent) were recipients of women's illness care in 1971 (see table 5-5). Users of illness care had a practice rate for project family planning that was 19.8 percentage points (47.7 - 27.9) higher

Table 5-6. *Estimated Net Effect of Health Services on Program Use of Family Planning*

<i>Prior family planning</i>	<i>n</i>	<i>Added users (per 1,000 pop.)^a</i>
WILL		
None	649	125
Traditional	412	97
Modern	185	168
WOTH		
None	649	219
Traditional	412	150
Modern	185	0
CILL		
None	500	224
Traditional	375	155
Modern	122	164
COTH		
None	500	236
Traditional	375	256
Modern	122	82

a. Numbers reflect relative magnitudes only. They are not additive across services because separate analyses did not examine service interrelationships.

than nonusers of such health services. Thus, for every 1,000 women without prior experience of family planning, 630 were reached by illness care. Those 630 contributed 125 family planning acceptors over and above those who could have been expected to become project acceptors without this illness care.

The results of similar calculations for all categories identified in table 5-5 are summarized in table 5-6. They are not significant; in particular, they do not consider interactive effects of different combinations of services. Nevertheless, the findings suggest possible guidelines for emphasis in programs. The effect of illness care on the acceptance of family planning is fairly uniform, regardless of prior experience of family planning. Although prior practice of family planning reduces the incremental effect of the use of health services, the increased likelihood of health services use in this population group provides a larger subgroup of users. This is illustrated by the following example of offering women's illness services to prior nonusers of family planning and to prior users who used traditional methods:

	Hypothetical population		Users of women's illness services		Incremental effect on use of family planning	Gain
No prior use	100	×	0.630	×	0.198	= 12
Prior use of traditional methods	100	×	0.740	×	0.136	= 10

Making children's other care available to the children of prior users of modern methods of family planning produced an effect on project use of family planning that was only about half as large as that from making children's illness care available. But children's other care had about three times more effect among those without prior family planning experience than among former modern users. Similar relations of effectiveness are observed for women's services. These variations in the effect of services have implications for targeting services to maximize the practice of family planning. In integrated programs of health and family planning, these efforts would have to be balanced by possibly competing demands for a different distribution of the services to maximize their effect on health. But as we found at Narangwal, prior nonusers of family planning tend to be those who need health care the most.

Summary

The use of health services at Narangwal was consistently associated with increased practice of family planning. Women who had received illness services had a family planning use rate 22 percentage points higher than those who did not receive illness services. Women who received women's other services or whose children received illness or other services had a family planning use rate about 35 percentage points higher than nonusers of these health services.

When the patterns of use of health services and family planning were examined over time, it was shown that concurrent periods of use of health care were more closely associated with family planning than either prior or subsequent use of health services.

If women used modern family planning methods before the project and if they or their children used any type of health service during the project, they had the highest family planning use rate during the project (between 70 to 80 percent). In contrast, if women neither practiced family planning in the past nor currently used health services, they had a family planning use rate of only 20 to 30 percent during the project.

The use of illness services increased the use of family planning among eligible women during the project no matter what their prior experience of family planning had been. The use of other services, however, had more effect on women who had never practiced family planning or who used traditional methods before the project than on those who were prior users of modern methods. Thus, all health services were effective in recruiting new acceptors of modern methods (from those who never used family planning before), but other services were more effective than illness services.

Chapter 6

Determinants of the Use of Family Planning

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The preceding chapters have established two strong associations: that between the use of health services and the practice of family planning and that between such predisposing factors as attitudes, beliefs, and socioeconomic characteristics and the use of health services or the practice of family planning. Because health services were the primary intervention variables in the study, we had to determine the strength of their association with family planning practice while controlling for the known effect of the predisposing factors. For example, it is important to know whether services induce similar or different changes in the use of family planning among women who have different attitudes toward family planning. The results could be used to identify women who would be more responsive or less responsive to service interventions and to determine priorities for target groups that have specific predisposing characteristics. In addition, the finding that a predisposing characteristic had no influence on the impact of services could indicate that the factor was unimportant or that the services were delivered in a way that neutralized its influence.

The first analysis in this chapter therefore examines the three-way association between health services, the practice of family planning, and attitudes, belief, and socioeconomic characteristics. All values for attitudinal, belief, and socioeconomic variables in this analysis are from the midproject cross-sectional surveys (1971). Values for health service and family planning variables are

from the experience of individuals throughout the duration of the project (1969-73).

To obtain a more comprehensive view of the relative importance of the many factors examined, a linear multiple regression model was developed to relate the practice of family planning (the dependent variable) to attitudes, beliefs, knowledge, practice, socioeconomic characteristics, demographic factors, and the use of services (the independent variables).

Women's and Children's Health Services

The percentage of women who practiced family planning at some time during the project has been related to their use (or their children's use) of health services. Users of women's and children's services were categorized by no use, some use (in either 1969-71 or 1972-73), and full use (in both periods). These categories were then used to subdivide women with specific response categories for each predisposing variable.

In the most favorable circumstances--when women approved of family planning and used services for illness care throughout the project--the rate of practicing family planning was more than 60 percent. This rate is twice that of the disapproving nonuser and three times that of the uncertain nonuser. As mentioned in chapters 3 and 4, women uncertain about family planning appeared more negative to project services than those who disapproved of family planning. The effects of the use of services on the practice of family planning, with attitudes about family planning held constant, were significant for those who approved and were uncertain--but not significant for those who disapproved, even though the direction of change associated with use of services was positive and on the order of 17 percentage points. Women's other services, as well as both curative and other services for children, had a consistently strong effect on the practice of family planning for all women, including those who disapproved. "Other care" services for children (preventive and surveillance visits) produced the widest spread in practice rates of family planning.

Moving from disapproval to approval within a use category or from one use category to the next higher category, with the attitude held constant, produced an approximate increase of 20 to 30 percentage points. It appears that the effects of attitudes toward family planning and of any of the women's or children's services are additive and

at least partially independent. It also appears that the effect of services was similar regardless of women's attitudes, except for women's illness care among disapprovers of family planning.

The additive effect of a woman's communication with her husband about family planning and the use of health services was equally dramatic. The use of children's other care again produced the most consistent findings. For example, family planning practice rates for nonusers of services ranged from 12 percent for women who did not talk with their husbands to 35 percent for those who did. In contrast, women who did not talk with their husbands but whose children received other care part of the time had a practice rate of 34 percent. In both instances a change in behavior was related to an increase in the family planning practice rate of about 20 percentage points. All these changes are highly significant--and just as noteworthy, changes of such magnitude should have great practical importance.

More than any variable of attitudes, beliefs, and socioeconomic characteristics, the variable of a woman's talking with her husband about family planning contributed to differences in family planning practice about as much as did services. For women's illness services, the independent contribution of talking with the husband is slightly greater than the independent contribution of that service. These findings also support the importance of such communication between a woman and her husband about family planning.

Differences in beliefs about changes in the frequency of child deaths over the previous thirty years produced only small variations in family planning practice rates in any category of health service use. The effect was least among women (or their children) who used services throughout the project (full use). In contrast, in any belief category practice rates of family planning were consistently and significantly related to the use of health services. What seems particularly important is that services had a strong effect on the practice of family planning, no matter what women believed about changes in the survival of children. The effect was most dramatic for women provided with services throughout the project. This finding supports the hypotheses that services could modify the beliefs and actions of women by changing their perception of their children's chances of surviving.

If the socioeconomic characteristics of women--caste, income, husband's education, and ownership of land or selected modern possessions--were held constant, associations between the use of women's and children's services and the practice of family planning remain highly significant. Generally a change from no use of services

to full use was associated with an increase of 20 to 40 percentage points in the proportion of women practicing family planning. The only times that services did not affect family planning practice as strongly were with women's illness care among women with no land, with medium income, or of low caste. In contrast, in only a few instances did these socioeconomic characteristics have an effect on the practice of family planning if services were held constant. Most of the exceptions involved the use of children's services. For example, among women whose children had illness care during one part of the project (some use), rates of practicing family planning for women whose husbands has passed fewer than six grades of education were 20 percentage points lower than those of women whose husbands had six or more years of education--29 percent compared with 49 percent.

In summary, the use of health services was much more strongly associated with the practice of family planning than were the socioeconomic variables. From the practical point of view, it is encouraging that the use of services seems to overcome most of the preexisting differences in the use of family planning related to socioeconomic and attitudinal characteristics. In the few instances in which services were not strongly associated with increases in the practice of family planning, these services almost invariably were women's illness care.

Motivation of Husbands and Family Planning

Motivational contacts with husbands by male family planning workers were also analyzed for possible associations with the practice of family planning and with the variables of attitudes, beliefs, and socioeconomic characteristics. For these analyses, women were identified as having husbands who either had or did not have such contacts. The results were just as dramatic as those for women's and children's health services--practice rates ranged from 24 percent for women whose husbands had not had discussions with family planning workers and who did not talk with their wives about family planning to 69 percent for women whose husbands had talked with both. Husbands who did not talk with family planning workers but did talk with their wives about family planning or those who had talked with family planning workers but not with wives practiced family planning at almost the same intermediate rates of 47 percent and 49 percent. Although the association between motivational contacts with the

husband and the practice of family planning is strong, it is not clear whether the contacts stimulated practice directly or only reflected secondary associations. The direction of cause and effect has not been established. Beliefs about the frequency of child deaths and socioeconomic factors had little influence on practice rates when general and motivational contacts with husbands were held constant. But these contacts were closely associated with the practice of family planning when the other variables were held constant.

In summary, the three-way analyses of men's, women's, and children's services indicate that the associations between the use of services and the practice of family planning often add to and are independent of the effects of attitudes, beliefs, and socioeconomic characteristics. This supports the importance of the relation between services and the practice of family planning in the Narangwal setting. The data also suggest that the associations between attitudes, beliefs, and socioeconomic characteristics and the practice of family planning--associations that were seen before the project but became less evident during the project--may have diminished because of the high use of project services. Health services were in general used equally by all groups in the population, and the influence of this use was to equalize the practice of family planning regardless of initial use.

Regression Analyses of the Use of Health Services and the Practice of Family Planning

Three regression analyses were conducted. In the first, the independent variables measuring specified services were simply defined as use or nonuse in one, two, or three years of the period 1969-71. In the second and third analyses, the number of service contacts in 1969-73 was used. As in the preceding section, the services included women's illness care and other care, children's illness care and other care, and male motivational contacts. These variables were considered to have direct program implications.

Measurements of contraceptive practice after the baseline cross-sectional surveys were restricted to methods offered by the project: condom, oral pill, vasectomy, tubectomy, intrauterine device (IUD), and injectable Depo-Provera. Use or nonuse of one or more of these methods during the project was the dependent variable in the first two regression analyses. The duration of the practice of family planning in days of use during the project was the dependent variable in

Table 6-1. Results of Multiple Regression Analysis Examining Service Utilization in 1969-71 and Its Effect on Use or Nonuse of Family Planning at Any Time during Project (1969-73)

Independent variable	Regression coefficients and their levels of significance		
	Coefficient	t-value	Level of significance
Education of husband	.0545	1.9	~.05
Occupation of husband			
Labor	.0076	0.2	n.s.
Farming	.0441	1.1	n.s.
Other	*	*	*
Religion-caste			
Jat-Sikh	-.0761	1.6	n.s.
Scheduled Sikh	-.0579	1.3	n.s.
Other	*	*	*
Number of living children and wife's age			
≤ 3 and < 35	.1894	3.6	< .001
≤ 3 and ≥ 35	*	*	*
> 3 and < 35	.2788	4.7	< .001
> 3 and ≥ 35	.0997	1.9	~.05
Number of child deaths	-.0305	2.1	< .05
Awareness of modern contraception	-.0324	0.6	n.s.
Prior family planning use	.0847	4.2	< .001
Belief about child mortality	.0121	0.7	n.s.
Talk with husband	.0893	3.2	< .005
Attitude toward family planning			
Approve	.1206	3.1	< .005
Uncertain	*	*	*
Disapprove	.0463	1.1	n.s.
Service utilization			
Women's illness care	.0481	4.1	< .001
Women's other care	.0032	0.2	n.s.
Children's illness care	-.0199	1.1	n.s.
Children's other care	.1049	6.1	< .001
Male motivation	.1022	5.3	< .001
$R^2 = 0.24$			

* Suppressed category; effect included in constant term.

n.s. Not significant ($p > .05$).

the third. Couples who had a vasectomy or tubectomy before the project did not have an opportunity to accept a method through project sources and were excluded from the analysis. And because outmigration and dissolution of marriage would deter the acceptance of contraception, only couples who were in experimental villages and currently married at the time (1969 and 1971) of the two cross-sectional surveys measuring attitudes, beliefs, and socioeconomic characteristics were included. The analyses were conducted on 1,187 women 15-49 years old who fulfilled these criteria and who provided complete information on all the variables.

The variables of attitudes, beliefs, knowledge, practice, and socioeconomic and sociodemographic characteristics were considered to be exogenous (nonmanipulable) but were thought to be potentially important determinants of the use of family planning and to be of interest in targeting services. The exogenous variables tested were limited to those that showed some promise in preliminary bivariate analysis--see the list of "independent variables" in table 6-1. Results of the first regression analysis using these exogenous variables and the service intervention variables mentioned earlier are shown in that table.

The regression analyses helped in assessing the separate and combined importance of interesting variables, but three limitations of the analysis must be borne in mind. First, only linear effects were considered. Thus, for example, the second year of use of health services was assumed to be as effective as the first. Second, interactions were not included in the analysis. It is possible that the effect of joint use of services was, in fact, not precisely the sum of the separate effects. Third, the regression analysis does not give explicit recognition to the fact that predicted values of the dependent variable (such as the percentage accepting family planning) cannot exceed 100. Despite these possible limitations, regression results conformed closely to observed conditions and led to the conclusion that the simple regression models used were adequate.

Socioeconomic Variables

Religion-caste and occupation of husband were not significant, a reflection of success in the equitable distribution of contraceptive practice in the population. Education of husband was slightly significant in the expected direction: the higher the husband's education, the greater the contraceptive practice.

Sociodemographic Variables

There was more contraception among young women (under age 35) than among older women. This was clarified by the number of surviving children. Among younger women, the contraception rate for those who had more than three children was higher than that for those who had fewer children. This has obvious implications for defining a particularly receptive target group for family planning. A significant negative association was found between women's contraceptive practice and the number of live-born children who died: the fewer the children who died, the greater the contraceptive practice, even for women with the same number of surviving children.

Attitudes, Beliefs, Knowledge, and Practice

Approval of family planning, belief about child mortality, communication with husbands about family planning, awareness of modern contraception, and prior practice of reversible methods of family planning constituted this group of variables. Ninety-three percent of women in the study were already aware of modern contraceptive methods, so obviously this was not associated with differences in subsequent contraceptive behavior. Approval of family planning and communication with husbands did help to explain subsequent contraceptive practice. Beliefs about child mortality were in the expected direction, with greater contraceptive practice rates among those who believed child mortality to be less today than thirty years ago. That this variable was not significant in the regression analysis--as it had been in the bivariate analysis--is at least partly due to a small but significant correlation with experience of child loss. Prior practice of reversible methods of family planning was significantly related to project contraception.

Service Inputs

Use of all five service input variables during the first three years of the project was related to the practice of family planning. Of special significance was the use of women's illness services, children's other services, and male motivational services. Note in table 6-1 that eight of the twenty variables were significant: age of mother and number of living children, number of children who died before the project, prior use of contraception, communication with husband, approval of family planning, and use of women's illness services, children's other services, and male motivational services.

To identify the balance of influences, we start with a hypothetical baseline population that is average in social status, in knowledge of modern contraception, in beliefs about child mortality, and in the use of women's other services and children's illness services. Further assume that the wives are under age 35, have no more than three living children, have had no child deaths, and are average in previous contraceptive use. The regression equation predicts that 9.8 percent of these baseline couples will become project contraceptive users without further project inputs.

Because the last three factors mentioned in the preceding paragraph were significant, different assumptions would alter the forecast of project contraceptive use indicated in table 6-2. For example, if interest is centered on women under age 35 with more than three living children and no previous experience of family planning, the table indicates an expected project use rate of 13.6 percent ($9.8 + 8.9 - 5.1$), not 9.8 percent.

The results of the regression analysis summarized in table 6-1 suggest that if, in addition to the foregoing baseline conditions, husbands and wives communicate about family planning through project interventions or otherwise, project use of family planning can be expected to increase 8.9 percent. When couples express approval of family planning, the use rate can be expected to increase another 12.1 percent. The service input effects summarized in table 6-3 would increase the use rate by over 25 percent.

Table 6-2. *Adjustment Factors for Significant Variables in Regression Analysis in Table 6-1*

<i>Variable</i>	<i>Level/category</i>	<i>Adjustment (percent)</i>
Number of living children and wife's age	≤ 3 and < 35	0.0
	≤ 3 and ≥ 35	-18.9
	> 3 and < 35	+ 8.9
	> 3 and ≥ 35	- 9.0
Number of child deaths	0	0.0
	1	- 3.0
	2	- 6.1
	> 3	- 9.2
Prior family planning use	None	- 5.1
	Traditional only	+ 3.3
	Modern	+11.8

Table 6-3. Summary of Effects on Contraceptive Use from Tables 6-1 and 6-2

Rate or variable	Effect on contraceptive use (percent)	Use rate (percent)
Baseline use rate		9.8
Talk with husband about family planning	+ 8.9	
Approval of family planning	+12.1	
Women's illness services in one year	+ 4.8	
Children's other services in one year	+10.5	
Male motivational services in one year	+10.2	
Modified use rate for one year of services		56.3
Modified use rate for two years of services, assuming linear effects (+25.5)		81.8

If all the listed effects were present, the rate of family planning use under the project would be expected to reach 56.3 percent, an increase of 46.5 percentage points from baseline conditions. Of the service variables, children's other services and male motivational services appear to be most important. Assuming linear effects, use of the three types of service in two years, not one, would add 25.5 percentage points to the rate of using family planning, bringing it to 81.8 percent.

The variables in this analysis explain about 24 percent of the variation in contraceptive practice. The unexplained variation could be attributed to variables not included or to nonlinear components or variables already included. Part of the unexplained variation could also be due to interaction between variables not considered.

Figure 6-1 shows the relations between contraceptive practice and a few of the explanatory variables. These relations are aggregate: no adjustments have been made for the influence of other variables. The three variables--number of children who died, use of male motivational services, and education of husband--seem to have fairly linear relations with contraceptive practice. The relations of women's illness services and children's other services are less linear; those of women's other services and children's illness services are far from linear, which may have influenced their not being significant in the regression.

Figure 6-1. *Bivariate Relations between Contraceptive Use and Selected Explanatory Variables*

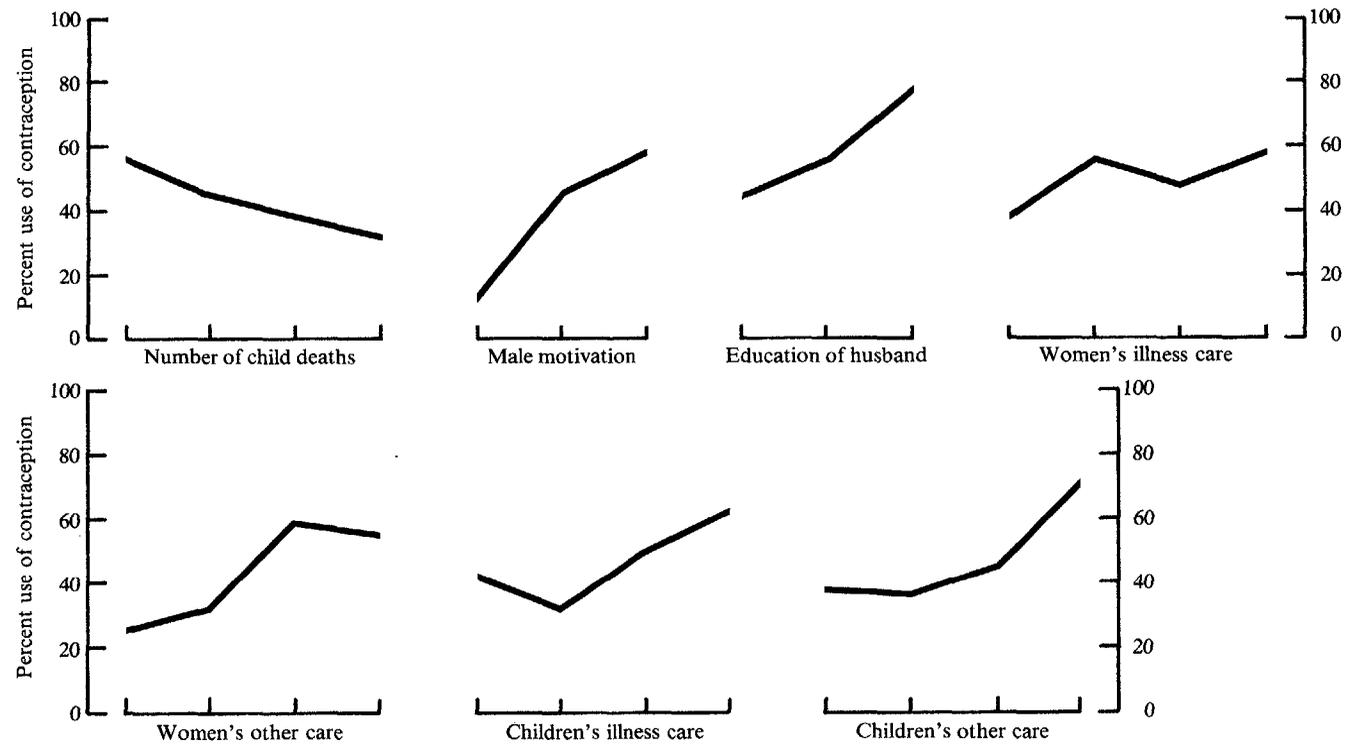


Table 6-4. Results of Multiple Regression Analysis Examining Volume of Service Contacts and Its Effect on Use or Nonuse of Family Planning at Any Time during Project (1969-73)

Independent variable	Regression coefficients and their levels of significance		
	Coefficient	t-value	Level of significance
Education of husband	.0337	2.1	< .05
Occupation of husband			
Labor	.0082	0.2	n.s.
Farming	.0543	1.3	n.s.
Other	*	*	*
Religion-caste			
Jat-Sikh	-.0800	1.8	n.s.
Scheduled Sikh	-.0474	1.1	n.s.
Other	*	*	*
Number of living children and wife's age			
≤ 3 and < 35	.1810	3.4	< .001
≤ 3 and ≥ 35	*	*	*
> 3 and < 35	.2568	4.4	< .001
> 3 and ≥ 35	.0885	1.7	n.s.
Number of child deaths	-.0234	1.6	n.s.
Awareness of modern contraception	-.0296	0.6	n.s.
Prior family planning use	.0704	3.5	< .001
Belief about child mortality	.0112	0.7	n.s.
Talk with husband	.0671	2.4	< .02
Attitude toward family planning			
Approve	.0799	2.1	< .05
Uncertain	*	*	*
Disapprove	.0307	0.8	n.s.
Service contacts (1969-73)			
Women's illness care	.0026	5.0	< .001
Women's other care	.0071	5.8	< .001
Children's illness care	.0012	2.7	< .01
Children's other care	.0008	4.8	< .001
Male motivation	-.0025	0.9	n.s.

$R^2 = 0.24$

* Suppressed category; effect included in constant term.
n.s. Not significant ($p > .05$).

Regression Analysis of Service Contacts and Use of Family Planning

A second regression analysis incorporated the same variables as the first, but services were expressed as the number of contacts during the project (table 6-4). Contraceptive use or nonuse during the project was again the dependent variable.

The variables concerning attitudes and beliefs, knowledge and practice, socioeconomic characteristics, and demographic factors in their relation to contraceptive use remained essentially the same as in the first regression--with the sign and size of the regression coefficients and the significance basically unchanged. Two variables lost their significance: the number of live-born children who died and the women who were over 35 and had more than three children.

The biggest differences between the two analyses were in the service input variables. In this second analysis, the measure of services was changed from the first in two ways: the number of service contacts was examined, not simply whether services were used in one or more years of the project; the use of services was considered during the whole project, not just the first three years. All women's and children's services had a significant and positive association with contraceptive use, but male motivation was not significantly related (and it changed signs). Other changes from the findings of the first regression (table 6-1) are in the significance and change in sign for children's illness services and the highly significant association of women's other services in the second regression.

The coefficients in the second regression are much smaller because service inputs were expressed by individual contacts, which were much more numerous. But the coefficients can still be interpreted as representing approximate increases in the percentage of contraceptive users in the population given an increased input of one unit (contact or visit) of service per woman. In this context one contact with women's other services is seen to have almost nine times the impact of one contact with children's other services; a visit for women's illness services is about twice as effective as a visit for child's illness services. But when the effect of services is examined in relation to the mean number of services received, the picture is somewhat different (table 6-5). If the coefficient for each service variable is multiplied by the mean number of service contacts, the effect of children's other services in the project is shown to be as strong as women's illness services, but still not as strong as wom-

Table 6-5. Mean Number of Service Contacts and Associated Regression Coefficients from Regression Analysis in Table 6-4

Service variable	Mean number of contacts (\bar{X})	Coefficients (B)	(B) \times (\bar{X}) $\times 100^a$	Beta coefficients
Women's illness care	18.1	.0026	4.7	0.1472
Women's other care	20.3	.0071	14.4	0.1729
Children's illness care	21.6	.0012	2.6	0.0866
Children's other care	60.3	.0008	4.8	0.0973

a. Estimated percentage increase in likelihood of family planning acceptance with average service utilization.

en's other services. Women's other services were associated with a 14.4 percent increase in the probability of accepting family planning, compared with an increase of somewhat less than 5 percent associated with women's illness and children's other services. In this case the relative importance of the variables in explaining differences in contraceptive use is about the same as the ranking of the *t* values (table 6-4) and the beta coefficients, normalized coefficients that take into account differences in standard deviations of the variables (see also table 6-5).

Five possible explanations for the differences between the two regressions are suggested:

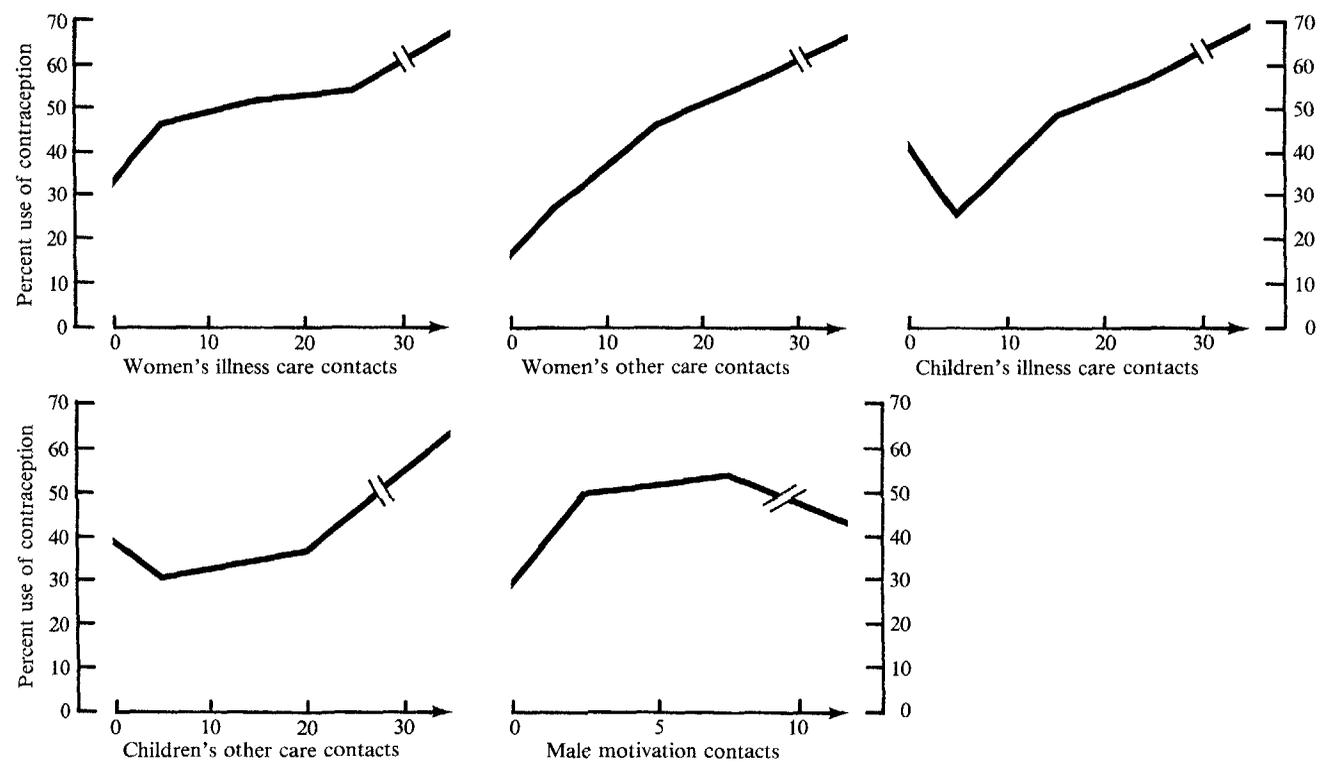
- Because most women received women's other services, the relatively simple indication of the use or nonuse of these services in the first regression obscured an effect that showed up strongly in the second. Apparently the frequency of contacts for women's other services (which included motivation to accept family planning) was important in initiating contraceptive use.
- The use of women's illness services was important no matter how these services were measured. Because illness is a random event and a visit for illness care is usually initiated by the patient, the availability and use of these services when needed seems to be as important as the frequency of their use.
- If it is assumed that a similar argument holds for children's illness services, the emergence of children's illness services

as an important explanatory variable in the second regression may be related to the longer duration in the second regression (1969-73) than in the first (1969-71). The association of children's illness services with the practice of family planning may have been greater in the later stages of the project, possibly because of improved service linkages. There may also have been a cumulative effect of these services or a lag between the use of these services and their effect (as postulated in our statement of the child-survival hypothesis; see chapter 1).

- Although still important in the second regression, children's other services had a relatively smaller effect than in the first regression. This difference is probably related to the very high frequency of contacts in the FPCC villages, a pattern strictly prescribed by the requirements of the overlapping nutrition study (see Kielmann and others 1983). The number of prescribed contacts was significantly smaller in FPWSCC villages, but coverage of children in any year by prescribed services was similar. Simple use or nonuse of services therefore was probably a more appropriate measure across all experimental groups providing child care.
- That male motivational services lost significance in the second regression may also be related to timing. Motivational contacts may be effective in the early stages of a project, when the number of possible acceptors is large. But as the number of candidates for ready recruitment falls, the marginal effort to get a new acceptor may greatly increase the motivational contacts needed to recruit new acceptors. This seems to be borne out by the bivariate analyses in figure 6-2; the figure shows a curvilinear relation with male motivation up to a maximum of five to ten contacts. The percentage of couples with eleven or more contacts who accepted family planning for the first time falls off.

All the bivariate analyses of service variables used in the second regression analysis are summarized in figure 6-2. The analyses are all highly significant, but as in the first regression, the assumption of linearity holds only for both kinds of women's service. Of special interest are the curves for children's services, which are remarkably similar to those of figure 6-1. Zero use of children's services was associated with a rate of contraceptive use that was artificially high. The distortion in curves resulted from including women from villages not receiving children's care. This introduced

Figure 6-2. *Bivariate Relations between Contraceptive Use and the Volume of Service Contacts*



an upward bias in the zero rates of contraceptive use--as demonstrated in bivariate analyses limited to data from villages with children's services, analyses that produced essentially linear curves.

Regression Analysis of Service Contacts and Duration of Contraceptive Use

The third regression analysis examined the relations of the twenty independent variables to the duration of use of modern contraceptives in the entire project period by those who accepted contraception (table 6-6); nonacceptors were excluded. The data were expressed as total days of use, whether continuous or interrupted by periods of nonuse, which provides a relatively broadly defined dependent variable. As in the second regression (table 6-4), services were defined as the number of service contacts received by a woman or her husband or children. The analysis included 559 women who practiced contraception during the project in villages receiving both health and family planning services, or twenty-nine fewer than were identified as users in the second regression (the definition of duration excluded women whose duration of use was not known). Table 6-6 summarizes the results of this analysis; figure 6-3 gives the results of bivariate analyses of the independent service variables and the dependent variables.

Among the predisposing variables found to be significantly associated with any use of family planning in the first two regressions, only prior use of contraceptives was found to relate significantly (and positively) to days of contraceptive use during the project. This suggests that the following factors contribute to starting contraception but are less important in maintaining it: age, parity, communication with husband, and approval of family planning. The only predisposing variable that was significant in this regression--but was not significant in the first two regressions--is occupation of husband. The occupation of farmer and (basically agricultural) laborer were positively associated with longer use of contraception.

Three of the five service variables were significantly associated with days of contraceptive use. But these results must be interpreted with care because the relations are not entirely linear (see figure 6-3). For women's illness care, the effect of these services on days of contraceptive use was positive, but children's illness care and women's other care had no effect. The other services were

Table 6-6. Results of Multiple Regression Analysis Examining Volume of Service Contacts in 1969-73 and Its Effect on Duration of Family Planning Use among All Project Users

Independent variable	Regression coefficients and their levels of significance		
	Coefficient	t-value	Level of significance
Education of husband	36.53	1.4	n.s.
Occupation of husband			
Labor	153.78	2.3	< .05
Farming	165.65	2.4	< .02
Other	*	*	*
Religion-caste			
Jat-Sikh	39.87	0.5	n.s.
Scheduled Sikh	-52.46	0.7	n.s.
Other	*	*	*
Number of living children and wife's age			
≤ 3 and < 35	-68.58	0.5	n.s.
≤ 3 and ≥ 35	*	*	*
> 3 and < 35	124.82	0.9	n.s.
> 3 and ≥ 35	223.11	1.5	n.s.
Number of child deaths	-15.40	0.6	n.s.
Awareness of modern contraception	**	**	**
Prior family planning use	98.55	3.1	< .005
Belief about child mortality	-15.92	0.5	n.s.
Talk with husband	21.00	0.4	n.s.
Attitude toward family planning			
Approve	124.41	1.7	n.s.
Uncertain	*	*	*
Disapprove	121.22	1.6	n.s.
Service contacts (1969-73)			
Women's illness care	1.83	2.2	< .05
Women's other care	-3.88	1.7	n.s.
Children's illness care	0.51	0.8	n.s.
Children's other care	-1.03	3.9	< .001
Male motivation	-21.82	4.4	< .001

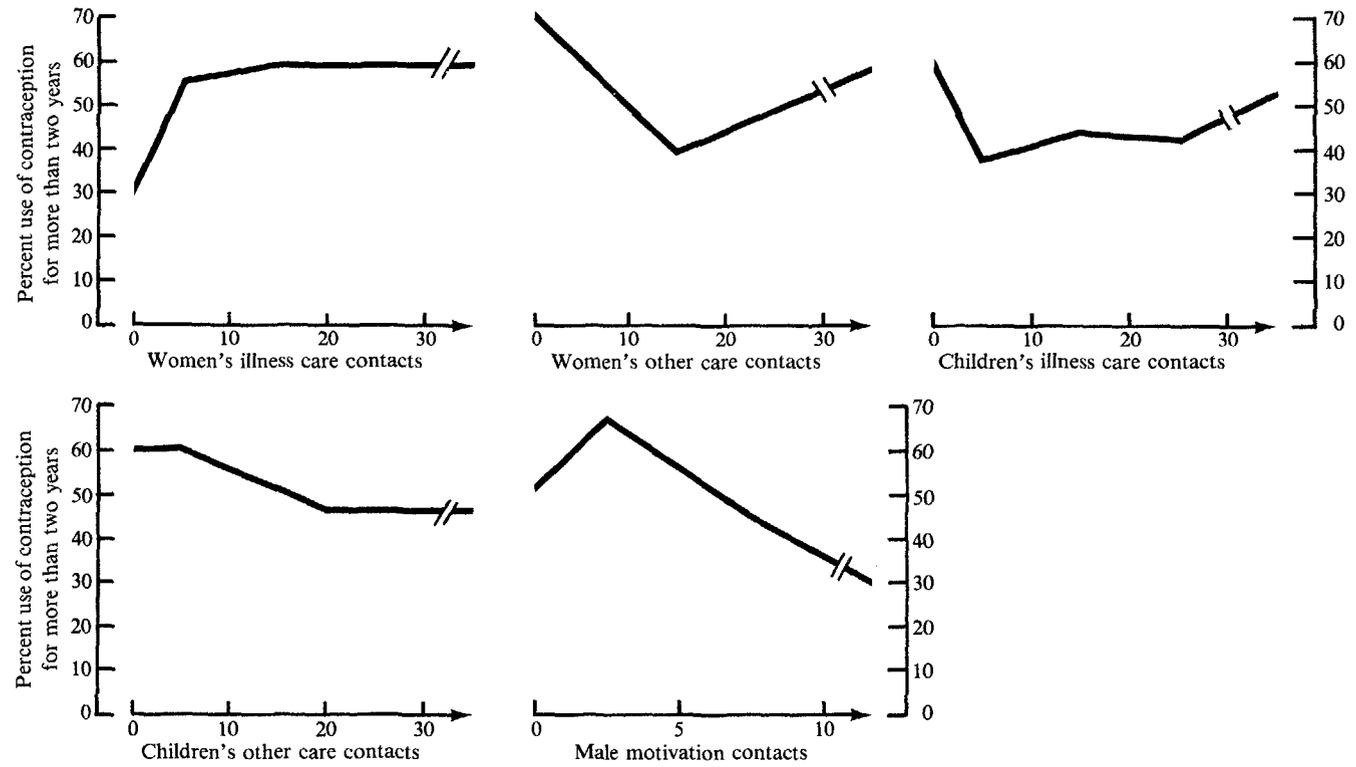
$R^2 = 0.23$

* Suppressed category; effect included in constant term.

** t-value or tolerance level insufficient to enter regression.

n.s. Not significant ($p > .05$).

Figure 6-3. *Bivariate Relations between Duration of Contraceptive Use and Volume of Service Contacts*



negatively associated with days of contraceptive use, a fact confirmed by the slope of the curves in figure 6-3 for children's other care and male motivational contacts. The following explanations for these relations are possible:

- The tendency among women who used contraceptives over longer periods is to have used services for women's illness care at least once. But the frequency of this use does not have an important effect on duration of use.
- Among women who were sterilized, the number of contacts for women's other care was reduced because we did not monitor menstrual cycles after the women were sterilized. Women sterilized early in the project would have a high number of days of contraceptive use but fewer contacts with women's other care. This may be the principal explanation for the nonsignificant and negative association (and for the "U" shape of the curve) for women's other care contacts in figure 6-3. If women with fewer than ten contacts are taken out, the relation between volume of other care and days of family planning use becomes positive and essentially linear.
- Children's illness contacts--which are not significantly related to the dependent variable in this regression--would also become more linear, and probably significantly and positively related, if we excluded from the analysis women whose children had no access to child care (say, women in the FPWS villages).
- The cause of the negative relation between children's other care and days of family planning use may be intentional or unintentional pregnancies that interrupt contraceptive use by women who therefore had higher use of other care services for their additional children.
- The strong negative association between male motivational contacts and days of family planning use can be explained by the same phenomenon postulated in the second regression: the acceptance of family planning was low among couples who had a large number of contacts either because of inherent greater resistance or because they delayed their acceptance until the end of the project. The finding that the number of contacts goes up as the average duration of use gets shorter may reflect the poorer chance that late acceptors would have of using contraceptives for extended periods. It may also be that male motivation workers tended to promote the use of condoms, which had an average

duration of use after first acceptance that was shorter than that of other temporary methods (twelve months compared with nineteen).

Regression Analysis within Experimental Groups

In planning the regressions we recognized that the absence of a service in an experimental group would tend to make the relation between services (especially children's services) and family planning practice nonlinear. For example, all users and nonusers of family planning in FPWS villages would have received essentially no child care services for their children from project sources. To eliminate this effect of the availability of services on the use of these services, we repeated the regression analyses separately for each experimental group.

The two regressions having use or nonuse of family planning as the dependent variable gave relatively similar results, except that the findings were somewhat more significant for service contact data from the entire project period (1969-73) than from 1969-71 alone. The regression results based on the first set of data are therefore presented to illustrate the intergroup differences (table 6-7).

Predisposing Factors

In the earlier regressions, education of husband was shown to be a moderately significant determinant of family planning practice. In the regressions shown in table 6-7, this influence was essentially confined to the FPCC villages, possibly suggesting that education had been offset as a predisposing factor in FPWSCC and FPWS villages by attempts to recruit acceptors from all educational strata, but that in FPCC villages the shorter period of family planning efforts had not achieved the same degree of equity by the end of the project.

It appears from the results that there is significant (synergistic) interaction between the husband's education and the use of services for child care in influencing acceptance of family planning. Effective use of child care is always facilitated by parents' education, and in FPCC villages the husbands' education seems to have interacted with the provision of child care to produce a significant effect on family planning.

Younger women (under age 35) with more than three children were more likely to be family planning users in both FPWSCC and FPWS villages, but these relations were significant only in FPWS villages.

Table 6-7. Results of Multiple Regression Analyses for Experimental Groups of Villages Examining Effect of Volume of Service Contacts on Use or Nonuse of Family Planning at Any Time during Project (1969-73)

Independent variable	Coefficients, F-values and levels of significance for each experimental group								
	FPWSCC			FPWS			FPCC		
	Coefficient	F-value	Significance	Coefficient	F-value	Significance	Coefficient	F-value	Significance
Education of husband	.0298	1.56	n.s.	-.0194	0.36	n.s.	.1004	14.53	<.001
Occupation of husband									
Labor	**	-	-	.0687	0.70	n.s.	-.0576	0.98	n.s.
Farming	.0399	0.42	n.s.	-.0319	0.14	n.s.	.0405	0.37	n.s.
Other	*	*	*	*	*	*	*	*	*
Religion-caste									
Jat-Sikh	-.0317	0.17	n.s.	-.0231	0.05	n.s.	-.0495	0.45	n.s.
Scheduled Sikh	-.0137	0.04	n.s.	-.0647	0.48	n.s.	-.0442	0.44	n.s.
Other	*	*	*	*	*	*	*	*	*
Number of living children and wife's age									
≤ 3 and < 35	.1344	2.64	n.s.	.3332	8.63	<.01	.0250	0.18	n.s.
≤ 3 and ≥ 35	*	*	*	*	*	*	*	*	*
> 3 and < 35	.2299	6.09	<.05	.4790	15.20	<.001	.0537	0.54	n.s.
> 3 and ≥ 35	.1222	2.35	n.s.	.1701	2.39	n.s.	**	-	-

Number of child deaths	-.0031	0.02	n.s.	-.0592	4.48	< .05	-.0177	0.58	n.s.
Awareness of modern contraception	.0607	0.63	n.s.	-.2056	3.41	n.s.	**	-	-
Prior family planning use	.0969	9.07	< .01	.0705	3.66	n.s.	**	-	-
Belief about child mortality	.0270	0.88	n.s.	-.0442	1.77	n.s.	.0401	2.37	n.s.
Talk with husband	.0890	3.95	< .05	.1155	4.16	< .05	.0615	1.86	n.s.
Attitude toward family planning									
Approve	.0892	2.51	n.s.	.0651	0.66	n.s.	.1095	2.96	n.s.
Uncertain	*	*	*	*	*	*	*	*	*
Disapprove	-.0315	0.29	n.s.	.0183	0.05	n.s.	.1135	2.42	n.s.
Service contacts									
Women's illness care	.0013	2.66	n.s.	.0019	4.68	< .05	.0253	10.18	< .01
Women's other care	.0057	9.51	< .01	.0017	0.53	n.s.	.0076	6.91	< .01
Children's illness care	.0015	4.27	< .05	**	-	-	-.0002	0.09	n.s.
Children's other care	.0024	23.04	< .001	.1840	0.61	n.s.	.0013	28.90	< .001
Male motivation	.0110	2.95	n.s.	-.0069	1.98	n.s.	-.0072	2.08	n.s.
R^2		0.34			0.19			0.34	
R^2 contributed by service contacts		0.24			0.05			0.25	
Constant	-0.2543			0.4112			-0.1161		

* Suppressed category; effect included in constant term.

** Did not enter the regression.

n.s. Not significant ($p > .05$).

Age and parity had little influence, if any, on family planning practice in FPCC villages.

It appears that there is some interaction between the kind of services and the age and parity of the client. Women's services, if provided as intensively as in FPWS villages, encourage young women to accept family planning irrespective of the number of children they have. Women's services, if less intensive and combined with child care, are effective for family planning acceptance for women under age 35 who have three or more children.

A very interesting finding that lends support to the child-survival hypothesis and to the inclusion of children's services in integrated health and family planning programs is the significant association between the number of a woman's children who have died and the practice of family planning in FPWS villages but not in child care (FPWSCC and FPCC) villages. Apparently child care services reduce the effect of prior child deaths on a woman's willingness to practice family planning.

Prior use of contraceptives was a significant predisposing factor only in FPWSCC villages. The greater intensity of women's or children's services in the other villages may have made this prior use less important.

Talking with husbands about family planning was significant only in villages with women's services (FPWSCC and FPWS), suggesting a possible interaction between this variable and the use of women's services.

Women's illness services were important when women's services were provided alone in FPWS villages. (A similar association in FPCC villages was due to the use of these illness services as a way to maintain rapport with family planning users, since such services were not generally available to all women as a matter of project design.)

Women's other services were important in villages where they were provided along with child care (FPWSCC and FPCC).

Children's illness services were important in FPWSCC villages, where they were provided at the initiative of families. Most of these illness contacts in FPCC villages were combined with other services, so the children's illness services by themselves did not seem to be important in the FPCC villages. Children's other services are one of the most important services available, as shown by their significance in both FPWSCC and FPCC villages.

These individual regressions do not change the conclusions from the earlier aggregate regressions. Nor do these results show an important interaction between individual services. But there is some

evidence of interaction of such services as women's care and child care with such predisposing variables as a woman's age and parity and a husband's education.

Summary

Three-way analyses examining the relations between the use of health services, the practice of family planning, and attitudes, beliefs, and socioeconomic factors suggest that health services had a strong and positive impact on family planning, irrespective of the attitudes, beliefs, and socioeconomic characteristics of women. When these other factors affect the practice of family planning, their effects and those of health services generally are additive.

Multiple regression analyses also demonstrate that the association between the practice of family planning and the use of health services remains strong even when predisposing factors are included in the analyses. Children's other care tended to produce the strongest and most consistent effect on the use of family planning. But women's illness care also had a strong effect when women's services were provided without children's services. Women's other care services tended to have their greatest effect when combined with children's other care. The duration of family planning use was less clearly associated with health services than was the simple use or nonuse of family planning.

Chapter 7

Determinants of Fertility and Its Decline

Rashid Faruqee and R. S. S. Sarma

The goal of integrated health and family planning programs is to influence mortality and fertility. At Narangwal, however, the short period of project activities and the fluctuation in fertility rates made it impossible to establish the link between project components and a decline in fertility. Some ideas nevertheless emerged about possible interactions of fertility with interventions, socioeconomic factors, and demographic and biological variables. This chapter first presents the profile of fertility in Narangwal villages at the beginning of the project and the relations between fertility and socioeconomic characteristics of households. It next presents data on how the fertility profile changed during the project and on the interaction of contraceptive use with socioeconomic, demographic, and biological variables, such as parity and the interval since the last birth. It then describes the apparent effect of different service packages on fertility.

Fertility in the Punjab

Crude birth rates and age-specific marital fertility have been declining for some time in rural Punjab and the Narangwal study area. According to official vital statistics, which are generally assumed to be underreported, the crude birth rate in Punjab fell from 45.5 per 1,000 in 1959 to 32.1 per 1,000 in 1969. In Ludhiana District, the fall was from 50 to 34.6 per 1,000 in the same period. (These esti-

mates are based on two censuses--in 1961 and 1971--and on vital statistics registration for the area.)

A detailed pregnancy history of each married woman in the Narangwal study area was compiled from a cross-sectional survey conducted in 1968-69 in twenty-two villages. The survey recorded pregnancies of women then 15-49 years old, the date of termination of each pregnancy, the outcome of each pregnancy, the sex of the child, and, if the child died, the date of death.

Analysis of age-specific marital fertility from retrospective pregnancy histories shows that from 1949 to 1968 there was a progressive decline in fertility among women over age 25. That decline was presumably related to increasing practice of family planning to limit rather than space births. There also was an increase in fertility in the 15-24 age group during this period, even though age at marriage increased. A possible explanation may be that women who married later seemed to have more children in the first five years of marriage than those who married early because of a combination of factors. The entire 15-29 age group showed an increase in the distribution of women married at older and more fecund ages. In addition, the younger women in the 15-19 and 20-24 age groups in the later cohorts, especially in 1964-68, may have had better recall of their live births (which, chances are, survived more than those of women who were 15-19 and 20-24 during 1949-53). Analyses by caste showed that this pattern of decreased fertility at older ages and of increased fertility at intermediate ages was limited to (high-caste) Jat-Sikhs (table 7-1).

Trends in women's age at marriage and the subsequent ceremony at the start of cohabitation (*muklawā*) paralleled past declines in crude birth rates and age-specific marital fertility. Much of the decline in the Punjab birth rate has been attributed to rising age at cohabitation (Wyon and Gordon 1971). The distinction between the age at marriage and the age at *muklawā* is important in Punjab. Marriage traditionally was at a very young age, particularly for girls, but the practice was tempered by the common observance of a delay between marriage and its consummation until closer to the start of menstruation.

Table 7-2 presents data on the trend of the mean age at marriage and the age at consummation. The mean age at marriage rose from nearly 14 years in the early 1940s to 19 years in the 1970s. There was a corresponding change in the age at consummation from nearly 16 years to 19 years. In a population such as that at Narangwal, where childbearing begins soon after start of cohabitation, a delay of three years presumably had a considerable effect on the birth rate.

Table 7-1. Age-Specific, Five-Year Marital Fertility Rates, by Major Caste Group, Narangwal Study Villages, 1949-68

Caste and five-year period	Age group of married women							
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
<i>Jat-Sikh</i>								
1949-53	27.5	203.7	314.4	317.2	266.9	-	-	-
1954-58	38.7	225.6	307.1	297.7	229.9	190.7	-	-
1959-63	33.0	236.1	307.2	286.3	209.2	124.2	42.4	-
1964-68	83.3	264.0	309.0	267.5	196.3	118.1	35.1	25.4
<i>Scheduled Sikh</i>								
1949-53	34.6	229.0	341.7	326.7	282.1	-	-	-
1954-58	70.0	264.3	349.2	346.0	279.8	179.5	-	-
1959-63	53.3	284.3	363.9	331.3	292.3	178.7	102.6	-
1964-68	113.6	243.6	369.2	328.4	261.4	174.3	65.0	8.5

- Not applicable or not available.

Note: Fertility rates are for live births per 1,000 married women in five-year age groups between 10-49 years for whom pregnancy histories are available ($n = 5,126$).

Fertility Profile before the Project

The analysis was based on 3,280 married women from the five groups of experimental villages. A socioeconomic survey, done at the same time as the pregnancy history, provided information on income, education, occupation, religion-caste, and current age of wife and husband. Because there was little variation in the wife's education (generally none) and occupation (household work), we used husband's education and occupation for this analysis. Detailed characteristics of the five clusters of villages were essentially similar, except for differences described in chapter 1, especially in the family planning education group (FPED), which was older, more educated, of higher caste, and had a lower ratio of women to men.

The number of children born alive was a measure of fertility. Two other demographic variables measured were fetal death rate and child loss. The fetal death rate was measured as the proportion of pregnancies that ended in fetal death; child loss as the proportion of children who were born alive but were dead at the time of the survey.

Table 7-3 presents the aggregate picture of fertility, fetal death, and child loss among women in the Narangwal study area. Fetal deaths were probably underreported: 5.5 percent of all pregnancies

Table 7-2. *Women's Age at Marriage and Age at Cohabitation, by Marriage Cohort, Narangwal Study Villages*

<i>Marriage cohort (year of marriage)</i>	<i>Number of women</i>	<i>Mean age at marriage</i>	<i>Mean age at cohabitation</i>
Before 1938	290	11.9	14.9
1939-1943	384	13.9	15.8
1944-1948	592	14.8	15.9
1949-1953	575	15.0	15.8
1954-1958	768	16.0	16.4
1959-1963	742	16.8	17.0
1964-1968	884	18.0	18.1
1969-1973	517	19.0	19.1

Note: The age data relate only to "eligible" women; that is, to women married once and between 15-49 years of age during the Narangwal Population Project for whom pregnancy histories and other relevant data are available ($n = 4,752$).

Table 7-3. *Mean Number of Live Births per Married Woman, Fetal Death Rate, and Child Loss Rate, by Age of Wife*

<i>Age group</i>	<i>Married women</i>		<i>Mean no. of live births</i>	<i>Mean no. of fetal deaths</i>	<i>Fetal death rate^a</i>	<i>Mean no. of live-born dead</i>	<i>Child loss rate^b</i>
	<i>No.</i>	<i>Percent</i>					
15-19	197	6.0	0.76	0.12	13.6	0.13	17.1
20-24	636	19.4	1.67	0.16	8.7	0.25	15.0
25-29	667	20.4	3.35	0.26	7.2	0.56	16.7
30-34	598	18.2	4.74	0.25	5.0	0.94	19.8
35-39	502	15.3	5.72	0.26	4.4	1.27	22.2
40-44	428	13.1	6.32	0.30	4.5	1.37	21.7
45-49	250	7.6	6.46	0.24	3.6	1.60	24.8
All ages	3,278 ^c	100.0	4.11	0.24	5.5	0.84	20.4

a. Percent of pregnancies terminated as fetal deaths.

b. Percent of children born alive who died by the time of survey.

c. Two women were younger than age 15.

is much less than the 10 to 15 percent usually reported. Lapses of memory probably explain this and the decrease of reported fetal deaths with age: from 13.6 percent for women age 15-19 to 3.6 percent for women age 45-49. The invariance of the child loss rate across age groups, around 20 percent, may mean that the underreporting caused by problems of recall was more than offset by the rapid decrease in child mortality.

Religion-Caste

The most important variable indicating social status in rural Punjab is religion-caste. Eighty-four percent of the population were landowning Jat-Sikhs (high-caste) and scheduled Sikhs (among the lowest castes). The remaining 16 percent of the population were non-Jat Sikhs of high caste, Hindus of all castes, and those of other religions. They represented a diverse range of socioeconomic levels.

The aggregate fertility of scheduled Sikhs was 4.34 live births per married woman; that of Jat-Sikhs 3.92 live births (table 7-4). For women age 15-24, the differences in live births between scheduled Sikhs and Jat-Sikhs were less marked than at later ages. The differences in fertility between the two groups could not be attributed to differences in ages at marriage, which were essentially the same. Because the age distribution of women in the three caste groups differed, the mean number of live births was adjusted by using the

Table 7-4. *Mean Number of Live Births per Married Woman, by Age and Religion-Caste*

Age group	Religion-caste		
	Jat-Sikh	Scheduled Sikh	Other
15-19	0.75	0.84	0.57
20-24	1.44	1.88	1.74
25-29	3.00	4.00	3.18
30-34	4.35	5.43	4.65
35-39	5.21	6.42	6.21
40-44	5.95	6.94	6.44
45-49	5.80	7.16	7.20
Total, adjusted for age differences	3.74	4.65	4.10

age distribution of all women as the standard: to 3.74 for Jat-Sikhs, to 4.65 for scheduled Sikhs, and to 4.10 for others. Differences in fetal deaths were small.

The higher fertility of scheduled Sikhs is balanced by higher mortality, so that there were equal numbers of surviving children. In each age group the mean number of child deaths was higher for scheduled Sikhs than for Jat-Sikhs (the overall child death rate was twice as high), with others in between.

Education of Husband

About 59 percent of the husbands had no schooling; 11.6 percent had passed grades 1-5; 25.6 percent had passed grades 6-10; 3.6 percent had higher education.

As the education of husbands increased, the fertility of married women in almost all age groups declined. The mean number of live births for women whose husbands had no education was 4.7. With 1-5 years of education this came down to 4.1 live births, with 6-10 years of education to 3.3, and with more education to 3. The relation holds when adjustment is made for age differences, but the differences are narrower (table 7-5).

Table 7-5. *Mean Number of Live Births per Married Woman, by Age of Wife and Education of Husband*

Age group	Education of husband (grades passed)			
	0	1-5	6-10	11+
15-19	0.91	0.50	0.71	0.80
20-24	1.95	1.59	1.51	1.54
25-29	3.69	3.20	3.11	2.74
30-34	4.94	5.03	4.18	4.04
35-39	5.96	5.29	5.54	4.75
40-44	6.54	6.47	5.78	4.57
45-49	6.41	7.70	6.30	-
Total, adjusted for age differences	4.34	4.15	3.81	3.31 ^a

- Not applicable or not available.

a. For the purpose of age adjustment, mean number for age group 40-44 was treated as the mean for ages 40 and over.

The link between education of husband and fetal death rate is less clear-cut. For women over age 35, there was a problem in recall, except for those whose husbands had higher education. Child loss, on the other hand, varied greatly with education. The rate of child loss in the lowest educational group was about two and a half times that in the highest educational group. Differences in child loss offset differences in live births, so that the mean number of surviving children in the different educational groups ranged from 3.4 to 3.0. The higher fertility of lower educational groups thus compensated for the higher mortality of their children.

Occupation of Husband

In the study villages, 41.4 percent of husbands were landowning farmers, 25 percent worked as farm laborers (which includes tending cattle), and 15 percent were in services, working for government or in private business. Farmers had high income and some education; those in services had more education but less income; laborers had low income and little education. The fewest live births were reported for women whose husbands were in services, perhaps indicating that education is more important than income in affecting fertility. The highest fertility was among laborers; farmers and other groups were in between.

The highest fetal death rate was reported in the service group, presumably because recall was better in the more educated group. Child loss was highest among laborers' families. As with husband's education, groups that had higher child mortality had higher fertility, so that the surviving number of children was about the same in the different groups.

Income

Detailed information on income was obtained only on the second cross-sectional survey. Thus, families interviewed on the first survey but not the second were excluded from the analysis of births by income. The average number of live births for married women decreased with increasing income: from 4.9 to 4.1. The difference between the highest income group and the lowest income group was significant; other differences were not. This fits with other data that show income to be less important as a correlate of fertility than education and some other social variables.

Fertility-Related Attitudes of Narangwal Wives

Among the many variables that were simultaneously measured at Narangwal, a special effort was made to ascertain attitudes about family planning and beliefs about child survival. We had expected that these attitude surveys would provide measurable indices of the motivational determinants underlying fertility. Considerable effort went into measuring attitude change through cross-sectional surveys of some 2,000 women in study villages in 1969 and again in 1971. A third survey in 1974 had just started when the project ended.

Preliminary analyses showed that the variables which seemed most promising for detailed analysis were ideal family size, ideal number of sons and daughters, and a desire for more children. Ideal family size and composition were compared with achievements and reproductive intentions. The preferred family size of Narangwal women was measured in responses to the question: "How many children (sons and daughters) should a family like yours have?" Ninety percent of the respondents wanted between two and four children, and half considered two sons and one daughter to be ideal.

Evidence of the preference for sons was exhibited in several ways. For women 25-29 years old, the number of living daughters generally exceeded their stated ideal number of daughters (table 7-6). For women 30-34 years old, the number of living children exceeded the stated ideal family size. It was not until women were 35-39 years old that the average number of living sons exceeded the stated ideal. With sons and daughters considered together, half of all women did not achieve their stated ideal number of sons and daughters until they had four living children. With five living children, four-fifths of the women had achieved the ideal number of both sexes. Because two sons and one daughter were typically considered ideal, there was a reasonable likelihood of achieving an excess of daughters in relation to sons, thereby producing a revision in expectations. As views about ideal family composition changed, there was a slight tendency to reduce the ideal number of sons and to increase the ideal number of daughters.

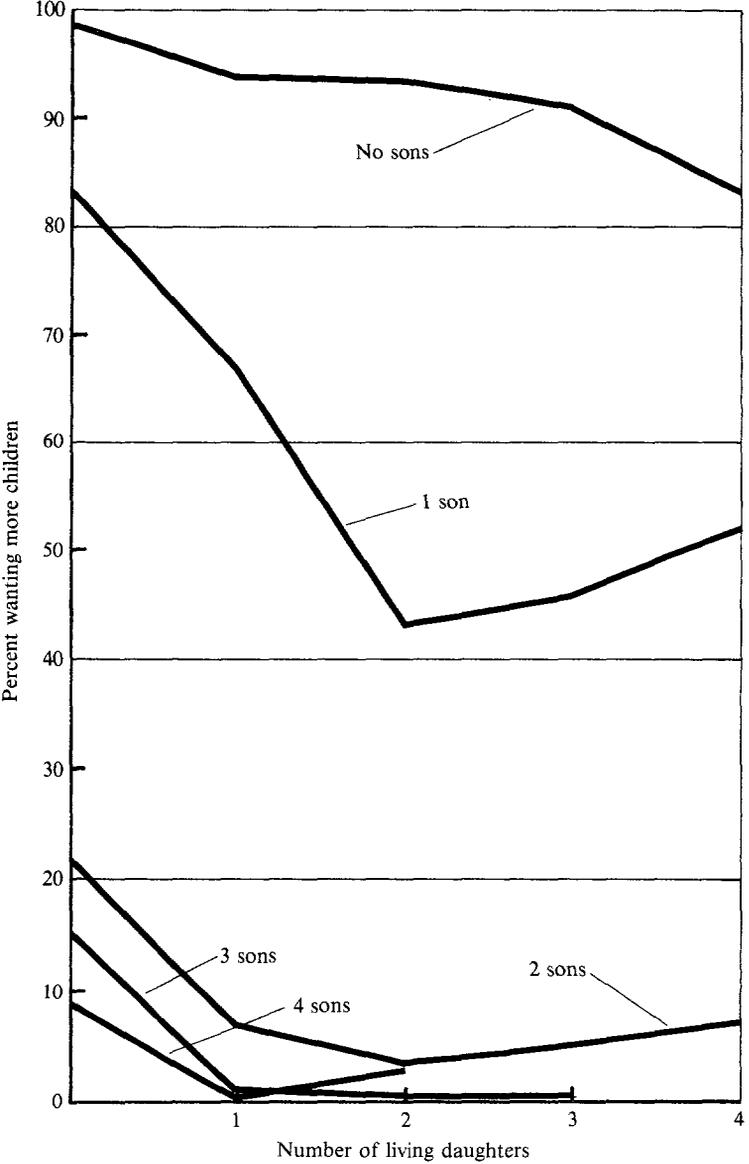
Analysis of data from the first attitude and belief survey suggested several influences on the individual's desire to have children. In particular, a woman's age, number of living children, number of living sons, and number of sons relative to number of daughters appear to be important indicators of a wife's desire for additional children.

Table 7-6. Comparison of Average Number of Surviving Children with Average Number of Children Desired by Continuously Married Women at Original and Reinterview, by Sex of Child and Age Cohort of Wife

Wife's age at first interview (c. 1969) and average number of children achieved and desired	First interview			Reinterview (c. 1971)		
	Sons	Daughters	Children	Sons	Daughters	Children
15-19						
Achieved	0.35	0.28	0.63	0.79	0.62	1.41
Desired	1.90	1.08	2.93	1.97	1.16	3.05
20-24						
Achieved	0.80	0.71	1.51	1.24	1.00	2.24
Desired	1.94	1.09	3.00	1.99	1.19	3.15
25-29						
Achieved	1.48	1.31	2.78	1.76	1.55	3.31
Desired	2.04	1.10	3.14	2.06	1.22	3.25
30-34						
Achieved	2.05	1.72	3.77	2.21	1.90	4.11
Desired	2.17	1.17	3.31	2.10	1.29	3.38
35-39						
Achieved	2.53	2.15	4.68	2.62	2.20	4.84
Desired	2.15	1.18	3.34	2.17	1.30	3.42
40-44						
Achieved	2.74	2.38	5.11	2.75	2.37	5.11
Desired	2.19	1.22	3.40	2.17	1.32	3.47
45-49						
Achieved	2.82	2.34	5.17	2.85	2.32	5.18
Desired	2.18	1.30	3.48	2.14	1.26	3.36
Total for all women	1,492	1,490	1,765	1,492	1,490	1,765

Wives' responses to the question: "Do you want to have more children?" were compared with information on the number of living children relative to the perceived ideal number. The results showed a poor correspondence between ideal family size and reproductive intentions. There were always more women who said that they wanted no more children than those who had reached their ideal family size or ideal number of surviving sons and daughters. Aggregate inconsis-

Figure 7-1. *Percent of Wives Age 15-39 Wanting More Children, by Number of Living Daughters and Sons*



tencies between intentions and ideal family size were greatest at parity three: only 10 percent of parity-three women had reached ideal family size, yet 7.6 percent of them wanted no more children.

When the relation between ideal family size and the desire to have more children was examined by the sex of surviving children, it was found that 93 percent of the women who had two living sons said they wanted no more children. The number of living daughters in the family did not have nearly the same influence on the stated desire for additional children. Figure 7-1 shows the percentage of women wanting more children in relation to the number of living sons and daughters in the family at the time of the first interview. About nine of ten families with no sons, regardless of the number of daughters in the family, wanted more children. In contrast, only about one family in twenty with two sons wanted more children, if there was at least one daughter.

Depending on the number of living daughters, the utility of having additional births dropped considerably when there was at least one living son. For example, figure 7-1 shows that women with one son and several daughters tended to favor family limitation, even though the ideal second son had not been born. In other words, the risk of yet another daughter outweighed the uncertain prospect of having a desired son instead.

In summary, a wife's desires for children were related to the size and sex composition of families. The most consistent finding is the great importance of sons and the lesser importance of daughters in fertility decisions of this sample of rural Punjabi wives.

Multivariate Analysis

A linear regression model was used to study the relative importance of socioeconomic, demographic, and attitudinal factors in explaining variation in the aggregate number of live births at the beginning of the project. In this analysis, based on 1,721 women for whom there was information on income, there are eleven independent variables, with the cumulative number of live births as the dependent variable (table 7-7). Since age was most important in explaining variation, we subdivided the sample into three broad categories: under 25, 25-34, and 35 and over. These background variables explained only a small amount of the variation in live births: 9.1 percent for those under age 25, 18 percent for those age 25-34, and 12.5 percent for those age 35 and over. The low R^2 is comparable to

Table 7-7. Regression Coefficients and Their Levels of Significance

Independent variable	Age of wife								
	25			25-34			35+		
	Coefficient	t-value	Level of significance	Coefficient	t-value	Level of significance	Coefficient	t-value	Level of significance
Religion-Caste									
Jat-Sikh	-0.0062	0.03	n.s.	-0.8261	3.10	0.003	-1.1493	3.34	0.001
Scheduled Sikh	*	*	*	*	*	*	*	*	*
Other	0.1957	0.95	n.s.	0.4999	2.08	0.040	0.5110	1.71	0.090
Education of husband	-0.1021	1.49	n.s.	-0.1409	1.77	0.090	0.0180	0.15	n.s.
Occupation of husband									
Farming	-0.0705	0.37	n.s.	0.6974	3.25	0.002	0.5468	1.87	0.060
Labor	0.1025	0.57	n.s.	-0.0084	0.05	n.s.	-0.1259	0.47	n.s.
Other	*	*	*	*	*	*	*	*	*
	0.0754	0.615	n.s.	-0.0536	0.43	n.s.	0.0473	0.29	n.s.

Proportion of children live-born dead	1.0551	3.87	<0.001	2.1954	6.09	<0.001	2.3841	4.60	0.001
Awareness of modern contraception	0.3244	1.45	n.s.	0.3050	0.86	n.s.	0.4345	1.05	n.s.
Attitude toward family planning									
Approve	0.4358	2.58	0.010	0.6659	3.19	0.002	0.4372	1.74	0.090
Disapprove	0.4801	2.62	0.009	0.8889	3.92	<0.001	0.7835	2.85	0.008
Uncertain	*	*	*	*	*	*	*	*	*
Belief about child survival/ mortality	0.1231	1.53	n.s.	-0.0419	0.48	n.s.	-0.0300	0.27	n.s.
		$R^2 = .091$			$R^2 = .180$			$R^2 = .125$	

* Suppressed category.

n.s. Not significant.

that found in other studies that do not consider direct determinants of fertility.

Other important variables are child loss, membership in Jat-Sikh and farming groups, and approval or disapproval of family planning. The positive association between fertility and child loss can be explained in part by the general finding that mortality increases directly with fertility. Higher mortality may lead to higher fertility by, say, shortening lactational amenorrhea. Membership in the Jat-Sikh group was strongly associated with lower fertility. This is significant only at higher ages, which implies that the lower fertility of this caste group is related to less child loss. An earlier association with occupation seemed to be washed out in a multivariate framework, perhaps because of multicollinearity.

The two indicators of attitudes approving family planning are positively associated with fertility, especially when those who approved and who disapproved were compared with those who were uncertain, who were consistently the most negative. The results indicate that both approval and disapproval of family planning were positively associated with the number of live births. Disapproval obviously would lead to less contraceptive practice. In the case of approval, the association may have reflected mainly a response to fertility, since women would be motivated to practice contraception only after they reached their desired number of children.

Although child loss was a significant variable in almost all age groups, the belief about child survival was not. In other words, once the effect of mortality was controlled in the analysis, there was little additional effect from perceptions about mortality that would explain variations in aggregate fertility. When other variables were controlled, awareness of modern contraception explained none of the variation in aggregate fertility. Education of husband, which had been a significant correlate of fertility, also was not significant in this regression.

Changes in Fertility during the Project

Fertility can be measured by the number of live births, by the pregnancy rate, by closed and open birth intervals, and by changes in the probability of birth during the program. This analysis used a dichotomous variable--whether a couple had a live birth during a calendar year--as the dependent variable. A dichotomous variable

was also used to indicate whether the couple had used contraception in the previous year.

The following variables were included in this analysis. The dependent variable was occurrence or nonoccurrence of live births to a couple in a calendar year. The explanatory variables were:

- Use or nonuse of family planning in previous calendar year
- Time since last live birth before beginning of calendar year (or since marriage)
- Number of live births at the end of the preceding calendar year (previous parity)
- Religion-caste (two dummy variables designating membership or nonmembership in the Jat-Sikh and scheduled Sikh groups)
- Education of husband (grades passed)
- Occupation of husband (three dummy variables designating membership or nonmembership in three groups: farming, labor, and services).

The cases in the analysis are currently married women 15-44 years old who lived in experimental villages until 1973 and for whom pregnancy histories were available. The villages are those that offered family planning services: eight in 1970, eleven in 1971, and fifteen in 1972. We analyzed births in 1971, 1972, and 1973 separately. Corresponding to these births, we examined the practice of contraception in the preceding years, 1970, 1971, and 1972. Age groups of women were introduced separately for 1971, 1972, and 1973. The numbers of women in the analysis for the three years were 2,398, 2,330, and 2,262.

The focus of this analysis is to observe the effect of contraceptive practice on the probability of births during the project. Since this effect is bound to interact with socioeconomic, demographic, and biological variables, we have included those in our analysis. The link between fertility and family planning use helps in understanding the differences in births that can be ascribed to the use of contraceptives from project services. We regarded couples using traditional and indigenous methods during the project as "noncontraceptors."

It is important, however, to emphasize the limitations of the main variables chosen to examine the link between fertility and family planning. Examining births and contraceptive practice in a calendar year is arbitrary and imprecise. It presumably diluted the relation between them, and more precise calculations would have shown

stronger relationships. A birth in a calendar year, preceded by nine months of pregnancy that may have started in the preceding calendar year, will not be directly influenced by the practice of family planning unless contraception was practiced continuously and effectively for the entire period of susceptibility to pregnancy. The contraceptive use variables in this dichotomous form may indicate only a behavioral predisposition to family planning, not actual practice. Findings on the relative effectiveness of protection provided by specific methods of contraception are summarized in chapter 3.

In general, births among women who practiced family planning were less frequent than among those who did not (table 7-8). About 17 percent of all couples practiced family planning in the first year, about 27 percent in the second year, and about 36 percent in the third year. The proportions of women who had a birth in the three years were 11 percent, 14 percent, and 14.5 percent for those who practiced family planning in the preceding year, compared with 23.5 percent, 25.1 percent, and 21.2 percent for those who did not. The differences were not uniform and seemed to become smaller.

Age

The effectiveness of contraception in averting births is influenced by the age of users: recruitment to project contraception was much faster for women under age 25 than for those over 25, despite the lower motivation for continuous use by younger women. For women under age 25, the proportion giving birth who had used contraception during the preceding year was not significantly lower than that for those who did not use contraception. Perhaps young couples used the methods intermittently for spacing. For older couples, contraception was more likely to have been continuous and effective, so more births were averted. Even if the birth performance of younger women was not dramatically influenced by contraceptive use, this service presumably was important in recruiting women who would later continue family planning more effectively.

Previous Parity

The probability of giving birth in a year decreased with increasing parity, because of the practice of family planning and the impairment of fecundity. Except for the first group with a parity of zero to one, fertility was lower among contraceptors than noncon-

Table 7-8. *Percentage of Women Who Had Live Birth in a Calendar Year, by Practice of Contraception in Preceding Year*

Calendar year	Users of family planning with live birth in previous calendar year			Nonusers of family planning in previous calendar year			χ^2	P-value
	No. of women of women	No. with live birth in present year	Per-cent	No. of women of women	No. with live birth in present year	Per-cent		
1971	418	46	11.0	1,980	465	23.5	31.3	<.01
1972	621	87	14.0	1,709	429	25.1	31.9	<.01
1973	816	118	14.5	1,446	306	21.2	14.9	<.01

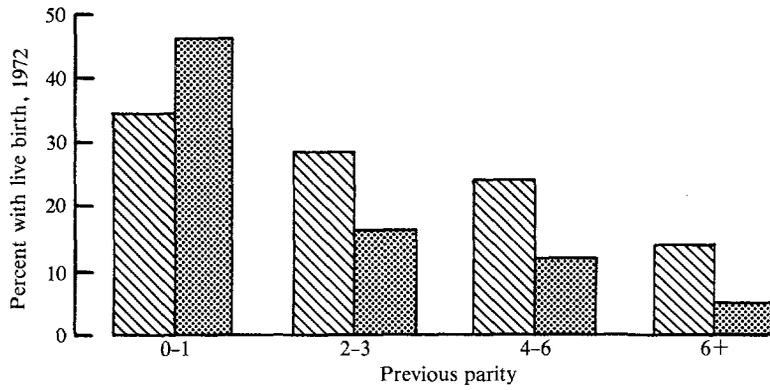
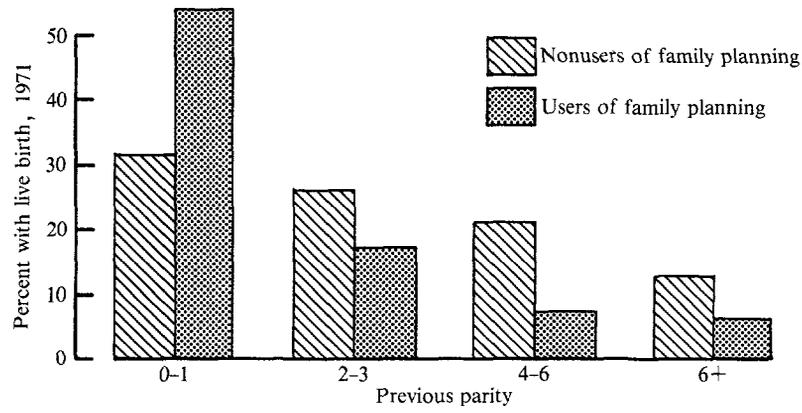
traceptors (figure 7-2). There was also a decline in fertility with increasing parity among those who did and did not practice family planning. The progressive reduction in the rate of decline in fertility by parity among noncontraceptors confirms the importance of other factors, including secondary sterility, separation of marriage partners, and the use of nonproject and traditional methods of family planning. This decline is indicated by the proportion of women with open birth intervals greater than five years, which increased rapidly up to a parity of three and then more slowly.

Interval since Last Birth

Another factor influencing a birth in a year is the time since the last birth as measured by the open interval up to the beginning of the calendar year under consideration. If there was no earlier birth, the interval was measured from the time of marriage. Decreased fertility during lactation is followed by a higher probability of birth after lactational amenorrhea. Lower probability of birth with longer durations results from secondary sterility or the practice of family planning. Presumably, the time since the last birth at first has a positive association with the probability of birth, but it then turns negative when the time is greater than desired spacing.

The proportion of women who gave birth in a calendar year increased up to an open interval of twenty-four months and then started to de-

Figure 7-2. *Percent of Women Who Had Live Birth in a Calendar Year, by Previous Parity and Practice of Family Planning in Previous Year*



cline. Of particular interest is the association of year-by-year declines in the proportion of women who had a birth and the increases in the proportion who practiced family planning. The proportion of women who had a birth was considerably lower among contraceptive users than nonusers for all intervals. The differences were greater, however, after an interval of about eighteen months than before. Up to that time, some women probably were in postpartum amenorrhea, and contraception had little effect on birth performance. Only after postpartum amenorrhea could the benefit of contraception be fully demonstrated. An open interval of zero to six months would normally be covered by postpartum amenorrhea, except for women of zero parity and for women who did not lactate because their last baby died soon after birth. Contrary to our assumptions, we found that the family planning practice rate was high during the open interval of zero to six months: 10 percent in 1971, 22.1 percent in 1972, and 28 percent in 1973.

In general, the data confirm the impression that family planning was used mostly for terminating childbearing rather than for spacing. Among family planning users, the birth interval curve was highest at nineteen to twenty-four months in 1971 but declined to thirteen to eighteen months in 1972 and 1973. Among nonusers the interval was nineteen to twenty-four months throughout the project.

Analysis of birth intervals observed during the project provided several other interesting findings about the dynamics of spacing births. The shortening of intervals following a child death was less than anticipated from previous studies, only slightly more than four months. In Bangladesh, child death resulted in a median shortening of intervals of 13 months (Chowdhury, Khan, and Chen in Preston 1978, Chapter 6, "Experience in Pakistan and Bangladesh," p. 126), with lactational amenorrhea of 17 months. In Korea the shortening was 9 months (Park, Han, and Choe 1979). In the Khanna study in the Punjab, the shortening of interval with no breast-feeding was 10 months (Wyon and Gordon 1971). In trying to separate the relative influence of lactational amenorrhea and replacement motivation on the shortening of birth intervals after child death, previous studies (Preston 1978) indicated that lactational amenorrhea seemed most important where health and family planning were least advanced. However, replacement motivation rather than lactational amenorrhea seemed a more likely explanation among populations where considerable family planning had resulted in a limitation in num-

bers (so that when a child died it would be replaced because of unmet desired family size).

Our data permitted more careful analysis of the correlates of shortened intervals after a child death. The first variable, which has received little attention, is the influence of parity. Intervals were shortest after the first birth, both when the index child survived (31 months) or died (25 months). Both sets of intervals increased with parity, but this was most marked after a child died, so that the differences were progressively reduced. The shortening of intervals after child death was reduced stepwise as follows: first parity, 6 months; second, 5 months; third, 3 months; fourth, 2 months; fifth, 1 month; sixth or more, negligible. It may be that intensity of lactation varies by parity, but the parallel Narangwal Nutrition Project (Kielmann and others 1983) demonstrated that in these study villages duration of lactation was increased overall by 5 months during the project. It seems more reasonable that the steady reduction in the shortening of intervals after child death is more likely to be due to progressive reduction in replacement motivation.

A second variable is that there was a significant sex differential in birth intervals. At each parity, intervals were longer (males 35.6 months and females 33 months) after a male birth than after a female birth when both children survived. When a child died, however, no differences in interval were observed regardless of whether the child was male or female (30.5 months for both males and females).

A third variable was caste. High-caste couples had birth intervals 2.8 months longer than low-caste couples when both children survived (Jats 35.6 months and scheduled Sikhs 32.8 months). When the index child died, however, high-caste intervals averaged 1.6 months shorter than low-caste intervals (Jats 29.4 and scheduled Sikhs 31.1 months). The shortening of high-caste, Jat intervals showed a particularly strong influence of parity, with a difference at parity one of over 11 months and at parity two of 9 months; after parity three the difference was negligible.

All children were breast-fed. It is unlikely, however, that the parity, sex, and caste differences were solely related to different intensity of breast-feeding. This applies especially to the dramatic shift in length of intervals after death among Jats between parity two and three. Local folklore is strong that prolonged lactation is an effective means of family planning. Therefore, mothers

who wanted to delay births, such as high-parity mothers, would probably extend lactation as long as possible. In view of the patterns observed, it seems only reasonable to attribute much of the change in intervals to both "replacement" and "insurance" motivation related to whether children survived.

Of practical interest was the finding that birth intervals were shorter among family planning users than among nonusers. When children survived, the difference was 4 months (users 32.6 months and nonusers 36.9 months). When children died, the reduction of birth intervals was 6 months (users 27.3 months and nonusers 33.2 months). It is possible that family planning users had a greater tendency than nonusers to give up lactation. An equally likely explanation is that family planning use reflected a response to high fertility. It is also possible that family planning users were planning their families more carefully than nonusers and that when a child died they were more likely to replace the child promptly.

Social Status (Caste, Education, Occupation)

The effect of family planning practice would not be expected to be the same in all socioeconomic groups. Table 7-9 shows proportions of users and nonusers of contraceptives, by caste group, who had a birth

Table 7-9. *Percentage of Women Who Had Live Birth, by Practice of Family Planning in Preceding Year and Religion-Caste*

Religion-caste	Calendar year	Percent women who had live birth		χ^2	P-value
		Nonusers of family planning	Users of family planning		
Jat-Sikh	1971	19.4 (940)	7.1 (226)	18.8	< .005
	1972	25.7 (829)	10.9 (303)	58.3	< .005
	1973	16.9 (715)	7.0 (384)	20.1	< .005
Scheduled Sikh	1971	29.3 (728)	16.7 (132)	8.3	< .005
	1972	26.7 (634)	16.2 (204)	8.7	< .005
	1973	28.0 (526)	22.7 (286)	2.4	.133
Others	1971	23.0 (304)	13.3 (60)	2.3	.144
	1972	19.8 (238)	18.4 (114)	0.0	.950
	1973	19.3 (197)	17.8 (146)	0.0	.950

Note: Values in parentheses are the numbers of women on which percentages were based.

a year later. Among the religion-caste categories, the greatest impact was in the highest caste group, the Jat-Sikhs, among whom contraceptors had significantly fewer births than noncontraceptors. Scheduled Sikhs also exhibited a significant effect of family planning on births--except in 1973, when the effect of the project should have been greatest. There were no significant differences in birth performance among contraceptors in the group of others, presumably because fertility already was low for those not using contraception from project sources.

The effect of the husband's education on contraception and births was examined by exploring differences between those with less than a sixth-grade education and those with a sixth-grade education or more. Births among users of family planning were significantly lower than among nonusers in both education groups (table 7-10). During 1971 and 1972 the effect of family planning on births was greater for the less educated group. It appears, however, that the differences in births between users and nonusers of family planning narrowed for the less educated group from one year to the next, perhaps because of the inclusion of more young women in later years.

By occupation group, the effect of family planning on births was greatest among farmers (table 7-11), followed by those in services. In the other two groups the effect of family planning on births was significant in only one of the three years under study.

Table 7-10. *Percentage of Women Who Had Live Birth, by Practice of Family Planning in Preceding Year and Education of Husband*

Education of husband (grades passed)	Calendar year	Percent women who had live birth				χ^2	P-value
		Nonusers of family planning	Users of family planning				
0-5	1971	22.9 (1,274)	8.6 (292)	29.5	<.005		
	1972	24.1 (1,100)	12.9 (412)	22.1	<.005		
	1973	20.1 (949)	15.2 (513)	5.1	.024		
6+	1971	25.8 (629)	14.2 (113)	6.4	.012		
	1972	30.6 (545)	18.0 (183)	10.3	<.005		
	1973	24.7 (421)	13.5 (290)	12.9	<.005		

Note: Values in parentheses are the numbers of women on which percentages were based. Nonusers and users of family planning above, respectively, add only to 1,903 and 405 in 1971, 1,645 and 595 in 1972, 1,370 and 803 in 1973. Education of husband was not known among nonusers and users for 77 and 13 in 1971, 64 and 26 in 1972, 76 and 13 in 1973.

Table 7-11. Percentage of Women Who Had Live Birth, by Practice of Family Planning in Preceding Year and Occupation of Husband

Occupation of husband	Calendar year	Percent women who had live birth			
		Nonusers of family planning	Users of family planning	χ^2	P-value
Farming	1971	20.2 (738)	5.9 (186)	20.2	< .00
	1972	27.2 (648)	12.6 (246)	20.4	< .00
	1973	19.2 (553)	8.3 (314)	17.6	< .00
Labor and tending cattle	1971	27.6 (497)	20.8 (96)	1.5	.23
	1972	25.7 (424)	13.5 (148)	8.7	< .00
	1973	25.4 (358)	23.6 (191)	0.1	.75
Service	1971	24.4 (352)	9.4 (64)	6.3	.01
	1972	26.0 (308)	17.8 (101)	2.3	.14
	1973	24.9 (257)	12.4 (145)	8.2	< .00
Other	1971	25.4 (339)	9.1 (66)	7.4	.00
	1972	21.1 (275)	15.0 (120)	1.6	.22
	1973	17.7 (226)	17.6 (159)	0.0	.95

Note: Values in parentheses are the numbers of women on which percentages were based. Nonusers and users of family planning above add only to 1,926 and 412 in 1971, 1,655 and 615 in 1972, 1,394 and 809 in 1973. Occupation was not known among nonusers and users for 54 and 6 in 1971, 54 and 6 in 1972, 52 and 7 in 1973.

Multivariate Analysis

In a multivariate analysis, a dichotomous dependent variable indicating whether the woman had a birth during a calendar year was regressed on several explanatory variables: previous parity, interval since last birth, contraceptive use in previous year, religion-caste, education of husband, and occupation of husband. Separate regressions were done for 1971, 1972, and 1973 (table 7-12).

Previous parity was most significant in explaining variation in the probability of birth. Also highly significant was the finding that the longer the open interval since last birth, the lower the probability of birth during the year. For every additional ten months of interval, the probability of birth was reduced by about 1 percent. Since the time since the last birth includes lactational amenorrhea, the effect of contraception may be partly captured by this variable.

Table 7-12. Relation of Probability of Live Birth in a Calendar Year to Selected Variables: Regression Coefficients and Their Levels of Significance

Variable	1971			1972			1973		
	Regression coefficient	t-value	Level of significance	Regression coefficient	t-value	Level of significance	Regression coefficient	t-value	Level of significance
Previous parity	-0.0506	14.3	<0.010	-0.0480	12.9	<0.010	-0.0467	13.2	<0.010
Duration since last live birth	-0.0009	4.7	<0.010	-0.0015	7.3	<0.010	-0.0011	5.5	<0.010
Family planning in previous year	-0.0889	4.0	<0.010	-0.1067	5.5	<0.010	-0.0667	3.9	<0.010
Religion-caste									
Jat-Sikh	-0.0515	1.9	0.050	-0.0197	0.6	n.s.	-0.0929	3.2	<0.010
Scheduled Sikh	0.0627	2.2	0.030	0.0377	1.3	n.s.	0.0691	2.6	0.010
Other	*	*	*	*	*	*	*	*	*
Education of husband	-0.0021	0.0	n.s.	-0.0016	0.6	n.s.	-0.0012	0.6	n.s.
Occupation of husband									
Farming	-0.0011	0.0	n.s.	0.0529	1.6	0.100	0.0468	1.6	0.100
Labor	0.0069	0.3	n.s.	0.0108	0.3	n.s.	0.0252	0.9	n.s.
Service	-0.0392	1.5	n.s.	0.0038	0.0	n.s.	0.0030	0.1	n.s.
Other	*	*	*	*	*	*	*	*	*
		$R^2 = .136$			$R^2 = .130$			$R^2 = .132$	

* Suppressed category.

n.s. Not significant ($p > .10$).

Contraception in the preceding year had a significant effect on births, reducing them 7 percent to 11 percent depending on the year. This estimate of the effect of contraception is low for the following reasons. Anyone who practiced contraception in a preceding year was counted as a contraceptive irrespective of the length of use, which would dilute the effect. Persons who used contraception other than that provided by the project were regarded as nonusers. The methods varied greatly in their effectiveness. The effect of sterilization is especially reflected in the interval variable, since even among those using family planning methods provided by the project, only the preceding year's contraceptors were considered in the model. Births in a year would also be influenced by contraception during the same year. In 1973, when the delivery of family planning services reached a peak, the proportion of women who gave birth was only 19 percent, and the proportion of couples who used contraception in the preceding year was nearly 29 percent. If none of the women had used family planning during the preceding year, the proportion giving birth in 1973 would have been nearly 12 percent higher (the marital fertility rate would have been 224 per 1,000 women, not 198).

Relations were significant between parity and births in a year and, except for 1972, between religion-caste and births. Being a Jat-Sikh was strongly associated with a lower probability of birth. The probability of giving birth in a year did not, however, seem to be associated with the education of the husband.

Effects of Services on Fertility

When the Narangwal study was designed, it was assumed that integrated services would produce an increase in contraceptive practice and a decline in fertility. Because the project did not continue long enough to show significant differences in the effect of services on fertility, we have relied mostly on contraceptive practice to measure that effect. In the preceding sections we showed how contraceptive use, interacting with other variables, affected births in the study villages. In this section we trace fertility in the experimental groups and examine changes in fertility in relation to the use of services.

Analysis by Experimental Group

Analysis of fertility in the experimental groups was useful for confirming effects observed in the practice of family planning. But

limitations in financial and logistical resources made it impossible to include a large enough population in each experimental group to obtain definitive fertility information in the short time we had for field observation. The fallibility of annual fertility measurements, which fluctuate regardless of population size, means that we should have observed fertility trends over a few more years. In our small population, we expected to have a standard error that permitted plus-or-minus fluctuations of 2 percentage points in annual birth rates, which could have been smoothed with moving averages if the project had continued longer.

There were six different sources of birth data, but in general we started with the two pregnancy-history surveys and then used other sources to update and correct birth reporting. A birth missed by the first or second pregnancy history was picked up by special vital statistics investigators or through service records and added to the pregnancy history of the mother. Service records varied somewhat from one experimental group to another because of different patterns of coverage and varying intensity of services.

Fertility of the study population. We computed annual age-specific fertility rates for the study population. The 5 percent average annual decline in birth rates in villages with integrated services was much faster than the birth rate reduction of slightly more than 1 percent a year in the Punjab. But we lack conviction in reporting these results because of fluctuations in annual rates and because fertility in the control group (CONT-P) also fell 3 percent a year. As noted earlier, the decline in fertility in rural Punjab and in the Narangwal study area started long before the project: the birth rate in the Punjab fell from 45.5 in 1959 to 32.1 in 1969; in Ludhiana District the fall was from 50 to 34.6 during the same period. The marital fertility rate for all groups combined dropped from 189 in 1970 to 172 in 1973, for a decline of 9 percent in four years.

The fertility decline occurred mainly in age-specific fertility rates for women over age 30. Our other data showed that these women also had the highest rate of contraceptive use. The highest fertility during 1970-73 was in the 25-29 age group. The youngest age group, 15-19, continued to have similar fertility throughout the four years. This distribution indicates that Narangwal women used contraceptives more for limiting births than for spacing them.

Fertility data by experimental group. Annual marital fertility rates by experimental group for 1970-73 are shown in table 7-13. The

fluctuation in fertility rates from year to year is considerable, partly because of the small sample size for each experimental group. The largest decline was in FPWS villages (21 percent), followed by FPWSCC villages (15 percent). The decline in FPED villages was 7 percent, that in the CONT-P villages 12 percent. The FPCC villages registered a rise of 2 percent. The crude birth rates reflect the same patterns (table 7-14).

The fertility data disaggregated by experimental groups do not permit firm inferences about trends in annual fertility rates or about the effect of services on these rates. As already mentioned, the period was too short to observe a secular trend or to calculate three-year moving averages to correct fluctuations. In addition, the births in a year were few in number, and fluctuations were accentuated because of variation in the quality of birth data gathered in the various groups--villages that had the most intensive services had the least underreporting.

An association was demonstrated between the use of family planning services and reduction in fertility. Family planning use produced its greatest direct effect in FPWS villages, with differences

Table 7-13. *Annual Marital Fertility Rates, by Experimental and Control Groups, 1970-73*

Group	1970	1971	1972	1973
FPWSCC	196.5 (1,043)	184.4 (1,052)	182.4 (1,069)	166.7 (1,086)
FPWS	208.0 (827)	185.2 (826)	202.8 (848)	163.4 (869)
FPCC	191.8 (803)	205.2 (809)	170.9 (819)	195.7 (828)
FPED	-	-	182.1 (895)	170.8 (878)
CONT-P	184.6 (899)	189.4 (908)	161.0 (913)	162.5 (917)
Other-NUT (except NUTHC)	171.4 (1,231)	197.0 (1,249)	146.2 (1,265)	175.5 (1,282)
Total	189.0 (4,803)	192.2 (4,844)	172.5 (5,809)	172.2 (5,860)

- Not applicable.

Note: Rates are based on annual number of live births (from all sources) per 1,000 married women (from Census rounds 3, with linear extrapolation between rounds). Values in parentheses are the numbers of women on which percentages were based.

Table 7-14. *Crude Birth Rates, by Experimental and Control Groups, 1970-73*

Group	1970	1971	1972	1973
FPWSCC	36.7	34.4	32.8	29.0
FPWS	38.3	33.2	36.1	28.8
FPCC	34.2	36.0	29.6	33.3
FPED	-	-	30.0	27.0
CONT-P	33.9	34.1	28.3	27.9
Total	34.1	34.1	29.7	28.9

- Not applicable.

Note: Rates are based on average number of live births per 1,000 population. Numerators were from all study sources pooled. Denominators were Census rounds 1 (1968), 2 (1971 except FPED in 1972), and 3 (1973), with linear extrapolations for years 1970 and 1972.

that were highly significant in all three years (table 7-15). Reductions in births were also significant in FPWSCC villages, but the effect was less than in FPWS villages.

Analysis of Individuals

Because of limitations in the data on experimental groups, we also analyzed individual data. Such an analysis requires specification of the use and outcome of services for individuals. This analysis was confined to the effect of services on fertility, primarily measured through changes in the fertility of individual women as related to the use of service inputs. (This analysis is similar to that of a production-function relationship in econometrics, but it does not use an input-output framework because of the problem of disentangling cause-and-effect sequencing in the use of services and the decline of fertility, as is explained later in the section.)

Measuring reductions in fertility requires, first, selecting a reference mark, a level of fertility from which the reduction is to be estimated; and second, relating the reduction to a period during which the interventions were operating. These measures should distinguish changes in fertility due to, and independent of, project efforts.

The change in fertility from preproject to project levels was defined as follows: by using the information on duration of marriage

(D_1) and the total number of live births (B_1) up to the end of 1969, the average annual probability of birth ($P_1 = B_1/D_1$) was computed for each woman to indicate preproject fertility. Similarly, by using the duration of the project (D_2) and total live births (B_2) during the project up to the time the women withdrew from project exposure (because of outmigration, dissolution of marriage, or end of project, whichever happened first), another average annual probability of birth ($P_2 = B_2/D_2$) was computed. The absolute decline ($P_1 - P_2$) in the probability of birth was then expressed as a percentage of the initial level (P_1). The percentage decline in fertility was $100(P_1 - P_2)/P_1$.

This measure of fertility decline has limitations. Marriage duration as a measure of exposure to sexual union is not homogeneous; a duration of, say, five years when a woman is 20 years old is different from the same duration when she is 35 or 40. In addition, D_2 always refers to a period when the woman is older, and consequently when (for most women) her fecundity is lower. Thus, the amount and direction of change of individual fertility measured by this formula is as

Table 7-15. *Percentage of Women Who Had Live Birth, by Practice of Family Planning in Preceding Year and Experimental Group*

Experimental group	Calendar year	Percent women who had live birth		χ^2	P-value
		Nonusers of family planning	Users of family planning		
FPWSCC	1971	22.9 (485)	14.4 (174)	5.17	.024
	1972	25.8 (422)	14.7 (225)	10.03	<.005
	1973	20.5 (375)	14.3 (252)	3.57	.062
FPWS	1971	26.3 (377)	9.6 (178)	19.42	<.005
	1972	29.1 (326)	12.7 (212)	18.79	<.005
	1973	21.2 (278)	10.3 (244)	10.80	<.005
FPCC	1971	26.0 (524)	6.1 (33)	5.57	.020
	1972	20.8 (389)	15.9 (151)	1.39	.243
	1973	22.9 (319)	20.6 (204)	0.26	.636
FPED	1971	20.0 (594)	6.1 (33)	3.07	.084
	1972	25.2 (572)	9.1 (33)	3.56	.062
	1973	20.5 (474)	12.9 (116)	2.97	.088

Note: Values in parentheses are the numbers of women on which percentages were based.

much a function of age as of the use of family planning. We therefore disaggregated the sample by age in the multivariate analysis.

The analysis included only women who had demonstrated preproject fertility or women who had at least one live birth at the beginning of the project--and only women from the four groups of villages (FPWSCC, FPWS, FPCC, and FPED) that received family planning services up to 1974. Measurement of preproject fertility of these women was based entirely on pregnancy histories obtained in the cross-sectional survey at the beginning of the project. These histories were updated up to the end of the project by using longitudinal sources of birth data. Information was available on 2,298 women, though the exact duration of exposure to the project was not known for 42 of them. Socioeconomic data were available for only 1,818 women, so the multivariate analysis was performed on that number. These data show that fertility can be affected not only by nonproject inputs, but also by variables that change the effectiveness of project inputs (for example, education helps more effective use of services).

Health and family planning services were classified in six categories: women's illness care, women's other care, children's illness care, children's other care, motivation for family planning, and family planning services with follow-up. Services provided by all personnel were grouped together.

The dependent variable was decline in the probability of births during the project. Of the 2,298 cases examined, about 18 percent had an increase in the probability of birth, about 4 percent had no change, and 78 percent had a decline. More than half had a decline in probability of less than 20 percent; about a fifth, more than 20 percent. As would be expected, age is significantly related to declining fertility. The women who had an increase or no change in fertility tended to be in younger age groups: 44.3 percent of those under age 25, 28 percent of those age 25-34, and only 6.2 percent of those age 35 and over. Conversely, the proportion of women who experienced a moderate (up to 20 percent) decline in fertility were older: 20.9 percent of those under age 25, 38.3 percent of those age 25-34, and 92 percent of those age 35 and over. High declines in fertility (more than 20 percent) became less frequent with age: 34.8 percent of women under age 25, 33.7 percent of those age 25-34, and 1.7 percent of those age 35 and over. Variation in the rate of decline of fertility was most for women under age 25 and least for those age 35 and over, presumably because the fertility of the older women was already low when the study started.

In analyzing the effect of socioeconomic variables on fertility, we considered family income first because it would reflect private inputs as well as project inputs, living standards, and modernizing influences on members of the family. Higher family income should indicate better access to information about family planning and greater awareness of the desirability and feasibility of regulating fertility. The proportion of women who experienced an increase or no change in fertility decreased with income, but a greater proportion of women in higher income groups had declines in fertility. The association is significant.

Caste is considered the most important indicator of social status in Punjab. Jat-Sikhs had the lowest proportion of women who experienced an increase in fertility and the highest proportion of women who experienced reductions. The findings were reversed for scheduled Sikhs. Others were in between.

Husband's education was associated differently with declines in fertility. Among the better-educated group (sixth grade or higher), an equal number of couples showed increased fertility and a decline of more than 20 percent during the program. The less educated group had a higher proportion with a moderate (up to 20 percent) decline in fertility. These findings indicated no clear association between declines in fertility and education. Similarly, there seemed to be no association with occupation.

To evaluate the effects of service inputs on the dependent variable, it is important to control for conditioning variables such as age and socioeconomic status (income, caste, and so on). A multiple regression model was used to partial out the effects of the service inputs on the dependent variable (table 7-16). The percentage decline in the average probability of birth per year of exposure was the dependent variable. The results show that the effects of the six service inputs, when various socioeconomic variables were controlled, are not in the direction expected. Family planning motivational services are significantly but negatively associated with a decline in fertility. Family planning services with follow-up have a consistent and positive (but not significant) association with a decline in fertility. Preventive services for children are significant, but the association is negative. Among the conditioning variables, being of high caste (Jat-Sikh) and in farming were significant.

The negative association with some of the service inputs may be caused by the fact that the use of some services--such as health services for women and curative services for children--increase as a

Table 7-16. Results of Regression Analysis with Dependent Variable the Percentage Decline in Average Annual Probability of Live Birth

Variable	Age of wife							
	All ages		< 25		25-34		35+	
	Regression coefficient	t-value						
Family planning motivation (FPMOT)	-0.5166	6.2	-0.6930	2.5	-0.4964	3.5	-0.2018	4.0
Family planning services (FPSER)	0.1552	2.9	0.2737	1.3	0.2218	2.8	-0.0082	0.3
Women's illness care (WILL)	-0.0095	0.3	0.0601	0.4	-0.0339	0.8	-	-
Women's other care (WOTH)	0.0859	1.7	0.4247	2.3	-0.0228	0.3	0.0363	1.4
Children's other care (COTH)	-0.0289	3.6	-0.0323	1.4	-0.0232	1.9	-0.0213	3.1
Children's illness care (CILL)	-0.0022	0	-0.0351	0.4	0.0052	0	-	-
Religion-caste								
Jat-Sikh	5.3998	6.2	14.7814	2.2	4.9112	1.5	-	-
Scheduled Sikh	-1.6055	0.9	-5.1730	0.9	-0.7339	0.3	-0.5438	0.7
Education of husband	-0.3181	2.0	-0.7706	1.5	-0.1576	0.6	-0.1027	1.0
Income	0.0002	1.5	-0.0002	0.3	0.0004	1.6	0.002	2.7
Occupation of husband								
Farming	-5.0605	2.6	-11.5980	1.2	-7.3550	2.2	0.4857	0.5
Labor	-0.7639	0.3	-2.2530	0.3	-1.8507	0.5	0.5721	0.6
Service	-0.7442	0.3	3.5560	0.5	-4.4415	1.3	0.4967	0.4
	$R^2 = .052$		$R^2 = .089$		$R^2 = .058$		$R^2 = .056$	

- Not applicable or not available.

direct result of births, which generate many service contacts. Use of services represents a response to need produced by births, rather than a factor that might contribute to a decline in fertility. The negative association between a decline in fertility and male family planning motivation may be the result of intensive efforts by motivators to influence high-fertility couples.

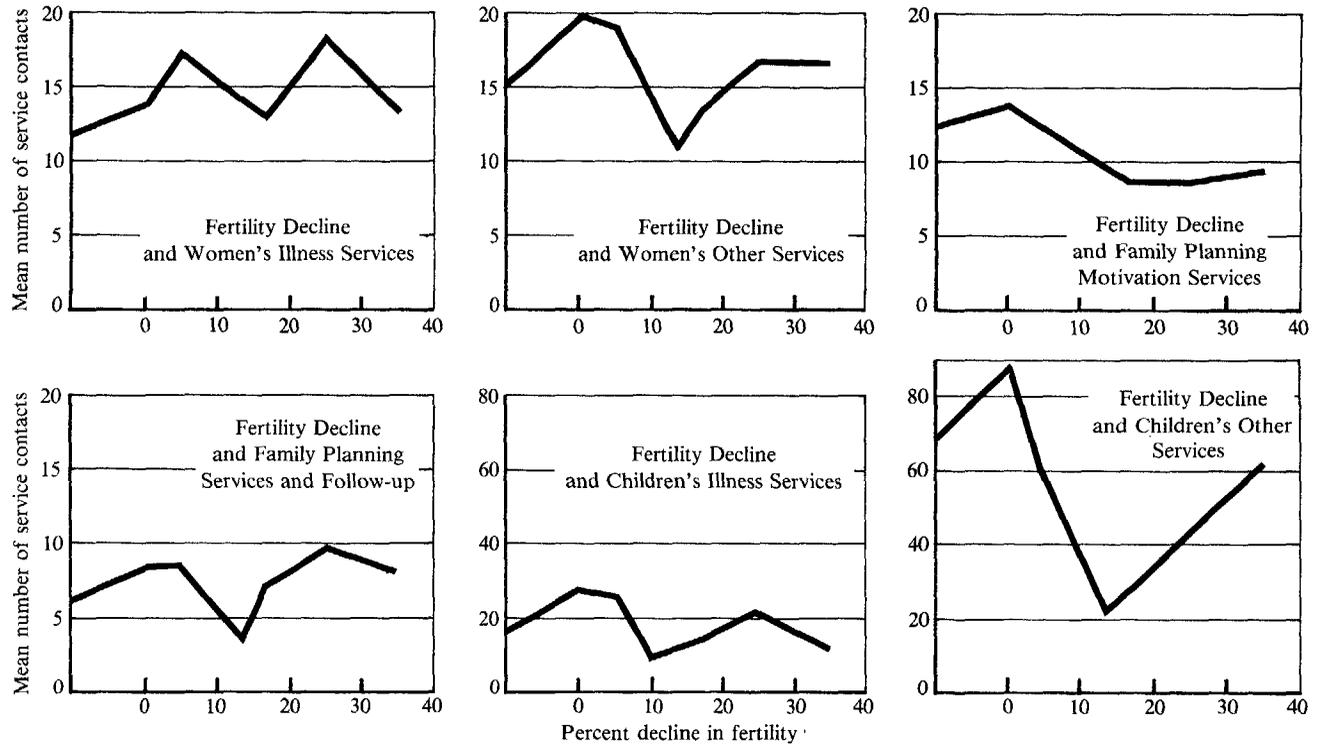
The relation between service inputs and the dependent variable (the percentage decline in the average probability of birth per year of exposure to the project) is nonlinear. This nonlinearity reduces the value of the regression results in table 7-16, and further analysis would have to separate service use associated with an increase in fertility from that associated with a decline. In all instances, the least use of services was related to a moderate decline in fertility (table 7-17). Those who had no decline, or even an increase, were heavy users of services. Those who had high declines in fertility were also heavy users of services. These results suggest that some heavy users were those families which had greater health needs because of high fertility. Probably the most important finding is that the rest of the heavy users of services had a substantial decline in fertility (16 percent and more), and these couples may be those for whom the fertility impact of services was beginning to be evident.

These relations are further illustrated by figure 7-3, which shows for each type of service the relations between mean numbers of

Table 7-17. Mean Number of Service Contacts by Type of Service and Percentage Decline in Fertility

Percent decline in average annual probability of live birth	Mean number of contacts					
	WILL	WOTH	CILL	COTH	FPMOT	FPSEK and follow-up
Negative	11.7	15.9	18.4	69.6	12.1	5.9
0	13.7	19.4	26.6	92.6	13.5	8.1
1-10	17.1	18.5	25.4	59.7	11.8	8.4
11-15	14.1	11.1	9.5	20.6	6.3	3.4
16-20	13.1	13.5	14.2	27.4	8.8	7.3
21-30	17.9	16.8	20.6	43.6	8.8	9.5
30+	12.9	16.4	15.4	61.3	9.2	8.0
Total	14.2	14.8	16.5	45.0	9.4	6.5

Figure 7-3. Relations between Fertility Decline and Volume of Service Contacts, by Type of Service



service contacts and the decline in fertility, as measured by changes in the average probability of birth. The first segments of the graphs show that high use for some women was associated with no decline in fertility, or even a rise. In these cases services were presumably provided in response to births or pregnancies. For women whose use of services did not show a decline in fertility, an effect might have been seen if the program had been extended. In other cases field workers, such as male motivation workers, might have worked more intensively on high-parity cases. The last segments of the graphs probably reflect the effect of services on fertility, with a heavy use of services being associated with a substantial decline in fertility (16 percent and more). The low points in the middle parts of the six graphs of figure 7-3 represent the cases of least service use. This slight decline in fertility (less than 20 percent) was found to be consistent with the trend among women in Narangwal. There is no clear indication that a significant decline in fertility required reaching a threshold of some minimum volume of services.

Summary

Fertility patterns before the project show that higher-caste groups had lower fertility than lower-caste groups. The higher fertility of the low-caste group was, however, balanced by higher mortality, so that there were equal numbers of surviving children. In almost all age groups, the fertility of married women declined as the education of their husbands increased. Of the three major occupations in the study villages, laborers had the highest fertility, those in services had the lowest, and farmers and other groups were in between.

The decline in aggregate fertility was shared by all experimental groups. It was largely due to declines in age-specific fertility early (under 20 years of age) and late (over 30 years of age) in the childbearing period.

Caste and parity differences significantly influenced birth intervals, which became shorter after a child death. The use of contraception in averting births was generally effective, but since the delivery of project family planning services did not reach a peak until 1973, the period of observation was too short to produce definitive results on births in experimental groups.

Previous parity was the most significant variable in explaining variation in the probability of birth in a given year. Also highly

significant was the finding that the longer the interval since the last birth, the lower the probability of birth during the year.

Impact on fertility in the various experimental groups was inconclusive. The largest decline was in FPWS villages (21 percent), followed by FPWSCC villages (15 percent). The decline in FPED villages was 7 percent, but that in the CONT-P group was 12 percent. These equivocal results were largely due to premature termination of the project and small sample size.

Individual-level (rather than village-level) analysis provides more relevant information to evaluate the impact of services. Increased use of services by individuals seemed on the one hand to be a response to need produced by births; on the other hand it could be considered a contributing factor to a decline in fertility. In all instances, the least use of services was related to a moderate decline in fertility. Those who had no decline, or even a rise, were heavy users of services, as were those who had the greatest declines in fertility. This implies that some heavy users were families to which services were rendered in response to health needs generated by high fertility. The remaining group of heavy users of services had a substantial decline in fertility.

Chapter 8

Efficiency and Equity of Project Services

Robert L. Parker and R. S. S. Sarma

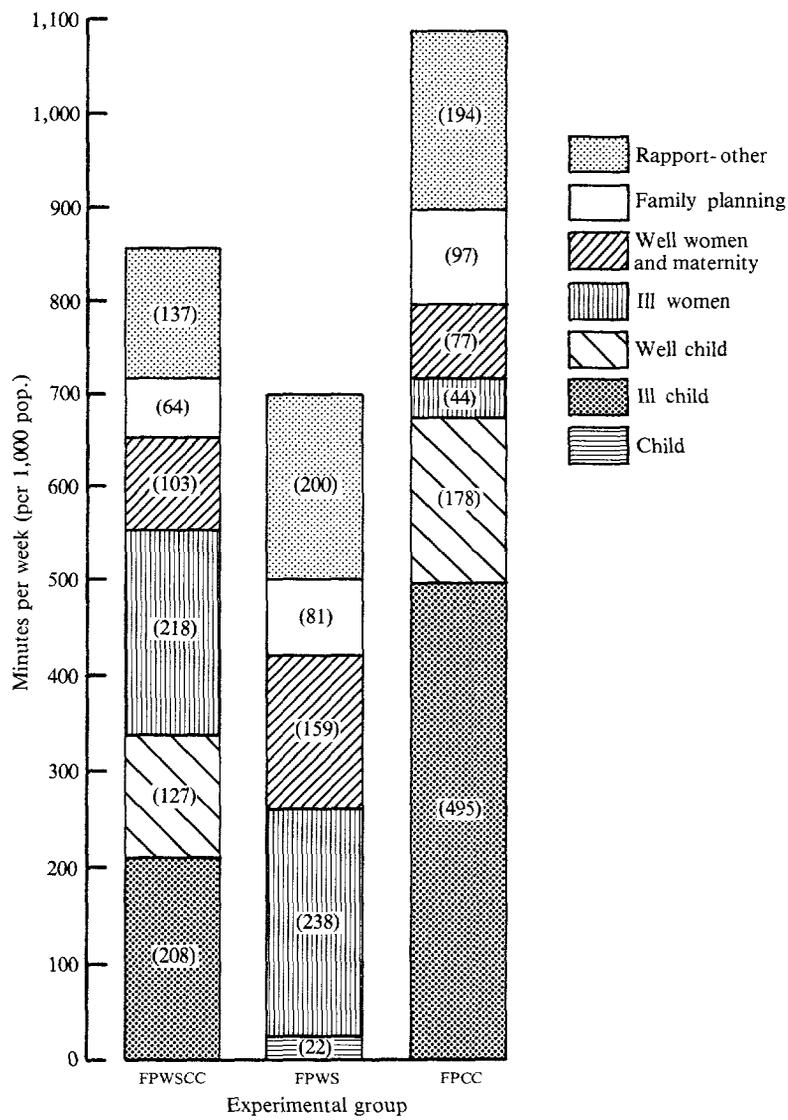
Some of the most difficult issues that policymakers and planners of health and family planning services must resolve are those of balancing tradeoffs between cost, equity, and effectiveness. Because of limited resources, there must be efforts to maximize the effect of services through increases in efficiency. It might be speculated that attempts at equitable distribution might dilute services so much that they would have little effect. At Narangwal we found that focusing project services on the group most neglected or at highest risk (see appendix B) actually helped to target the distribution of services and increased the efficiency (and effect) of services.

In this chapter we support the case for integrating health and family planning services by presenting descriptions of the inputs of time and cost and calculations of efficiency expressed as time required per service contact, cost per service contact, and the cost effectiveness of different service combinations. The considerations of efficiency are then balanced by an examination of project achievements in promoting equity in the distribution of health services and in the use of family planning.

Service Time

Work-sampling observations were used to estimate the amount of time project staff spent in carrying out the various components of services in each of the four experimental groups of villages: those receiving family planning, women's services, and child care

Figure 8-1. Average Time Spent Providing Direct Services by All Staff Working in Each Experimental Group, 1971



Note: Village attendants excluded. Numbers in parentheses are actual average times spent in services indicated. Services in FPED villages did not start until 1972.

(FPWSSC); those receiving family planning and women's services (FPWS); those receiving family planning and child care (FPCC); and those receiving family planning and family planning education (FPED). In the original experimental design, the decision was to have equivalent personnel-to-population ratios for all groups, even though the work load differed from group to group. Some variations in the size of villages and in staffing made it necessary to standardize the results of the work sampling as time inputs per 1,000 population per week.

Figure 8-1 shows for each of three experimental groups of villages the time spent on direct services at the midpoint of the project in 1971. (Services did not start in FPED villages until 1972.) The total direct service time that all project staff provided during an average week varied from 700 minutes per 1,000 people in FPWS villages to almost 1,100 minutes per 1,000 in FPCC villages. The FPWSSC villages had a staff input of about 860 minutes per 1,000.

The greater inputs in FPCC villages were related to the higher staff-to-population ratios called for by the research activities of the parallel Narangwal Nutrition Project. (FPCC villages were NUTHC villages in the nutrition project.) The intensive services for child care consumed twice as much staff time (673 minutes) as similar services in FPWSSC villages (335 minutes). Although the content of services was similar, the larger volume of child care in FPCC villages was associated with much more frequent surveillance contacts to collect information on nutritional status and infection (Kielmann and others 1983). Although the design called for no child care in FPWS villages or services for ill women in FPCC villages, it proved necessary to spend a little time in such activities to maintain rapport with village families, in cases of emergency, or when these types of care could not be separated from other services. Examples of the third requirement include essential care of the newborn in the immediate postpartum period in FPWS villages, or care of a woman during pregnancy in FPCC villages as part of prenatal care of the child.

Unlike these differences in the design of child care, we had planned that women's services in FPWSSC and FPWS villages would be similar in content and frequency of routine contacts. In practice, the staff in FPWS villages spent about 25 percent more time on women's services (397 minutes) than the staff in FPWSSC villages (321 minutes). The time spent in care of ill women was almost the same, suggesting that demand for clinical services produced a comparable response even though time constraints differed. The main differ-

ences between the two experimental groups were in routine surveillance and maternity care. As noted in chapter 4, this difference resulted from the increased frequency of contacts and, as will be noted later in this chapter, from the greater time spent per contact in FPWS villages. The difference also suggests that family health workers (FHWs) tended to use direct service time more efficiently in FPWSSC villages because child care and women's services could be combined in one home visit. Other care of women required less time in FPCC villages than in FPWSSC villages (77 minutes compared with 103). That care was devoted to surveillance to identify pregnant women early in pregnancy and to provide them with "prenatal child care" focused primarily on services needed to produce a healthy baby.

Family planning services during an average week took up 97 minutes per 1,000 people in FPCC villages, 81 minutes in FPWS villages, and 64 minutes in FPWSSC villages. This difference helps to explain how combined services achieved the greater efficiency shown by the cost-effectiveness calculations later in this chapter. Finally, time spent on contacts whose purpose was mainly to maintain good relations with individuals and communities was higher in FPWS villages (200 minutes) and FPCC villages (194 minutes) than in FPWSSC villages (137 minutes). This presumably reflects the additional time needed or available to maintain rapport in villages that did not receive complete services.

Seventy-six percent of direct service time in study villages was provided by the FHW residing in each village (averaging about one FHW per 1,600 people in FPWSSC and FPWS villages and one FHW per 1,000 in FPCC villages). About 70 to 75 percent of the FHW's activity observed during work sampling was classified as service, the rest as research. These findings mean that, if Narangwal services were to be "replicated" in other similar locations and if no time were allocated to research, the worker-to-population ratios could be between 1:2,000 and 1:3,000.

In addition to resident FHWs, other staff were involved in direct services in each village on regularly scheduled visits. The proportions of direct service time provided by these staff were 13 percent by male family planning workers, 6 percent by physicians, and 4 percent by family health supervisors and public health nurses.

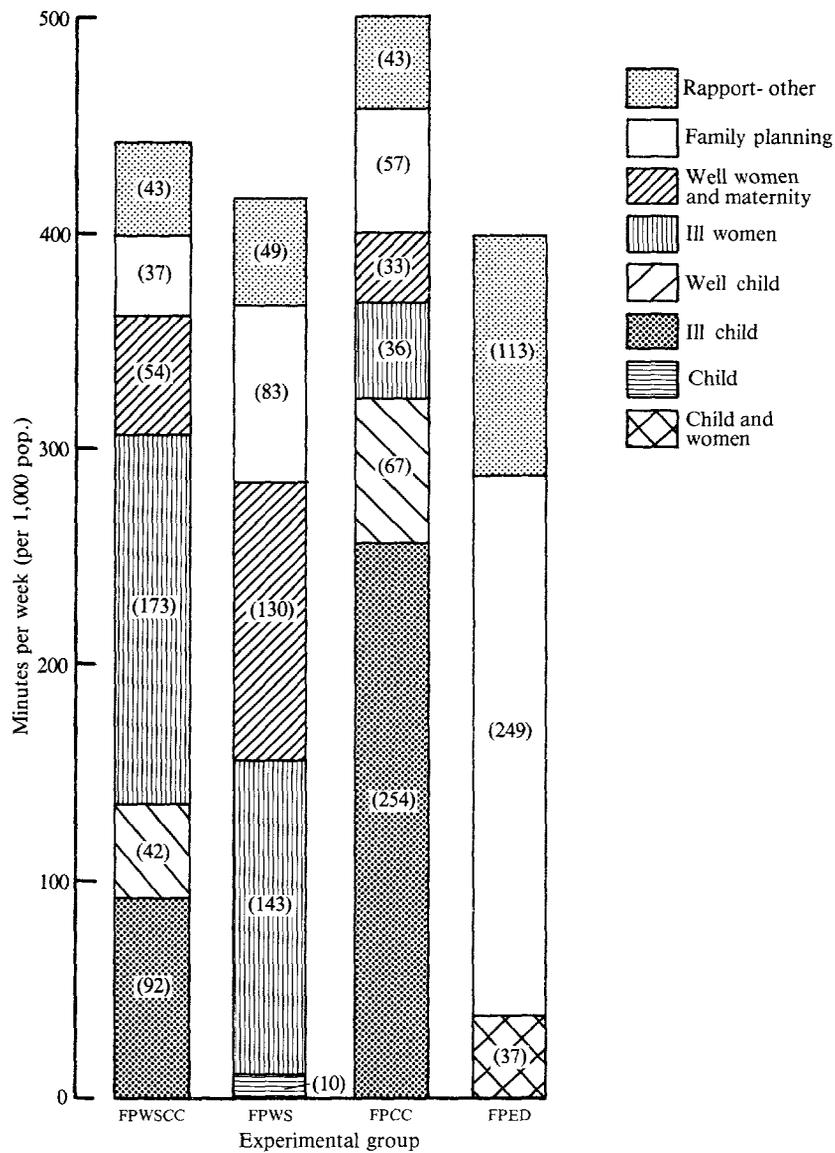
A second work sampling, in 1973-74, provided more data on changes in the distribution of direct service time, including information about the FPED villages, where services started in mid-1972. In

those villages family planning educators rather than FHWs were used as resident workers (one per 1,400 people). Because of a smaller sample size in 1973-74, data were sufficient only to describe the direct service time of FHWs and family planning educators (figure 8-2). In general, the direct service time of FHWs followed a pattern of distribution similar to all staff in 1971. The important finding was that the average time put in by FHWs in 1973-74 was only 70 percent of that in 1971. Much of this reduction was in child care, which was progressively streamlined and simplified in FPWSSC and FPCC villages. The time FHWs spent in FPWS villages did not change much: almost 500 minutes per week per 1,000 people on direct services in FPCC village, 440 minutes in FPWSSC villages, and about 415 minutes in FPWS villages. The direct service time of family planning educators was 400 minutes per week per 1,000, close to the time of FHWs in FPWSSC and FPWS villages. In 1973-74, as in 1971, child care (especially for ill children) was higher in FPCC villages than in FPWSSC villages (254 minutes compared with 92 minutes); care of well women, including maternity care, was higher in FPWS villages than in FPWSSC villages (130 minutes compared with 54 minutes).

That some activities were classified as children's and women's services in FPED villages (37 minutes) indicated that family planning educators spent some time discussing these topics during their home visits. No care was provided, but advice was given about what they could do or where they could go for care, usually to the nearest government health center. As might be expected, family planning educators provided much more time specifically for family planning (249 minutes) than did any of the FHWs in their villages (83 minutes in FPWS villages, 57 minutes in FPCC villages, 37 minutes in FPWSSC villages). Finally, the time spent maintaining friendly relations was also much higher in FPED villages (113 minutes) than in the other experimental groups (43 to 49 minutes). The "friendly" time in the health service villages may indicate that rapport had stabilized and that FHWs were accepted, whereas family planning educators had been active for less time and had less to offer.

The findings from the 1973-74 work sampling confirmed that workers providing a limited range of services spent much more time on those specific services than workers who had to provide similar services in combination with other services. This may seem obvious, but it was important to identify these quantitative differences between experimental groups to determine whether variations in amounts of a service were associated with differences in outcomes.

Figure 8-2. Average Time Spent Providing Direct Services by Family Health Workers (FHWs) in FPWSSC, FPWS, and FPCC Villages and by Family Planning Educators in FPED Villages, 1974



Note: See note to figure 8-1.

Time per Service Contact

The comparison of service contacts in chapter 4 showed that the combined services in FPWSSC villages generated more contacts than those in FPCC villages, even though staff spent more time on contacts in FPCC villages. In addition, people in FPWSSC villages had almost twice as many service contacts as people in FPWS villages in 1971 and about a third more in 1973. The different patterns of time inputs and service contacts can be compared by calculating the average time per contact. In 1971 the average time spent per contact in FPWSSC villages was 5.4 minutes. This figure combines all services in the home and clinic into one average. The corresponding averages were 6.9 minutes in FPWS villages and 7.6 minutes in FPCC villages. The greater efficiency of the combined services is indicated by the averages for child care: 4.6 minutes per contact in FPWSSC villages, where they were combined with women's services, but 6.7 minutes in FPCC villages. Another factor contributing to the differences in child care services between FPWSSC and FPCC villages was the greater use of home visiting, which required more time per contact in FPCC villages.

In 1973-74 the contacts in FPWSSC villages were more efficient in the use of direct service time (4.4 minutes) than in other villages. In FPED villages each contact took more than 14 minutes. When time per family planning contact was calculated separately, the averages were found to be about 4 minutes in FPWSSC villages, 8 minutes in FPWS villages, 19 minutes in FPCC villages, and 16 minutes in FPED villages.

Why were the contacts in FPCC villages least efficient? One explanation is that family planning services were started several years after child care services had been well established, thus requiring a big readjustment in the work patterns of FHWs. Just as important, if not more so, child care in these villages was supervised by a male pediatrician, family planning by a female physician. As a result, family planning workers had difficulty integrating the two activities in their thinking and in their work. From our experience, child care services will always be somewhat more difficult to integrate with family planning services than with women's services; FHWs made much more efficient use of their work time when their supervision was integrated. This should be taken into consideration by those who are planning integration of separate categorical programs merely by maintaining the separate hierarchies but trying to have them work through a single peripheral worker. This kind of planning necessarily leads to inefficiency.

Cost of Services

Detailed accounting of expenditures in the Narangwal Population Project permitted calculation of cost related to specific functions, activities, and services. Work-sampling and other data were used to estimate the distribution of salaries and other expenditures for the different experimental groups and types of services. For example, the costs for family planning were calculated using the proportion of time spent by all staff on family planning as the proportion of salaries to be allocated to family planning. In addition, an estimate of the use of space for different activities provided a means to allocate building and maintenance costs. Costs associated with transport, equipment, supplies, food, and drugs likewise were allocated based on their use. Referral costs were distributed to different activities depending on the reason for referral. All non-specific costs, such as time spent on administration, were allocated proportionately to different services based on the total distribution of specific service costs determined by the above allocation procedures. The field staff established criteria to define the project activities that were classified as research. In estimating service cost this research component was excluded so that findings would reflect the service cost of each component of the service package.

The cost analysis was as comprehensive as possible in identifying the components. For example, all donated drugs, food, buildings, and land were given an estimated value in current market prices. Capital expenditure for buildings and large equipment was amortized at annual rates of 2 percent and of 5 percent; that for small equipment and vehicles at 10 percent. The components of average annual cost in each experimental group are listed in table 8-1. The share of the cost related to personnel--the service component of salaries--ranged from 45 percent in FPWSSC villages to 71 percent in the FPED villages. FPWS and FPCC villages were in between, at 63 percent and 51 percent. If the cost of the nutrition supplementation program (food, supplies, salaries, and so on) is subtracted from all costs, the proportion attributable to salaries rises to about 54 percent in FPWSSC villages and 65 percent in FPCC villages. The amount spent on the service component of salaries was least in FPED villages (US\$820 or Rs6,151), most in FPCC villages (US\$1,310 or Rs9,824), and in between in FPWSSC villages (US\$995 or Rs7,465) and FPWS villages (US\$1,132 or Rs8,491).

Table 8-1. *Distribution of Costs by Specific Categories of Expenditure in Each Experimental Group, Based on Average Annual Costs per 1,000 Population (rupees)*

Cost category	FPWSCC	FPWS	FPCC	FPED
Buildings: 2% ^a	217 (1.3)	230 (1.7)	193 (1.0)	209 (2.4)
Maintenance	250 (1.5)	257 (1.9)	270 (1.4)	287 (3.3)
Equipment: 5 or 10% ^a	300 (1.8)	257 (1.9)	232 (1.2)	148 (1.7)
Supplies	1,052 (6.3)	864 (6.4)	1,158 (6.0)	513 (5.9)
Vehicles: 10% ^a	184 (1.1)	216 (1.6)	251 (1.3)	165 (1.9)
Vehicle operation and maintenance	969 (5.8)	1,120 (8.3)	1,274 (6.6)	809 (9.3)
Food	2,973 (17.8)	-	3,860 (20.0)	-
Drugs	2,505 (15.0)	1,606 (11.9)	1,949 (10.1)	366 (4.2)
Referrals	785 (4.7)	459 (3.4)	289 (1.5)	52 (0.6)
Salaries	7,465 (44.7)	8,491 (62.9)	9,824 (50.9)	6,151 (70.7)
Total	16,700 (100.0)	13,500 (100.0)	19,300 (100.0)	8,700 (100.0)

- Not applicable or not available.

Note: Costs in 1970-73 for FPWSCC and FPWS; in 1971-73 for FPCC; in 1972-73 for FPED. Column percentages are given in parentheses. In this and subsequent cost tables, US\$1 = Rs7.5.

a. Capital expenditures amortized as indicated to provide annual costs.

Three other differences were major: the large proportion of the cost of food in child care villages (18 to 20 percent), the greater cost of supplies and drugs in the child care villages, and the marked variation in the cost of referral. The referral cost in FPWSCC villages was almost the same as the combined referral costs in FPWS and FPCC villages, indicating that, despite the greater work load, FHWS in FPWSCC villages were identifying the serious cases that required special attention. For the other recurring cost of consumable material, especially for drugs and supplies, the efficiency of combined

services in FPWSCC villages is evident: they are lower in FPWSCC villages than in FPWS and FPCC villages combined.

The amortized capital cost was only 3.5 to 6 percent of the total cost in any of the groups and in rupees was almost the same. This shows the need to plan for the proportionately greater drain on resources related to recurring costs when developing primary care services and the importance of not becoming overcommitted in capital investments. Adequate facilities were provided by the villages, but these capital costs, when included in our calculations, were a very small fraction of total costs. The situation would have been quite different if international funds had been used to put up the buildings (as they are in most donor programs, in which most of the funds go into facilities). Moreover, drugs are more important than buildings in making programs of primary health care effective. In the experimental groups with health care services, the proportion of expenditure for drugs ranged from 10 to 15 percent. The annual drug cost per capita in the FPWSCC villages was about US\$0.33 (Rs3.5). This was kept low by carefully limiting the formulary to a small number of drugs with known efficacy. The share of the cost of transport in total cost ranged from about 7 percent to 11 percent. The major difference in a comparison with the distribution of expenditure in government health centers is that salaries consume about 75 percent of all funds in government services, proportionately reducing the amount to spend on drugs, supplies, and transport.

These findings show the great need for reversing patterns of expenditure. Rather than spending so much on buildings, as is common in government services, providing adequate drugs, supplies, and transport would be much more practical. In any attempt to plan services, it is important to know what proportion of the cost is fixed (and will produce a constant demand on resources) and what proportion will vary depending on use of the services. Costs that we considered to be fixed in the short run were primarily capital costs, salaries, and part of the building and vehicle maintenance. Fixed costs averaged about 53 percent in FPWSCC villages, 58 percent in FPCC villages, 73 percent in FPWS villages, and 83 percent in FPED villages. These findings show that services in the last two experimental groups could be made much more efficient by appropriate changes in distribution of services.

Table 8-2 gives the average annual cost per capita for each type of service in each experimental group. Children's services cost US\$0.56 per capita in FPWSCC villages and US\$1.07 in FPCC villages.

Table 8-2. *Average Annual Cost per Capita for Different Services in Each Experimental Group*
(rupees)

Service	FPWSCC	FPWS	FPCC	FPED
Child care	4.2	0.4	8.0	-
Nutrition	4.5	-	6.5	-
Women's services	4.5	6.6	1.0	0.5
Maternity services	1.7	3.2	0.8	0.1
Family planning	1.8	3.3	5.0	8.1
Total	16.7	13.5	21.3	8.7

- Not applicable or not available.

This difference is another indication of the difference in intensity of surveillance in the two experimental groups. Nutritional supplementation, primarily for children 1-3 years old, also cost more in FPCC villages (US\$0.87 per capita) than in FPWSCC villages (US\$0.60 per capita). The cost of women's services other than maternity care was US\$0.60 in FPWSCC villages and US\$0.88 in FPWS villages; cost of maternity care was US\$0.23 and US\$0.43 for these experimental groups. The cost per capita of limited services to women as part of prenatal care of children in FPCC villages was much less. For both women's services and child care, the costs per capita in FPWSCC villages were consistently lower than in villages receiving either service alone--indicating the greater efficiency of combined services.

Efficiency was also increased for family planning, which showed a dramatic progression of cost per capita from US\$0.24 for FPWSCC villages, US\$0.44 for FPWS villages, US\$0.67 for FPCC villages, and US\$1.08 for FPED villages. The cost per capita of each service package, obtained by adding the costs of component services, was US\$1.16 for FPED villages, US\$1.80 for FPWS villages, US\$2.23 for FPWSCC villages, and US\$2.84 for FPCC villages. The estimated expenditure per capita for services that government primary health centers provided in Punjab in 1968-69 was between US\$0.27 and US\$0.40 (Johns Hopkins 1976). But it was estimated that if Narangwal staff had received the same lower fringe benefits of the government personnel, if medicine and supplies had been bought from government stores, and if a major share of the food for nutrition supplementation had been donated by outside sources or collected from the villages, the per capita cost for the FPWSCC services could have been reduced by about

Table 8-3. *Average Cost per Service Contact for Different Services in Each Experimental Group (rupees)*

<i>Service</i>	<i>FPWSCC</i>	<i>FPWS</i>	<i>FPCC</i>	<i>FPED</i>
Child care	1.4	-	1.7	-
Nutrition ^a	0.25	-	0.32	-
Women's services	2.2	2.7	2.2	-
Maternity services	5.9	9.8	9.1	-
Family planning	3.8	5.8	14.4	10.9

- Not applicable or not available.

a. Cost per supplemental feeding.

half to US\$1.07 (Rs8.0), which is still about four times what the cost per capita in primary health centers was at that time. This must be balanced against the well-documented findings that the government services cover less than a quarter of the population for either maternal and child health or curative services (Johns Hopkins 1976). This would make similar the per capita cost for the population served, a conclusion backed up by calculations of cost per service contact.

Cost per Service Contact

The cost per unit of service for children's or women's services at Narangwal ranged from US\$0.19 to US\$0.36, compared with US\$0.21 per patient visit and US\$0.13 per maternal and child health contact in government primary health centers in 1968-1969 (table 8-3) (Johns Hopkins 1976). There were major differences in the achievements of Narangwal and primary health center services, but the costs per contact for both services were remarkably close.

Maternity care was expensive, ranging from US\$0.79 in FPWSCC villages to US\$1.21 in FPCC villages and US\$1.31 in FPWS villages. Family planning contacts were also expensive: US\$1.92 per contact in FPCC villages, US\$1.45 in FPED villages, US\$0.77 in FPWS villages, and US\$0.51 in FPWSCC villages. Part of the reason that costs in FPCC villages were higher was because services for child care and family planning were poorly integrated, with a male pediatrician in charge of the overlapping activities (NUTHC) of the nutrition project and a female physician in charge of family planning. The cost in FPWSCC villages approached the 1968-69 cost per family planning contact in

primary health centers (US\$0.33 or Rs2.5). The cost per supplemental feeding was US\$0.03 (Rs0.25) in FPWSCC villages and US\$0.04 (Rs0.32) in FPCC villages. Just as with cost per capita, FPWSCC villages consistently had the lowest cost per unit of services--again indicating the greater efficiency of combined services.

Expenditure on Nonproject Services

Despite government and project expenditures on health care services, the villagers still spent a large amount of money on health care. Information on such out-of-pocket spending was collected during the sample household survey and was combined with data on project and government expenditure to estimate total expenditure on health care per capita in project villages, including control areas. The findings in table 8-4 show that provision of project services permitted a reduction in the amount of money spent on health care by the villagers and by the government. Nonproject health care expenditure was US\$1.96 (Rs14.7) in FPWSCC villages, which had the most project services, compared with US\$2.96 (Rs22.2) in control villages and US\$3.51 (Rs26.3) in FPED villages, which had no project health care services.

Table 8-4. *Estimated Annual per Capita Expenditure on Health, by Source of Care, for Experimental and Control Villages (rupees)*

<i>Source of care</i>	<i>FPWSCC</i>	<i>FPWS</i>	<i>FPCC</i>	<i>FPED</i>	<i>CONT-P</i>
Government and other services	1.5	2.9	1.5	3.4	6.3
Private practitioners	13.2	15.7	16.5	22.9	15.9
Subtotal	14.7	18.6	18.0	26.3	22.2
Project services ^a	12.2	13.5	12.8	8.7	-
Total	26.9	32.1	30.8	35.0	22.2

- Not applicable or not available.

Note: Costs for government, other services, and private practitioners were estimated using data from the functional analysis project and the 1973-74 sample household survey (Yellow Book).

a. Excluding nutrition supplementation.

When the second two amounts are compared with the expenditure per capita (project and nonproject) in FPWSCC villages, it is clear that introducing the comprehensive package of women's and children's services (excluding nutrition) in Punjab villages cost only slightly more than the existing pattern of government and private services--US\$3.59 (Rs26.9) per capita a year, compared with US\$2.96 (Rs22.2) and US\$3.51 (Rs26.3). In contrast, total expenditure on each of the other service packages--FPWS, FPCC, and FPED--shows them to be somewhat more expensive alternatives. These data should be considered by planners who justify costs for government-sponsored primary health care on the assumption that private expenditures will be transferred to pick up costs. It is not simple to replace traditional patterns of care; in our situation we achieved a shift of only about a third in local funding.

Cost Effectiveness

Estimates of cost effectiveness were made from the data previously summarized on outcome and cost. The average family planning cost per new acceptor of a modern family planning method during the second year of services in FPWSCC villages was half that in FPWS villages and a third that in FPCC and FPED villages. If it is assumed that the average number of couples practicing family planning during the second year of services represents a full year of use by that many couples (a "couple-year" of use), the cost of using family planning was US\$10.27 (Rs77) per couple in FPWSCC villages. The cost per couple-year of use was 1.7 times more in FPWS villages, 2.4 times more in FPCC villages, and 2.9 times more in FPED villages. The ratios confirm the much greater efficiency of family planning services in the FPWSCC villages. If all health and family planning costs are included in the cost-effectiveness calculations, the picture changes considerably--with FPED services least costly, because there were no associated health costs. This comparison is only valid if one is not concerned about any output other than family planning.

One measure of health outcome used for the cost-effectiveness calculations was deaths of children under 3 years old. This was considered an indicator of the effect of child care. Average death rates for children of this age in FPWSCC and FPCC villages were compared with similar rates in the control villages to estimate the number of child deaths presumably prevented by project services. The cost of child care, including nutritional supplementation, was then related to this outcome measure to give the cost-effectiveness

ratios. The total cost attributable to each death averted was US\$749 (Rs5,616) in FPWSCC villages and a little more in FPCC villages. The closeness of the cost-effectiveness ratios for these two experimental groups was a surprise because services in FPWSCC villages had little effect on deaths of infants (under 1 year old), but those in FPCC villages had a much greater effect. At these levels of services, it would seem that reductions in infant mortality are directly related to the increased input, mainly a difference in the frequency of surveillance.

A more careful analysis used data from the nutrition study (Kielmann and others 1983) to identify the costs of services that most likely produced such outcomes as reducing morbidity, improving growth, and preventing death. These costs were determined by allocating part of the costs of nutrition and health care to the prevention of deaths in accordance with the proportion of children dying in control villages (age-specific mortality rates). The rest of the health care costs were then attributed to reducing morbidity, and the rest of the nutrition costs to improving physical growth.

For FPCC villages, which were also a part of the nutrition study (NUTHC villages), the costs per death averted are much lower than in the previous analysis because only a part of costs was counted as contributing to prevented deaths. Prevention of perinatal deaths required the least (US\$9.87--Rs74--per death averted); prevention of infant deaths cost four times this amount; prevention of deaths of children age 1-3 cost ten times this amount. As age-specific mortality rates declined over the first three years of life the cost of averting death increased. The cost per day of illness averted was fairly similar for infants and for children age 1-3--US\$0.53 (Rs4) and US\$0.40 (Rs3). Nutrition costs per additional centimeter of growth by age 3 were just under US\$27 (Rs200) per child.

In summary, these findings of cost effectiveness support conclusions about the greater efficiency of the integrated services in FPWSCC villages.

Equity in the Use of Project Health Services

Before the start of project health services another study had conducted surveys to collect data on the use of government and private sources of care in six villages that were also included in the population and nutrition studies. These surveys demonstrated a significant, direct relation between income and the use of health services.

Lower-income people used health services less than higher-income people (Johns Hopkins 1976, p. 134). Project services were designed, however, for all people in the study villages, with special concern for those with the greatest need (see appendix B). It was therefore important to find out whether we overcame preexisting disparities and improved equity in the use of project services.

Curative Services

Table 8-5 presents the coverage of women and children by services for illness care throughout the project. These services required a visit to the FHW's village clinic and were mainly initiated by patients. Use of services was categorized in three ways: no use during the project, use early (1969-71) or late (1972-73) in the project, and use throughout the project. The families were characterized by socioeconomic indicators, including caste, income, ownership of land, education of husband or father, and the possession of radios, bicycles, or sewing machines. The project services attracted all types of women and children almost equally. Women from landowning families and those whose husbands were better educated used women's illness services significantly more than other women. Other than that, there were no significant differences in use between different socioeconomic groups. But there was a small, consistent trend for women of higher socioeconomic status and children of lower socioeconomic status (except for education) to use services more.

Cross-sectional household surveys measuring the use of different sources of care (mentioned in chapter 4) also confirmed the equitable distribution of project curative services and the removal of disparities between women and children of high caste and those of low caste. The data from these surveys showed that 38 percent of illnesses of high-caste children were treated by project personnel, compared with 39 percent of all illnesses of low-caste children. Among women the proportion of illnesses receiving project services was 28 percent for high-caste families and 29 percent for low-caste families. Although project services were equally used by different castes, the use of outside sources of services by children in nonservice villages was similar by caste group: 35 percent for high castes, 34 percent for low. But in project villages, high-caste families (20 percent) continued to use outside sources of services much more than low-caste families (7 percent), producing a use rate significantly higher for high-caste children (56 percent) than for low-caste children (45 percent). Thus project services in many cases tended to

Table 8-5. Percentage of Families with Various Socioeconomic Characteristics Who Used Curative Services for Women or Children during Project (1969-73)

Socioeconomic characteristic	Women's services				Children's services					
	n	No use	Some use	Full use	n	No use	Some use	Full use		
Caste										
Low	477	15.9	16.2	67.9	} n.s.	476	12.0	21.2	66.8	} n.s.
High	912	11.6	17.0	71.4		801	13.0	23.0	64.0	
Income										
<Rs1,894	450	15.1	16.2	68.7	} n.s.	357	12.1	18.2	69.7	} n.s.
Rs1,894-6,500	326	12.0	18.4	69.6		396	12.4	25.0	62.6	
>Rs6,500	390	11.5	14.6	73.9		341	10.9	23.7	65.4	
Land										
No	578	15.6	18.0	66.4	} **	577	11.1	23.1	65.8	} n.s.
Yes	749	10.5	15.1	74.4		642	13.2	22.0	64.8	
Possessions										
<2 items	570	14.9	16.3	68.8	} n.s.	476	11.8	19.7	68.5	} n.s.
≥2 items	592	11.3	16.4	72.3		616	11.7	24.3	64.0	
Education of husband (grades passed)										
0-5	979	13.8	16.6	69.6	} *	827	12.8	21.9	65.3	} n.s.
≥6	394	8.9	20.6	70.5		438	9.8	23.1	67.1	

Note: "Some use" = use in 1969-71 or 1972-73; "Full use" = use in 1969-71 and 1972-73. On the chi-square tests, n.s. = not significant; * = $p < .05$; and ** = $p < .01$.

supplement outside sources of care for high-caste children, but they substituted for most outside sources of care for low-caste children. The pattern of displacement of other sources of care by project services among high-caste women and low-caste women was similar to that observed in their children. In nonservice villages, however, high-caste women used outside sources of services significantly more (34 percent) than did low-caste women (26 percent). The same was true for men who had access only to outside sources of services in all the project villages. The data therefore indicate that the project delivered services equitably, but that the demand for

continued use of other sources of care varied significantly by socioeconomic level.

Other Services

Most services other than curative services were initiated by the project. They include prevention and surveillance, usually in the home. Except for differences by caste, the proportion of women using these services varied slightly but not significantly by socioeconomic classification (table 8-6). In general, 10 percent or fewer never used the services. In addition, a greater proportion of low-

Table 8-6. Percentage of Families with Various Socioeconomic Characteristics Who Used Other Services for Women or Children during Project (1969-73)

Socioeconomic characteristic	Women's services				Children's services			
	n	No use	Some use	Full use	n	No use	Some use	Full use
Caste								
Low	477	7.1	16.0	76.9	476	16.0	21.6	62.4
High	912	10.9	18.5	70.6	801	22.6	33.2	44.2
				*				***
Income								
<Rs1,894	450	11.1	16.2	72.7	357	17.1	25.5	57.4
Rs1,894-6,500	326	6.2	19.9	73.9	396	19.7	29.0	51.3
>Rs6,500	390	10.5	16.4	73.1	341	22.6	34.0	43.4
				n.s.				**
Land								
No	578	8.3	18.3	73.4	577	16.8	25.7	57.5
Yes	749	10.2	16.8	73.0	642	22.9	32.7	44.4
				n.s.				***
Possessions								
<2 items	570	8.8	17.0	74.2	476	18.7	25.0	56.3
≥2 items	592	10.3	17.7	72.0	616	20.5	32.8	46.7
				n.s.				**
Education of husband (grades passed)								
0-5	979	9.0	17.7	73.3	827	21.4	29.3	49.3
≥6	394	8.4	14.2	77.4	438	15.5	28.1	56.4
				n.s.				*

Note: Use defined as in table 8-5. On the chi-square tests, n.s. = not significant; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

caste women used them, unlike curative services, which higher socioeconomic groups used more. The opposite was true for educational level: women whose husbands were better educated used other services more than women whose husbands were less educated. Use of children's other services must be interpreted with care because the services were primarily designed for children under age 3. Because the two time intervals in the project were short, it was difficult to fit observation intervals with the periods in which children were eligible to receive services. So the numbers did not match precisely for children who passed their third birthday during the project or were born in the second half of the project. It was shown in chapter 4 that in a given year more than 90 percent of the children under age 3 received other services. But because table 8-6 includes some families with children over age 3, the coverage of all families by these services at any time during the project is about 80 percent. Despite these limitations, it is apparent that families from lower socioeconomic groups benefited most from the project's preventive and surveillance services for children. The exception, as with curative services, is again related to the father's education: better-educated households used these services most. Although some of these differences can be explained by the higher number of young children in lower socioeconomic households, the main explanation is that these targeted services identified high-risk children and concentrated services on them.

Family Planning Services

Differences in preproject rates of "ever use" of modern contraceptives were significant among religion-caste groups, among education groups, among occupation groups, among age groups, and among family-size groups (table 8-7). The general pattern is that higher-caste, higher-education, higher-occupation, and larger family-size groups had greater rates of contraceptive use. The 25-34 age group had the highest rate, the group under 25 the lowest.

The difference in rates of contraceptive use during the project were less significant than the differences in preproject use. The exception was the age of wife: there was a reversal in the relations, with the youngest age group (under age 25) having a significantly higher use rate than the oldest group (over age 35). This reversal was obviously important demographically.

Couples recruited by the project were from three prior-use categories: users of traditional methods, users of modern methods, and

Table 8-7. Comparison of Preproject Use (Modern-Temporary and Permanent Contraceptive Methods) and Project Use Rates among Sociodemographic Groups

Sociodemographic group	No. of women	Preproject users (modern, temporary, and permanent methods)			Program users		
		No.	Per- cent	χ^2	No.	Per- cent	χ^2
Religion-caste							
Jat-Sikh	1,274	262	20.6	$\chi^2_{(2)} = 21.88$	584	45.8	$\chi^2_{(2)} = 0.49$
Scheduled Sikh	895	115	12.9	$p < .001$	421	47.0	n.s.
Others	419	77	18.4		199	47.5	
Education of husband (grades passed)							
0	1,417	215	15.2	$\chi^2_{(3)} = 49.0$	652	46.0	$\chi^2_{(3)} = 17.40$
1-5	294	51	17.4	$p < .001$	130	44.2	$p < .001$
6-10	624	134	21.5		336	53.8	
11+	83	36	32.4		50	60.2	
Occupation of husband							
Farming	993	178	17.9	$\chi^2_{(3)} = 42.85$	485	48.8	$\chi^2_{(3)} = 0.68$
Labor	632	70	11.0	$p < .001$	297	47.0	n.s.
Service	366	99	27.0		180	49.2	
Other	452	93	20.6		217	48.0	
Age of wife							
< 25	537	66	12.3	$\chi^2_{(2)} = 23.48$	280	52.1	$\chi^2_{(2)} = 99.5$
25-34	865	195	22.6	$p < .001$	494	57.1	$p < .001$
35+	923	165	17.9		318	34.5	
No. of living children							
< 3	890	105	11.8	$\chi^2_{(2)} = 42.25$	369	41.5	$\chi^2_{(2)} = 19.50$
3-5	1,047	227	21.6	$p < .001$	536	51.2	$p < .001$
6+	388	94	24.2		193	49.7	

nonusers. It was shown in chapter 3 that there were no socioeconomic differences in acceptors recruited from preproject users of traditional methods and of modern methods. More important than eliminating differences in the recruitment of prior users was the narrowing of differences among new recruits.

The sociodemographic characteristics of new recruits were distinctly different from those of the preproject users mainly because of considerable success in equalizing the distribution of new recruits to reflect general community characteristics. This is indicated by comparing preproject differences in table 8-7 with those of

new recruits in table 8-8. Table 8-8 shows that differences during the project are not significant, which is in marked contrast to the great differences ($p < .001$) among preproject users of modern methods. It seems extremely important for equity that the previous pattern of distribution has been reversed and that the low-caste group had a recruitment rate considerably greater than did the high-caste group ($\chi^2_{(1)} = 5.0, p < .025$). Differences according to occupation of the husband, highly significant for preproject users, were also eliminated. Education of husband maintained the same pattern of distribution as that for preproject users, with higher education being associated with higher family planning rates but at considerably lower levels of significance. In contrast to preproject users,

Table 8-8. *Sociodemographic Differentials in Recruitment into Project of Previous Nonusers of Family Planning*

Sociodemographic group	No. of preproject nonusers	No. of nonusers who became project users	Percent fresh recruitment	χ^2
Religion-caste				
Jat-Sikh	626	203	32.4	$\chi^2_{(2)} = 5.01$ $p = .084$
Scheduled Sikh	486	189	38.9	
Others	191	68	35.6	
Education of husband (grades passed)				
0	719	260	35.7	$\chi^2_{(3)} = 9.8$ $p = .020$
1-5	148	48	32.4	
6-10	286	129	45.1	
11+	25	10	40.0	
Occupation of husband				
Farming	498	191	38.4	$\chi^2_{(3)} = 1.2$ $p = .750$
Labor	341	132	38.7	
Service	165	60	36.4	
Other	202	70	34.7	
Age of wife				
< 25	314	147	46.8	$\chi^2_{(2)} = 82.9$ $p < .001$
25-34	373	169	45.3	
35+	460	91	19.8	
No. of living children				
< 3	551	186	33.8	$\chi^2_{(2)} = 2.6$ $p = .282$
3-5	435	167	38.4	
6+	161	54	33.5	

who mainly were older women, the project was able to get fresh acceptors at a considerably higher rate from among women under age 35. Only about 20 percent of the women over age 35 became users of family planning for the first time; but about 46 percent of women under age 35 did. The relation between preproject use and number of living children was significant. By contrast, fresh recruitment among groups with different numbers of living children ranged from 33.5 to 38.4 percent, but these differences were not significant.

Summary

Integrating family planning and health services proved efficient from several points of view. First, there was substantial saving in workers' time when services were combined. For integrated women's and children's services, there was a saving of between 20 and 34 percent in time spent on family planning services when compared with women's or children's services provided alone with family planning; a 35 percent saving in time for women's other services when provided with child care; and a 24 percent saving in time for children's other services when provided with women's services.

Second, integrated services were cost effective. The cost per new family planning acceptor was US\$12.27 (Rs92) in FPWSSC villages, twice that amount in FPWS villages, and three times that amount in FPCC and FPED villages. The cost per year of family planning use was US\$10.27 (Rs77) in FPWSSC villages, 1.7 times that amount in FPWS villages, 2.5 times in FPCC villages, and 3 times in FPED villages. When health costs were attributed to reduced mortality, improved morbidity, and better nutrition, numerous cost advantages were observed in integrated services.

An important achievement of the Narangwal Project was that it reduced preexisting disparities and improved equity in the use of project services. By providing services to those in greatest need, disparities in the use of health and family planning services by different castes, occupation groups, and educational levels were reduced. For example, 39 percent of the nonusers among the lowest castes became users of modern family planning methods during the project; the corresponding figures for other castes and for Jat-Sikhs are 36 percent and 32 percent. Before the project, use of modern methods of family planning was primarily a high-caste activity (Jat-Sikh, 20.6 percent; scheduled Sikh, 12.9 percent).

For health services, the use of curative services was essentially equalized among the different socioeconomic groups. It appears that the provision of curative services by the Narangwal Project made it possible for the low-caste group to shift to project services, whereas the high-caste group continued to use private services, but the disparity in total use of the services by caste was reduced. Project-initiated preventive and surveillance activities promoted equity because allocation was based on need. For children's other services, differences in use were shifted in favor of low-caste children, low-income families, landless families, and those with the fewest material possessions. Equitable coverage by women's other services was similar.

Appendix A

Method of Data Collection

Information was gathered from three main sources: cross-sectional surveys purely for research purposes, longitudinal data gathering in association with service and surveillance activities, and service input information. Each of these will be briefly described.

Cross-sectional Surveys

Censuses and Socioeconomic Data

Demographic and socioeconomic data were collected in three censuses of the study villages in 1967-68, 1971-72, and 1973 and in two socioeconomic household surveys at the time of the first two censuses. Villages in the family planning education group (FPED) were not included in the first round of either survey because these services did not begin until mid-1972.

Censuses. The first census was carried out after the study villages had been carefully mapped and households numbered. During the census interviews, all families in each household were identified and all resident members recorded. To be considered a resident, the member had to have been living in the village six months or to have expressed the intention to stay for six months or more. Special care was taken to ask about members who were temporarily away but were normally residents of the village. Systematic probing to determine the age of each individual was standardized by using village events calendars containing Indian months and all major national and local historical events. Reinterviews and cross-checks with other data sources showed that this method of determining age was quite reliable. Other information collected at the time of the censuses included marital status, education, occupation, and dates of migration, marriage, and births or deaths that had occurred between censuses.

Socioeconomic surveys. Social, economic, and other household data were collected in all households. Items in the survey included caste, religion, housing, sanitation, selected possessions (including land), nonland income (such as that from labor, service, and trade), and land (agricultural) income (available only on the second survey). When possible, socioeconomic interviews were with the senior man of the household because of the need for accuracy in getting details of the type of crops, yield, and market prices used in estimating agricultural income.

Attitudes and Beliefs

Attitudes toward family planning, specific contraceptive methods, survival of children, and family size at the beginning of the project provided an important part of the baseline data collected. Change was measured by repetition of this cross-sectional survey after two years of services. In FPWSCC villages a third round was carried out at the end of the project. Because FPED villages were included midway through the project, only one round of cross-sectional surveys was available for this experimental group.

Development of survey forms. Widely recognized difficulties in measuring attitudes and beliefs led us to adopt a cautious approach. There were no standard procedures that could be applied to the questions that we wanted to ask. We were especially conscious of the delicate nature of many important issues and of the possibility of inadvertently antagonizing village people, such as by questions on sensitive issues such as the death of a son. In addition to long-standing cultural blocks, we realized the need for special sensitivity to recent developments, such as the backlash to and rumors about the hazards of the intrauterine device (IUD).

This led to a sequential development of survey forms by our staff of Indian social scientists. The first stage was conceptualizing the questions to be asked. This was followed by an essentially anthropological exploration of the issues through discussions with a limited number of respondents. We then developed a structured format that was revised in several pretest field trials. The form was mostly prestructured and had only a few items permitting open-ended conditional responses related to reasons for particular opinions. A number of modifications were also made before the second round of surveys because of problems and gaps encountered in the first survey.

Data collection team. The major responsibility for conducting this part of the research was assumed by Indian social scientists on our staff. Six to eight field investigators were selected through newspaper advertisements and interviews. They were all young women and recent master's graduates in one of the social sciences--such as sociology, anthropology, geography, or social work. All were Punjabis, although only a few had come from a village. Their field orientation included discussions of the conceptual and intellectual bases for the research. They were given special orientation in the methods of interviewing village workers, which used such techniques as role playing. Intensive field supervision was provided by the social scientist responsible.

Data gathering. The data collection team went as a group to villages. The census had been used to give each village resident an identification number based on the house number. From the census, complete lists were drawn up of all women 15-49 years old. They were interviewed in their homes. The team of field investigators swept systematically through the village, covering all families. In the survey of attitudes and beliefs, each investigator was expected to interview four families a day.

Knowledge and Practice

Information on the knowledge and use of the various methods of family planning was obtained from all married women 15-49 years old at the same time as data were being collected on attitudes and beliefs and by the same survey team.

Questions about methods of contraception were in five categories: (1) never heard about the family planning method specified; (2) heard about the method but did not know how to use it; (3) knew how to use the method but never used it; (4) used the method earlier but not currently using it; and (5) currently using the method.

Pregnancy History and Present Fertility

The same team of social scientists and interviewers who carried out the surveys of attitudes, beliefs, knowledge, and practice was also responsible for interviewing all married women 15-49 years old about their pregnancy histories. This was done in conjunction with the other cross-sectional surveys, either on the same visit or close to the

other interviews. Details about all pregnancies, pregnancy outcomes, and infant and child deaths were obtained. Dates were carefully identified so that pregnancy intervals could be calculated. Additional information about the woman's current pregnancy status, age at marriage, age at cohabitation (*muklawā*), presence or absence of husband, and breast-feeding and delivery practices was obtained.

Longitudinal Data Collection

Family Planning Practice

Of the twenty-six villages covered by the Narangwal study, eleven never received family planning services; fifteen received services that started at different times. During the project, continuing information on contraceptive practice was obtained in all fifteen service villages. This was accomplished through a system of service records, special registers, and monthly reports maintained by village workers and their supervisors. The information that was recorded included methods of family planning used, dates of use, and reasons for changing methods or discontinuing use.

Fertility Survey

All married women 15-49 years old were routinely visited every other month in their homes by family health workers (FHWs) to find out their current fertility status. On each such visit, dates of the last menstrual period, confirmation of early pregnancy when appropriate, lactational status, and family planning status were entered on a special service record maintained for each woman.

Vital Statistics

Data on births, deaths, and marriages were obtained from 1969 through 1973 from the following three primary sources.

Chowkidar. The *chowkidar* is a village resident employed by the government as the only source of vital statistics under the official registration system. He has several responsibilities related to his title, "watchman," and often is illiterate. During the period of our study, the *chowkidar* continued to record all births and deaths in the study villages. These records did not, however, contain information on births or deaths to residents of the village that took place

outside the village: that is, the "outgoing" events. At first we confirmed the usual experience, that their records showed serious underreporting, but as soon as the chowkidars learned that others were recording births and deaths, there was a dramatic improvement in the quality of their reporting.

Vital statistics investigator. Vital statistics investigators were employed by the project to visit each village once in fifteen days and to contact about twelve key informants--such as barbers, shopkeepers, and village midwives--for information about births, deaths, and marriages (both incoming and outgoing, in the village and to villagers outside their village). The investigator then confirmed the information from members of the family involved. Each was a college graduate who traveled by bicycle to cover two groups of villages, or about 10,000 people.

FHW. The FHW was employed by the project and had primary responsibility for delivering health and family planning services. The FHW gathered information on births and deaths during her routine home visiting and during longitudinal surveys, especially as part of the fertility survey mentioned above. Because no services were offered in the control group, no FHW was available to gather vital statistics in these villages. Moreover, in villages receiving only family planning education (FPED), the duties of the family planning educators employed there by the project did not include the same intensive case finding and follow-up of pregnant women that was possible for FHWs as they delivered maternal and child care services. Thus data collection by workers in FPED villages may have been less complete than that by FHWs in villages receiving health services.

In addition to the continuous data collection, births were recorded in the cross-sectional surveys already mentioned--the pregnancy history and the population census. Before the end of the project in May 1974, a special retrospective survey was conducted to validate information on all births and deaths since 1970. Except for some differences in the timing of the pregnancy history and census surveys, these six different sources were essentially comparable for all the groups of villages.

Morbidity Survey of Children

In all villages associated with the parallel nutrition study (see Kielmann and others 1983), a morbidity survey was conducted weekly by

the resident FHW for each child up to 3 years of age. Based on the mother's recall, a detailed record was obtained of the incidence and duration of morbidity during the preceding six days as well as on the day of interview. Local terms were used in a standardized format to define illnesses according to a list of forty-four clinical signs and symptoms. A physical examination by the FHW--obviously limited to the day of the visit--supplemented the recall. For children who had been outside the village for more than fourteen days, recall data were collected for the preceding two weeks.

Anthropometric Measurement of Children

Anthropometric measurements (weight and height) were recorded in all ten villages of the nutrition project and in the four child-service villages (FPWSCC) of the population project. FHWs made these measurements at birth when possible and then at intervals conforming to the decelerating rate of growth of children over the first three years of life--so that in each period there would be an expected average weight increment of 250 grams. This schedule was worked out so that measurements were scheduled once every month for the first 9 months of life, once every two months between 9 and 21 months, and once every three months between 21 and 36 months. Measurements were taken on the day of the month corresponding to the birthday, plus or minus five days.

Service Input Information

Methods to measure service inputs had been developed earlier in the functional analysis project conducted at Narangwal and other sites (Johns Hopkins 1976). Four separate techniques of data collection were used by a separate team consisting of a statistician, a physician, and a group of field investigators with backgrounds in social science.

Work Sampling

This technique provided detailed information on the time spent by project staff during their village work. Investigators observed all categories of staff who provided services on specified sample days, recording functions and activities at two-minute intervals throughout the observation day. Each service staff member was observed on at

least twenty-four complete days during 1971 and on four to six complete days during the final five months of the project in 1973-74. Calculations were made of the minutes per week devoted to specific functions.

Service Record Analysis

Information was abstracted from individual service records for all years of the project (1969-74). This information included a description and count of all project services received by individuals in the study population.

Sample Household Survey

About 20 percent of study households in early 1973 and 10 percent of the study households in early 1974 were interviewed in a special survey to determine their use of services, especially those provided by sources other than the project (such as private practitioners, traditional healers, or government services) and all out-of-pocket expenditures related to this use.

Cost Analysis

Detailed accounting of all costs related to the provision of services for each year of the project was carried out. Work-sampling data and other information were used to allocate these costs to specific activities and services and to calculate costs per unit of service, costs per capita for specific services, and cost-effectiveness ratios. Research costs were carefully distinguished from service costs.

Appendix B

Description of Project Services

A major goal of the Narangwal effort was to develop an effective service model combining health care and family planning for wider application with appropriate adaptation to new settings.

Framework for Integrated Services

Early in the project some crucial decisions were made about the framework of the services: to use the existing regionalized pattern in India and thereby make it easier to apply the results elsewhere; to concentrate on bridging the gap between health services and people's homes in providing primary care; to provide most services to women and children and only limited services to men; and to refrain from including such mass programs as malaria control or other services covered by national programs of the government. Integration of all basic health services at the village level was considered to be a more appropriate undertaking for subsequent demonstration projects.

There were many reasons for assigning a high priority to services for women and children:

- The official policy of the Indian government was to integrate maternal and child care services with family planning.
- The greater mobility of men made it relatively easy for them to leave their villages to seek medical aid in government primary health centers or from private practitioners of all kinds.
- The likelihood was that allocating scarce resources to intensive home contacts would make it possible to concentrate on the children, who account for about 40 percent of the village population, and on women of reproductive age, who account for 20 percent. We assumed that this focus would produce a measurable effect on health and fertility. Further concentration of effort

was possible by selecting high-risk individuals among children and their mothers through surveillance techniques to target services for those at greatest risk.

- The research objectives were to test hypotheses related to the health of mothers and children.

The services were organized according to the following underlying principles:

- As much responsibility as possible would be delegated to those with little training, especially to family health workers (FHWs), the indigenous midwives (*dais*), village attendants, and the families themselves.
- Medical diagnosis and care would be moved as close as possible to the village home and in a setting appropriate to the village environment. An essential aspect of this was to have FHWs live in the villages where they worked.
- The service system would provide good communication and medical back-up for referral.
- Rather than only on waiting for serious illnesses to develop, the emphasis would be on providing preventive services, home contacts, and early diagnosis and care.
- A major investment would be made to get complete coverage through surveillance but not to force compliance with mass procedures for control. For example, regular weighing and measuring of children would be a basis for identifying faltering growth, and nutritional supplementation would then be focused on those in need rather than on trying to cover all children. Similarly, intensive prenatal screening would be a basis for identifying high-risk pregnancies, so that normal deliveries could continue to be handled by *dais*.
- Routine supervisory checks would be supportive and educational so as to maintain the motivation of workers and the quality of services.
- Particularly important would be continuing education of all members of the health team through regularly scheduled programs of in-service training and the development of field manuals.
- Community participation would be encouraged in planning and implementing services, with village leaders involved in substantive decisions.

In developing services, we followed the cycle of starting with a clear idea of the simple procedures we wanted to develop, but to test all possible alternatives we used whatever complex procedures of research were appropriate and then devoted great effort to returning to the simple and streamlined approaches for implementation. As services were being developed early in the project, new components and programs were gradually added, enlarging the scope and complexity of services. About midway through the project, a conscious effort was made to trim away unnecessary components of services--with the ultimate goal of developing the simplest model possible in line with realistic cost and manpower constraints. This process was still in progress at the end of the project.

Because of this evolution of service packages, it was impossible to plan and implement all the experimental service inputs at the start. Children's health and nutrition services were tried out and implemented first, followed by women's services and family planning. Table B-1 lists the approximate starting dates for all the major service components by village and experimental group. These dates refer to the time when the preliminary development of the initial service packages was considered far enough along so that fairly complete services were reaching the village people. But the services continued to evolve after these dates.

Children's Services

In rural Punjab and in most areas of India, children under 3 years old bear the brunt of most of the mortality, morbidity, and malnutrition. This includes the neonate, whose immediate well-being may be determined by the health and nutritional status of the expectant mother. The program of child care provided intensive care to children under age 3 and episodic coverage to children age 3-15. Intensive care included routine surveillance of morbidity, nutrition, and development; immunizations; nutritional supplementation; and curative care. Episodic coverage for older children was primarily curative care in subcenter clinics at the initiative of the family when the child was ill.

As data from ongoing surveys were analyzed during the project, particular attention was devoted to developing criteria for defin-

Table B-1. *Effective Starting Dates of the Major Service Components in Each of the Experimental Groups of Villages*

<i>Experimental group/village</i>	<i>Children's services</i>	<i>Women's services</i>	<i>Family planning services</i>
<i>FPWSCC</i>			
Ballowal	Sep. 1968 ^a	Jan. 1969 ^a	Sep. 1969 ^a
Chaminda	Sep. 1968 ^a	Mar. 1969 ^a	Sep. 1969 ^a
Dhaipée	Sep. 1968	Feb. 1969 ^a	Sep. 1969 ^a
Dolan Kalan	Mar. 1969	Oct. 1969	Oct. 1969
<i>FPWS</i>			
Sekha	-	Feb. 1969 ^a	Sep. 1969 ^a
Uksi-Dudhal	-	Apr. 1969 ^a	Sep. 1969 ^a
Chomon	-	May 1969	Sep. 1969 ^a
Kishanpura	-	Mar. 1970	Mar. 1970
<i>FPCC</i>			
Mansuran	Sep. 1968 ^a	-	Dec. 1970
Rattan	Sep. 1968 ^a	-	Dec. 1970
Saya	Sep. 1968	-	Dec. 1970
<i>FPED</i>			
Rajoana Kalan	-	-	June 1972
Rajoana Khurd	-	-	June 1972
Barmi	-	-	June 1972
Littar	-	-	June 1972

- Not applicable.

a. Villages in which preliminary development of the different service components had been worked out and tried before the date shown.

ing a high-risk child. This knowledge was used to establish regular routines so that FHWs could identify these children for close surveillance. Some characteristics associated with high risk were:

- Low socioeconomic status of the family
- Low birth weight or prematurity
- A female child, especially when there was more than one in the family
- Between 8 and 18 months of age
- High birth order.

The components of children's services that were applied in villages according to the experimental design were as follows:

Prenatal Care

Tetanus toxoid immunizations and iron and folic acid tablets were routinely provided to pregnant mothers as an integral part of child care. Underweight, poorly nourished mothers also received supplemental feedings at the discretion of the FHW.

Neonatal Care

Newborns were checked and weighed by the FHW as soon after birth as possible. Repeat postnatal visits at 24 hours and at 2, 6, 9, 14, and 40 days of age were made on the same scheduled visits as for postpartum care. All neonates with problems or those weighing less than 2,500 grams were referred to a physician for evaluation.

Monitoring and Early Care

Underlying all the health services was the general principle of surveillance, in that much effort was devoted to monitoring for morbidity and faltering growth. Care then was provided early and was highly focused on those in need. Each child was checked regularly at home in a systematic sequence. This involved a history and review of symptoms, examination of the child, and checking for milestones in psychomotor development. Health education was given to the mother as needed. These visits were monthly during the first year of life and then gradually reduced in frequency to quarterly visits in the third year. No routine checks were made after age 36 months unless there was a specific problem to follow up.

In the FPWSCC villages, visits during infancy were monthly, but midway through the study this was changed to seven visits spaced after the last postnatal visit. (See table B-2 for the timing of these visits, their content, and their relation to women's services.) In the FPCC villages, however, a weekly morbidity survey was part of the data collection for the parallel nutrition and health study. This took the place of the health check. During the last year of the study, after the Narangwal Nutrition Project was completed in May 1973, the frequency of visits in these villages was reduced to a visit every two weeks during the first year of life and then according to the pattern of the FPWSCC villages over the next two years.

Surveillance was also the basis for regular measurements of weight and height to monitor health and nutrition. Children were weighed and measured as part of the health check. Mothers of older

Table B-2. *Coordination of Routine Children's and Women's Services after the Neonatal Period*

Child's age (months)	Children's services				Women's services		
	Health check	Weight	Diet survey and advice	Immuni- zation	Mile- stones	Fer- tility check	Post- natal
1½	x	x	x	-	-	-	x
3	x	x	x	-	x	x	-
5	x	x	x	x	-	x	-
6	-	-	-	x	-	-	-
7	x	x	x	x	x	x	-
8	-	-	-	x	-	-	-
9	x	x	x	-	-	x	-
11	x	x	x	-	-	x	-
13	x	x	x	-	x	x	-
15	x	x	x	-	x	x	-
17	x	x	x	-	-	x	-
19	-	-	-	x	-	x	-
21	x	x	x	-	-	x	-
23	-	-	-	-	-	x	-
25	x	x	x	-	-	x	-
27	-	-	-	-	-	x	-
29	x	x	x	-	-	x	-
31	-	-	-	-	-	x	-
33	x	x	x	-	-	x	-
35	-	-	-	-	-	x	-
36	x	x	x	-	-	x	-

x Applicable.

- Not applicable.

children were encouraged to bring them to the clinic also for periodic measurements. Children who were identified as faltering in their weight increments or were below the expected growth curves were referred to a physician who checked for possible illnesses before they were started on regular supplementation in the feeding center.

Weight-for-age charts based on those developed by Dr. David Morley were used to monitor growth of each child. Curves were printed on weight charts indicating the ranges for malnutrition as follows:

- *First degree*: between 70 and 60 percent of the fiftieth percentile of the Harvard standard weight-for-age

- *Second degree*: between 60 and 50 percent of the Harvard standard
- *Third degree*: below 50 percent of the Harvard standard.

Plotting the child's weight on this chart at each visit made it easy to identify whether children were attaining the expected increments in weight for their age, as well as whether they were in one of the malnourished groups. At first, a major effort was made to focus supplementation on third-degree malnutrition and then to eliminate progressively second- and first-degree malnutrition. It was found, however, that it was better eventually to prevent all malnutrition because the third-degree cases tended to recur. It was observed that these hard-core cases were mostly high-parity female babies.

Smallpox and three DPT (diphtheria, pertussis, tetanus) immunizations were routinely given before the ninth month. Polio, BCG (tuberculosis), and measles immunizations were provided during special campaigns in project villages. At various times, smallpox vaccinations were given by the FHW, the family planning worker, or the government vaccinator. DPT immunizations were first given by a team--to get quick coverage of all the children--and then the program was shifted to a maintenance routine, with the FHW providing the immunizations.

Nutrition Services

Detailed information on these services is given in the companion volume (Kielmann and others 1983). At the time of each health check, the dietary history of the child was determined and the mother was given appropriate advice about feeding. Early weaning was discouraged both in direct advice to the mother and in special group meetings organized as special education sessions. When the child reached 4 to 6 months of age, supplementation of breast-feeding was encouraged with appropriate, locally adapted weaning foods in gradually increasing amounts.

Feeding centers were organized as part of child care to provide supplementary feeding to children identified as faltering in growth. Village women were trained as feeding center attendants. Such children were given food supplements in the feeding center twice a day. If they did not attend, a village attendant took the food to the home and supervised the feeding. Siblings who took responsibility for bringing younger children were fed, too, if they wanted some of the supplement. The supplement at first consisted of a drink

of skimmed milk powder fortified with sugar and oil to increase the caloric content; a gruel of cracked wheat, crude sugar, oil, and skimmed milk; or both. During the last two years of the project, combinations of corn-soya-wheat or corn-soya-milk were mixed with oil and crude sugar in the form of various traditional dishes to replace the gruel. All these foods were accepted by most children. Iron, folic acid, and vitamins were routinely added to the feedings.

Day Care Centers

During harvest seasons, day care centers were organized on an experimental basis in some villages for children under age 3. The centers lasted for four to six weeks during the most intensive work period. While the mothers from poorer families were working all day in the fields, the children were cared for and fed by village attendants under the supervision of the FHW.

Curative Care

The FHW identified illnesses either during a home visit or when the child was brought to the clinic. Histories were taken, examinations performed, and treatments provided or referrals recommended, according to specific guidelines contained in manuals and standing orders. The standing orders were modified as FHWs demonstrated increasing ability to handle most of the medical problems that could be treated on an ambulatory basis. Children with serious illnesses or with symptoms clearly defined in standing orders as requiring referral were seen by a physician at the weekly visit. If necessary, and if the parent could not take the child to project headquarters, the physician made an emergency house call to see the child in the village.

Hospitalization depended on the physician's recommendation, and patients were sent either to the teaching health center of the Ludhiana Christian Medical College, located next to the project headquarters in Narangwal, or if necessary to the Medical College's hospital in Ludhiana, 20 miles away. This system was set up to replicate the government's regionalized pattern of care in subcenters, primary health centers, and subdistrict and district hospitals. As the project progressed, it was discovered that more and more cases that would originally have been hospitalized were more adequately treated at home in the village. This was especially true for children with third-degree malnutrition who did not respond rapidly to sup-

plementation. In the long run these children did as well with village nutrition services as with intensive rehabilitation in a hospital or health center.

Children's services were carefully integrated with other services provided in the villages. Women and children in the same family were treated together in the home or the clinic. Family planning advice was given according to the "entry points" outlined at the end of chapter 2 (the section "Framework for Implementing Integrated Services"). Careful planning, coordination, and timing of all these services were required to assure the most efficient use of precious home-visiting time. Special reminder cards were developed for each family to show when each visit was due and what activities were appropriate.

The reminder cards were an integral part of the family folder, which included all records of women and children in each family. An index card for each child was filed separately to help locate the appropriate family folder. The folders included the weight chart, routine visit cards for the health check, and patient cards for curative services. Research data were collected on special record forms for morbidity, anthropometry, diet, and feeding. Index cards of children requiring special surveillance (such as severely malnourished children) were kept in a high-priority file so these children could be more intensively monitored. For some time, weight cards were also kept by the mother, but this produced unnecessary duplication. The chart in the clinic record provided an effective audiovisual device for educating the mother. If this had not been a research project, we would have recommended that the family retain the weight card.

Women's Services

In integrated care, the women and children were treated as a unit. This overlap was most apparent when prenatal services were provided as an integral component of children's services. For maternity care, the FHW did not try to replace the role of the traditional birth attendant (dai) but cooperated with her in improving delivery practices. She involved the dai as much as possible in antenatal and postnatal care. Many of the services to women involved a cyclical pattern of pregnant and nonpregnant states, and the routines for identifying potential high-risk cases were important. Since emer-

gency obstetrical cases can rapidly lead to disastrous complications, there was special need for prompt support for the FHW and for immediate referral to well-equipped hospital services.

Fertility Surveillance

Each potentially fertile married woman was visited every two months to record the dates of her menses, to detect early pregnancy, and to screen for symptoms of illness, especially gynecologic disorders. This visit was a central activity in scheduling home visits and maintaining the link between the FHW and the village women.

Antenatal Care

When a pregnancy was identified at the time of a routine bimonthly visit, care was started with an antenatal check at the visit and was continued through four more successive visits at the home or in the clinic (at roughly 22, 34, 36, and 38 weeks of pregnancy). The services included measuring weight, height, and blood pressure, performing an abdominal examination, and testing urine and hemoglobin. The tests were done in the subcenter by the FHW. Routine treatment during the pregnancy included provision of iron, folic acid, medication for intestinal parasites if needed, two tetanus toxoid immunizations, and health and nutrition advice. Occasionally, pregnant women received nutritional supplementation on the recommendation of the FHW or physician. On the last visit, the FHW and the dai would go to the woman's home to review all arrangements for the delivery. In addition, risk categories were reviewed to anticipate and prepare for possible complications at the time of delivery. An important part of antenatal care was the classification of women in four categories of risk:

- Normal
- Abnormality in present pregnancy (such as twins or breech position)
- Previous obstetrical complications
- Unfavorable age, parity, or stature (below a specified height).

Appropriate management of the three high-risk categories was decided by the physician to whom any patient meeting these criteria was referred.

Labor and Delivery

The families and the attending dai were instructed to notify the FHW at the onset of labor. The FHW was prepared to attend the labor and delivery if it did not appear to be progressing normally. She did not attempt to observe the process continuously but made repeat visits to monitor progress. The FHWs used a list of danger signals during labor to decide on appropriate management and to determine whether to call for consultation. Physicians were provided with special emergency obstetrical kits for use in such emergencies. At the time of labor and delivery, and during antenatal and postnatal visits, the FHW consistently tried to improve the knowledge and skills of the dai. Emphasis was placed on teaching dais the danger signals of labor and the indications for referral. A more intensive training program, along with special procedures to incorporate the dai even more into the team structure was being developed when the project ended.

Postpartum Care

Along with visits for neonatal care of the child at 24 hours and at 2, 6, and 9 days postpartum, the mother's uterine involution, vital signs, and lactation were checked. Follow-up visits were coordinated with child care on the second and sixth weeks and seventh and ninth months postpartum. Special attention was given in these visits to maintaining lactation.

Curative Services

Women of all ages were provided care for illnesses either in the subcenter clinic or during a home visit, although the latter was discouraged unless the problem precluded travel by the woman. As with child care, standing orders and guidelines were used by the FHW to obtain histories, to examine the woman, and to give appropriate treatment or to arrange referral cases to the physician. Hospitalization or referral to the health center or specialty clinics at the hospital was provided when needed. The women's service component was qualitatively identical in both groups of villages receiving women's services (FPWSSC and FPWS).

The record system for women was similar to that for child care and included an index card, a high-priority file, a reminder card, a routine visit card (fertility survey), and a clinical record card. In

addition, a special record was used to collect pertinent information from previous and current pregnancies, including antenatal visits, labor and delivery care, and postnatal visits. These were all kept with the children's cards in the family folder.

Family Planning Services

Family planning services in all the experimental villages included education and motivation about the use of contraceptives both to limit family size and to space children, providing contraceptive services, and follow-up of users. At the beginning of the study, family planning education and motivation were done in a low-key way. It was thought that previous adverse reactions by villagers to government family planning campaigns, and the backlash from the mass IUD campaign, necessitated a cautious approach while developing rapport and understanding between the project staff and the villagers. We let people know that contraceptives were available and provided family planning without aggressive education to those who requested it. After other services were well established, FHWs were encouraged to discuss family planning with women during contacts for other services. At first, it was left up to the FHW to sense appropriate times for such discussions. When a potential acceptor was identified, advantages and disadvantages of various methods were discussed. But no pressure tactics were used, and no monetary or other incentives were offered. Nor were targets set for the FHWs. Specific routines were gradually established to follow up on acceptors. It became apparent that appropriate subjects and occasions when advice on family planning could be introduced were not easy for a young (frequently unmarried) FHW to recognize. A special effort was then organized to formulate guidelines for the FHW to use other service contacts in order to introduce family planning advice and motivation. Specific occasions were identified when family planning workers had to discuss family planning ("entry points"). In addition to the FHWs, a male family planning worker was engaged in promoting family planning among the men.

Systematic Family Planning

At first, FHWs were trained to recognize and offer standardized advice at eight entry points during the women's care cycle. This later was expanded to fourteen by incorporating other occasions re-

lated to the care of children. Because many women's and children's services overlapped, these entry points also frequently coincided. The FHW was expected to combine educational messages appropriate to these entry points. (See the list of entry points at the end of chapter 2.)

The frequency and content of family planning advice depended on the women's reproductive history, family socioeconomic conditions, family health, and prior attitudes toward family planning. Especially important was the use of a family planning profile developed for each eligible woman--a profile the FHW used to determine the intensity of encouraging the limitation or spacing of children. This profile was based on the number of living children, sex of living children, elapsed time since the last pregnancy, spacing, occurrence of abortion or family planning failures, and health of the mother. At first these were grouped into "high," "medium," and "low" profiles. Women with a high profile received the most frequent and intense advice emphasizing limitation. The profiles were streamlined toward the end of the project to include only high and low categories. The final criteria of a high-profile woman consisted of one or more of the following:

- A chronic illness
- An induced abortion or family planning failure within the previous two years
- Three or more living children with at least two sons and less than five years since termination of the last pregnancy
- Less than three living children with less than two years since termination of the last pregnancy.

The FHWs rapidly learned to classify women appropriately, but they were also encouraged to use their judgment to determine when additional advice could be given. A round, clocklike device was developed to help FHWs remember when to give the appropriate advice. This device was used until the FHWs were able to use the entry points reflexively. In the final form, entry points were used consistently by experienced FHWs but with some flexibility permitting more frequent or less frequent advice, depending on their judgment of need and on the situation of the home visit. For example, if male members of the family were present at the time of an entry point, advice or discussion was often postponed until the next opportunity to see the woman alone, or the occasion was used as a means of encouraging discussion between the husband and wife about family planning.

Provision of Contraceptives

The contraceptive methods made available to all potential acceptors included condoms, foam tablets, diaphragms and spermicidal cream, oral pills, injectable Depo-Provera (provided by Upjohn Pharmaceutical Company), IUDs (the Lippes 27.5-millimeter loop and the "Taviti," a shield-shaped polyethylene device developed at Narangwal), sterilization of males and females, and instruction in the rhythm method. After the introduction of liberalized abortion laws, assistance was provided to women seeking induced abortions. Because of Punjabi regulations, both abortions and sterilizations were performed in accredited private or government hospitals or periodic camps to which the acceptors were referred and given transport assistance. All the other methods were provided by resident FHWs or at the time of the project physician's weekly visit to the subcenter.

All contraceptive methods were discussed with potential acceptors, with the worker helping the couple choose the most appropriate methods after a screening history and examination. Recommendations for a method other than that chosen spontaneously by the acceptor were made only if there were medical or social contraindications. For example, pills were not given during lactation, but Depo-Provera was used as an interim measure because it does not interfere with lactation. Depo-Provera was not, however, suggested for prolonged use, unless the couple was relatively certain that they had achieved their desired family size. Sterilizations were not urged unless the couple had two living sons, because of the strong cultural bias in favor of sons.

Conventional contraceptives, including condoms and foam tablets, were dispensed by FHWs, family planning workers, and family planning educators. Diaphragms, used very infrequently, were fitted by the physician. At first pills, injections, and IUDs were given only by the physician after examining the acceptor. In the final year of the project, the FHWs were taught to dispense pills and to insert IUDs after completing a checklist and examination. If the checklist and examination were entirely negative, the FHW could proceed on her own; any positive findings on the checklist or in the examination required referral to the physician for evaluation. Although a similar pattern was judged feasible for injections, it was carried out only on a few occasions. The reason was that more caution was needed because Depo-Provera was a drug that was still undergoing clinical testing by the government.

Follow-up of Contraceptive Users

FHWs followed up on contraceptive users in the clinic and the home. Encouragement and support were the main themes in follow-up, but it was also considered important to identify the rare complications early so as to limit the spread of rumors. Schedules for follow-up visits varied as follows.

Conventional contraceptives. Inquiries were made at each home visit at the time of the fertility survey (every two months). Supplies were dispensed at that time by the FHW. Alternatively, the male family planning worker distributed supplies (condoms) on his routinely scheduled visits.

Oral pills. Users of oral contraceptives were visited once a month for three months and thereafter every two months at the time of the fertility survey. Enough supplies were provided to last until the next visit, and careful inquiries were made about the manner of taking pills, any menstrual abnormalities, or other possible side effects. The FHW checked supplies to verify that the pills had been taken before providing subsequent pill cycles.

Depo-Provera. Monthly follow-up visits were carried out during the initial three months and then every three months at the time repeat injections were due. Examinations and inquiries were similar to those for pill users. The weight and blood pressure of women was also checked. Because of frequent prolonged amenorrhea associated with Depo-Provera, oral estrogen therapy was provided for ten days each month to induce withdrawal bleeding if this was of concern to the woman.

IUDs. Acceptors were checked one week, one month, and three months after insertion of IUDs. Thereafter the follow-up was coordinated every four months with the fertility survey. At each visit an inquiry was made whether the patient could still feel the threads of the IUD and whether she had any adverse symptoms, such as cramping and bleeding. If there was any question about the IUD's being in place, the FHW or the physician checked it in a pelvic examination.

Sterilization. After vasectomies, the man was visited by the FHW to find out whether any complications had developed and to make sure the man understood the need to continue another family planning method until his semen was checked and found to contain no sperm.

When tubectomy cases returned to the village, the FHW made frequent visits to check the wound and change the dressing until the incision healed.

Male Family Planning Motivation

The combination of family planning with women's and children's services produced a family planning program centered on women. It was thought, however, that family planning contacts with men, unlike health services that men could seek elsewhere, were essential to provide adequate coverage for the couple. This was especially true because the husbands were culturally considered the principal decisionmakers in family planning. To provide special coverage for men, male family planning workers were employed to supplement the activities of three or four female FHWs, depending on the size of the villages. The male worker routinely visited all husbands in study villages--to motivate them to use contraceptives, to supply condoms to acceptors, and to follow up users. An important aspect of the village visits by male family planning workers was to discuss problem cases with the FHW and to coordinate the motivation of both husband and wife in resistant cases. The work load of the male family planning worker was organized so that he could spend all his time on family planning. On occasion, however, he assisted the FHW in organizing programs for smallpox vaccination and other immunizations.

Family Planning Education

The provision of family planning services in FPED villages was similar to that in other study villages with respect to delivery of contraceptives and the follow-up of users. These two activities, however, were carried out primarily by one family health supervisor, who served all four villages, and by one physician, who was available for supervision, referral, and consultation. The major difference in the FPED villages was that home visiting was limited to family planning education, that frequent group education meetings were organized, and that no health services were provided. The FPED village workers were called family planning educators: they were junior basic teachers, a category of village teacher with essentially the same total amount of educational preparation as auxiliary nurse midwives. To give structure to the home visits, a sequence of discussion topics was developed for family planning educators to use in routine visits to each eligible woman about once a month. When

an acceptor was identified, she was referred to the supervisor or physician for contraceptives. To supplement home contacts, group meetings of women were organized to discuss aspects of family planning. After specific family planning issues had been covered, a sequence of general development topics was introduced that stressed ways in which women could improve conditions for themselves and their families. These meetings proved useful, and before the end of the project similar meetings were being organized in all the study villages according to the pattern developed in FPED villages.

Family Planning Records

In villages with women's services, all family planning visits were recorded on the women's patient records. If advice was given at the time of an entry point, special notation was made in the space provided on the form. In the FPCC and FPED villages, a special family planning record was used because services were separated. In addition, the family planning workers and educators kept separate records on motivational possibilities for each man or woman visited. Lists of all acceptors as well as a special index file of all users were maintained to ensure adequate follow-up.

Staffing of the Service Programs

The basic staffing pattern of the Narangwal services consisted of one female FHW assigned to each village subcenter, one male family planning worker for every three or four female workers, and one female family health supervisor for every three or four female workers. In addition, public health nurses provided overall supervision of the female field workers, with one nurse generally responsible for eight or more village subcenters when services were originally developed. The number of villages covered was progressively increased. Physicians participated in the coordination and supervision of services and provided service back-up to FHWs by weekly visits to each subcenter and by being available for emergencies. A male social scientist supervised the male family planning workers. Each subcenter served one village with an average population of 1,300 to 1,500. Modifications to this pattern were made in the experimental groups and included the following.

In the FPWS villages four subcenters were served by the FHWs, but one subcenter covered two smaller villages. The FPCC villages were

also included in the nutrition and infection study (as NUTHC villages; see Kielmann and others 1983). Five FHWs worked in the three villages because a major part of their research responsibility included a detailed morbidity survey, which took considerable additional time. There was, however, no family health supervisor because the additional research effort required that the workers have training equivalent to the supervisors in other villages. A public health nurse provided direct supervision to the workers in these villages. In May 1973 the field work of the nutrition project was completed, and thereafter one worker served each village in a pattern similar to that for FPWSCC villages. In addition, in the first two years of family planning services in the FPCC villages, one full-time and one half-time male family planning worker provided services to the men. This was reduced to one worker in 1973 to bring services in line with those in the other experimental groups.

For approximately one year in 1972-73, only one family health supervisor was available to cover both FPWSCC and FPWS villages. During this time she supervised all seven FHWs. Although this restricted her involvement in research, it provided an opportunity to observe the feasibility of greater service coverage by the supervisor, and the coverage seemed adequate.

In 1973 one of the more experienced male family planning workers was given responsibility for additional group education in all study villages. This consisted of helping the other family planning workers organize group meetings and film shows. The FPED villages had staffing ratios similar to other villages, except family planning educators replaced FHWs. In addition, there was one family health supervisor to provide contraceptive services for the four villages, but she was not the direct supervisor of the family planning educators.

The staffing pattern for public health nurses and physicians varied depending on the number available and the intensity of their research activities. It was greatest at the beginning when the services were first being developed and was decreased as efforts were standardized. The ratio of physicians and public health nurses to subcenters varied from 1:4 to 1:8. Most important was a frequent lack of lady physicians to supervise both child care and family planning activities. The FPWSCC, FPWS, and FPED villages had lady physicians most consistently. During the last year only one lady physician was available, and she had to divide her time among all groups of villages. As a result, male physicians on several occasions provided all services except gynecology and family planning. In the FPCC vil-

lages especially, this dual coverage--by a male physician for child care and a female physician for family planning--proved necessary for most of the study and made integration of services difficult. Another variation was that a nurse with special training in family planning served as a physician substitute during the last year of the project. At one time or another, she backed up family planning services quite adequately in all villages of the project.

An important requirement for all three types of peripheral workers (FHWs, family planning workers, and family planning educators) was the availability of "relievers." These were reserve workers of the same category who filled in when regular workers were on leave. This provided a continuity of field work, continuity considered essential for collecting research data and for making services more consistent and more credible to villagers. Such a system should be used mainly for large blocks of leave (such as maternity leave) if government manpower is limited.

In each village with children's services (FPWSOC and FPCC), two local women were hired to assist the FHW in feeding centers and in home follow-up. These full-time village attendants were directly supervised by the FHW.

Background, Selection, and Role of Different Categories of Staff

To make project findings relevant to implementation in government services and to conform with government regulations, all service staff met the criteria of workers in government health services. The few modifications were in flexibility to expand their service responsibility and to collect research information.

FHWs

Two types of health workers were recruited for this position. In the FPWSOC and FPWS villages, they had received standard government-prescribed training as auxiliary nurse midwives. This training consisted of two years of hospital and field training after eight to ten years of basic education. The emphasis was mainly on hospital midwifery. In the FPCC villages, the FHW was a lady health visitor, which meant that she had received two and a half years of training beyond the tenth grade. The field and public health aspects of their training were more intensive than those of the auxiliary nurse mid-

wives. The slightly greater academic qualifications of the lady health visitor were considered necessary because the requirements of gathering data for the morbidity survey were particularly demanding.

All FHWs were recruited through newspaper advertisements and selected by an interview and the results of a nonverbal intelligence test (Raven's Matrix Text). Final selection was based on their performance during training. Reading and writing ability in English was required because research data were recorded in that language, but the ability to converse in English was not essential. All field workers were fluent in the local Punjabi. From project experience we learned that workers with little experience were more receptive to retraining in new service patterns than those with experience in government health centers. The FHW was the primary health worker in each village--providing both home and clinic services as required by the project design. She also referred cases to the family health supervisor, public health nurse, and physician.

Family Planning Educators

The background of family planning educators was matched as closely as possible with that of the auxiliary nurse midwives, except that they were trained as teachers, not as health workers. Females of similar age and general education with two years' training as junior basic teachers were selected in a manner similar to that of FHWs and were retrained for their new roles. The educator's command of written English was often not as adequate as that of FHWs (because of differences in their previous medium of instruction), so all their records were maintained in Punjabi or Hindi. The educator worked mainly in family planning motivation but did offer some specific contraceptive and follow-up services in addition to referring cases to the family health supervisor and physician.

Male Family Planning Workers

Men with a high-school degree or undergraduate college degree were selected as male family planning workers. No formal health training or experience was required. Selection was based on criteria similar to those for FHWs, except that emphasis was placed on apparent maturity and presumed ability to relate and communicate with village men. The worker was expected to develop good relations with the men in study villages to educate them about family planning

and to motivate them to use contraceptives. They also supplied condoms and made follow-up visits to the husbands of all contraceptive-using couples.

Family Health Supervisors

In the Punjab government services, the supervisors of auxiliary nurse midwives are expected to be lady health visitors. They were chosen either from among the FHWs in the villages that overlapped with the nutrition study or (less often) directly. Their main role was to support and supervise the FHWs. In difficult or emergency situations, they occasionally provided direct services to women and children. After workers were trained to screen potential contraceptive users, to dispense oral pills, and to insert IUDs, the supervisors generally were the first to start these delegated activities in each group of villages. In the FPED villages, the supervisor worked more directly in providing contraceptive services. But because of her considerable experience, she also assisted in supervising the family planning educators and in group education.

Social Scientists

Although selected for their potential contributions to the research aspects of the Narangwal studies, social scientists were also designated to provide family care services and to promote community participation. Their academic background was in sociology, anthropology, or social work at the master's or doctoral level. The justification for using people with such a high level of training was the importance attached to community relations in the experimental and developmental stages of the work.

The social scientists were primarily responsible for initial and continuing negotiations with village *panchayats* (councils). They helped organize group activities and advise on approaches to resistant families. If there were unfavorable rumors in a village, they were expected to respond in the same way an epidemiologist responds to an epidemic. They were specifically responsible for maintaining a village profile, for studying village factions (*pattis*), and for ensuring coverage of all groups. The social scientists helped organize the field activities of workers and most of the approach in the FPED program. They were also responsible for helping in the continuing modification of all services to make them culturally more acceptable. Supervision of male family planning workers was

limited to a small fraction of one social scientist's time. Overall assistance in the FPED villages required about half of a social scientist's time.

Physicians

The physicians in the project had diverse backgrounds and experience. Some had no specialty training but many years of field experience in primary health centers and government family planning programs. Others had specialty training in pediatrics, obstetrics-gynecology, and public health. In general, those with extensive special training served as project officers and infrequently delivered services. They directed and developed the service and research components of the project. The other physicians were also deeply involved in research and development, but their primary role was to provide services as needed for referral and to coordinate field supervision with supervisors and public health nurses. All physicians took part in the training programs and in the development of manuals and standing orders.

Village Attendants and Dais

The village attendants generally were illiterate women who lived in study villages and needed employment. They varied from teenagers to women past the reproductive age. Some happened also to be dais. Their main work was to maintain the feeding center, to prepare food supplements, to supervise feeding in the center, to feed nonattenders at home, and to assist the FHW in weighing and in maintaining records of malnourished children. In addition, they assisted in other activities, such as accompanying referral cases to the clinic, rounding up children for routine weighing or immunizations, and acting as a direct channel of communication to the village women.

A special effort was made to work with the dais or traditional birth attendants. They were not given financial or other incentives but could augment their local credibility by working as partners of the FHWs. Special training was provided to them based on a special study that developed a profile of dai activities. These activities were classified systematically according to whether they were beneficial, dangerous, or neutral on scientific grounds. The training concentrated only on changing what was potentially dangerous, which was remarkably little. It also encouraged those activities that were considered beneficial. They were provided supplies to assist

in deliveries and were encouraged to refer patients. This program was just moving into effective implementation when the project was terminated.

Others

Laboratory technicians provided simple clinical laboratory tests, such as stool exams, sputum smears, white blood cell counts, urine sediment exams, and blood smears for red blood cell morphology and malaria parasites. They also performed special laboratory tests for research substudies and prepared medicines for use in the villages.

A nutritionist, employed for the research aspects of the nutrition project, also assisted in developing and supervising the feeding centers. Especially important was her role in developing, from the basic staples available, the varied food supplements used as weaning foods.

Other Project Components

Logistical support is essential in maintaining the quality of services. At Narangwal this included diverse components.

Facilities

In each study village, one of the first activities after the panchayat agreed to participate in the study was to ask them to renovate a village building or house as a subcenter clinic and headquarters for the village services. Generally the village or an individual donated an existing or new building for renovation. The renovation of older structures included adding cement floors, screens, a latrine, and a hand-driven pump for water. When possible, the space was divided into two rooms, one for consultation and the other for examinations, IUD insertions, and so on. Attempts were made to ensure that each clinic was reasonably accessible to all village families and castes and did not antagonize any one faction or patti by its location.

The subcenters were sparsely equipped with the minimum essential furniture and equipment, much of it made by project carpenters: a desk, chairs, storage cabinets, wooden examining tables, and filing

cabinets for records. Purchased equipment included trays, scales, instruments, and kerosene stoves.

In villages providing nutrition services, an additional room--or a room in one or more separate buildings--was used as a feeding center. The location was planned to give easy access to poor, high-risk families. Apart from rugs or mats for the children to sit on, the only equipment required was a kerosene stove, utensils, and food storage bins.

The workers' village residences were a major concern. Space was usually rented from a respected family, and one or two rooms were provided with such improvements as screening and cement floors. A bath, latrine, and a kitchen were always built for the worker as a demonstration to villagers of improved living conditions. At first there was great concern about the female worker's safety and the social acceptability of having a young, unmarried woman living on her own. After the first episode in which negative comments were made, the panchayats came up with a solution that had excellent cultural acceptability. The panchayat formally announced that they as a group were adopting the field worker as a "daughter of the village," thus accepting responsibility for her safety.

The Narangwal headquarters for research and administrative offices was converted from village buildings. A large training room was used for staff education, and a small but comprehensive library was available. A room for consultations and examinations was maintained for cases referred from the villages to the project physicians.

Supplies

Each fortnight, when the field workers were brought by project vehicles to the headquarters for a full day of continuing education, they used the opportunity to replenish their subcenter supplies. Alternatively, requests were forwarded through supervisors, and supplies were sent in the vehicles at the time of field visits.

A set formulary was established for drugs dispensed by FHWs and physicians. Supplies for the use of the physicians were kept separately in each village, and each physician carried a complete medical box of special supplies on field visits. Progressively over time, more drugs were moved from the doctor's shelf to the FHW's shelf. The formularies were frequently reviewed to ensure that they were limited to essential drugs and that costs were kept down. Almost

all drugs were purchased from supply houses in India, except such special items as Depo-Provera and measles vaccine.

Food supplies were obtained from relief agencies, but crude sugar and oil were purchased. Panchayats also developed a pattern of collecting food at harvest time from farmers' donations to be stored for use in feeding centers.

Transport

FHWs, supervisors, and family planning educators all used bicycles for transport in and between villages. The ability to ride a bicycle was a positive, although not essential, consideration in the selection of new workers. If new workers did not already know how to ride a bicycle, they had to learn after joining the project. The bicycle was especially important to the family planning workers and family health supervisors, who had to cover more than one village. Nurses and physicians used project vehicles, including motorcycles and scooters, to travel to villages. Vehicles, mostly with four-wheel drive, were also used to bring field workers to training sessions at the Narangwal headquarters every two weeks.

Education of Workers

Every two weeks all village workers attended a full day of continuing education at Narangwal. Depending on the season, focused topics were reviewed. A major activity was to have FHWs present problems in field work; all staff would then work out solutions. All workers were encouraged to continue their education. Special fellowships were provided for courses in India and abroad. Most important, arrangements were made with local educational institutions, and costs were paid for any educational activity that would improve workers' competence.

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