Determinants of Reproductive Change in a Traditional Society: Evidence from Matlab, Bangladesh

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A decade has elapsed since a project was launched in Matlab, Bangladesh to test the hypothesis that contraceptive services can induce and sustain fertility decline in a rural traditional population. The demographic impact of this project has been pronounced, lending support to the view that supply-side policies can succeed even where institutional supports for demand are weak. This paper reviews the relationship between the Bangladesh climate of demand and the Matlab system of supply with the aim of explaining how such effects arise. A sociologically appropriate system of supply can induce fertility change in a society where such change would not spontaneously arise. The study of programs and the "sociology of the supply side" thus deserve the same degree of rigor accorded to research on the "sociology of demand." (STUDIES IN FAMILY PLANNING 1988; 19, 6: 313–334)

A decade has elapsed since a project was launched in Matlab, Bangladesh to test the hypothesis that providing contraceptive services to rural Bangladeshi couples can induce and sustain fertility decline. This hypothesis was derived from the proposition that demand for contraception can exist even if levels of current contraceptive practice are low and prevailing social and economic conditions are not improving. The impact of this project on demographic dynamics has been substantial. Prevalence has risen to the mid-40s (per 100) and the fertility effects noted in the early stages of the project have been sustained. It is therefore fitting to review the lessons from this decade of effort, and the broader policy significance of the results achieved.[1]

The impact of the Matlab Project challenges the widely accepted view that economic development and improvements in well-being are prerequisites to demographic change.[2] Widespread adoption of family limitation, the theory states, is hampered by high fertility norms, born of the historical and institutional necessity for large families in which children contribute to economic well-being, sons are a source of security to parents, and high mortality threatens child survival. Only by restructuring the societal rationale for high fertility through dramatic reduction in mortality and changing economic roles will the demand for children change and the demand for contraceptive services become manifest (cf. Davis, 1969; Hauser, 1967, 1969; Blake and Das Gupta, 1975; Hernandez, 1981a, 1981b).

This view holds particular appeal in reference to settings such as Bangladesh, where service programs have long been in operation without generating appreciable impact. Much has been written about the determinants of reproductive preferences and behavior in rural Bangladesh, and little in this literature lends support to the hypothesis that services, however carefully designed or conscientiously implemented, could introduce and sustain the fertility decline that has been observed in Matlab in the past decade (see, for example, Demeny, 1975; Arthur and McNicoll, 1978).

First, social, economic, and structural fertility determinants are unfavorable to fertility change. Offspring are critical to familial economic and social security, since wealth traditionally flows from children to parents and the labor value of children is manifest at an early age. Moreover, children represent insurance against risk in the face of social and environmental uncertainty that

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characterizes rural Bangladesh.[3] The country is situated at the deltaic confluence of the great rivers of Bengal, and the instability of river-beds directly threatens well-being through periodic floods that have affected human ecology and social organization for centuries. Settlements are comprised of small clusters of dwellings on artificially elevated land that impose limits on geographic extension, necessitating periodic dispersal of families. Reflecting the fragmented and diffuse ecology of settlement patterns, community organization lacks cohesion, and factionalism and conflict endanger the economic standing of individual households.[4] Sons are a resource, not only for their direct contribution to household income, but also for their importance in establishing and maintaining vital familial ties to village patronage groups. They are thus a source of prestige to mothers, and a source of security to parents. In this environment, the desire for many children is not simply a household decision, but a systemic necessity.[5]

Second, rural Bangladesh society remains conservative, traditional, and agrarian, much as it has been for centuries. Economic conditions are not improving; rather, analyses of the rural economy show that conditions have deteriorated markedly in the past three decades. Although the population is 90 percent rural (see Bangladesh Bureau of Statistics, 1977, 1984, 1985) the agricultural sector of the economy languishes, despite fertile soil and abundant water reserves, owing to constraints on resources for mechanization, irrigation, or fertilization of soil required for the introduction of high-yield crops. International markets for the principal export commodity, jute, have declined, exacerbating the stagnation of the agricultural economy. A doubling of the rural population over the past three decades has produced substantial declines in real wages, widespread fragmentation and distress sale of land, and marked increases in the population of landless and destitute households.[6]

Evidence is accumulating that this growing economic adversity is having negative social and health consequences. Marital dissolution is increasing, with detrimental economic and health effects, especially for women.[7] Since Bangladesh has an inadequate industrial base, surplus labor among the rural poor is absorbed by economic involution, wherein economic roles and sources of sustenance are as fragmented as the landholdings from which most rural wealth is derived (see A. R. Khan, 1976, 1977; A. Majeed Khan, 1967). Little in the way of modernization of village institutions has occurred that would alter this institutional climate. Bangladesh has thus not experienced a systematic transformation of economic and social life that can be characterized as development.

Third, mortality is high and survivorship has not significantly improved. Although mortality declined gradually in the first half of this century, most observers agree that this trend has abated in the past three decades, and that mortality may have increased in the period of the late 1960s to mid-1970s owing to the extreme adversity that accompanied and followed the Liberation War. Improvements followed the 1974–75 famine, but mortality among children remains at exceedingly high levels.[8] Widowhood often occurs at a young age, exposing women to economic adversity. Increasing marital dissolution is associated with elevated morbidity and mortality risks among single women and their children.[9] Some progress has been achieved in the control of infectious diseases, but diarrheal and respiratory diseases are nonetheless the major causes of death among children under five (Black et al., 1982; United Nations, 1981). Nutritional deprivation is widespread and, in most assessments, rising.[10] Thus, while gradual improvements in mortality conditions have occurred in this century, the quality of life in rural Bangladesh is, from the perspective of villagers, likely to be seen as deteriorating.[11]

Failure of the Bangladesh population program to achieve its aims is often cited as a manifestation of an unfavorable climate of demand. Since Liberation and even earlier, during the East Pakistan regime, the need to control rapid population growth has been a central theme of public policy.[12] With a population that now exceeds 100 million, Bangladesh is the most densely populated country in the world, the most rural, and among the poorest. Despite a substantial commitment of resources to developing supply-oriented policies and programs, however, the impact of the national population effort has been unimpressive.[13] Increases in contraceptive prevalence are evident, but trends do not reflect a sustained and pervasive change in fertility regulation behavior characteristic of a demographic transition (NIPORT, 1981; Mitra and Kamal, 1983, 1985). That the national program has not produced extensive reductions in fertility in Bangladesh represents, for some observers, *prima facie* evidence for the paucity of demand and the need for policies aimed at its generation. Some have argued that major demographic change would require no less than structural reorganization of community institutions, assuring rural people relief from the pressures of uncertainty and risk. While the country has undoubtedly witnessed some degree of modernization over the past decade, no observer of the Bangladesh situation would claim that such a transformation is underway; rather, the institutional constraints to fertility decline are everywhere graphically evident (Arthur and McNicoll, 1978).

The Matlab findings thus represent a paradox. Data, known to be accurate and complete, document demographic changes inconsistent with expectations derived from established social theory. In this article, the design of the Matlab experiment is reviewed, and an interpretive overview of major results is provided, with the aim of reconciling this apparent anomaly. No new findings are presented, but rather the lessons are synthesized, and the broader implications from this project for population policy and demographic thought are reviewed.

The Design of the Matlab Project

Matlab is a field research station of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). Located in a rural riverine subdistrict 35 miles south of Dhaka, the area is isolated and largely inaccessible to all forms of communication except river transport. There are no cities or towns of consequence, apart from Matlab Bazaar, the small rural town from which the subdistrict derives its name. While no locality is representative of Bangladesh, the Matlab ecological, social, and economic situation is typical of the area delineated by the vast deltaic confluence of two great rivers of Bangladesh, the Meghna and the Padma. Recent trends in Matlab closely parallel the tragic history of post-Partition deltaic Bengal. Like much of Bengal, economic deterioration, famine, political upheaval and environmental adversity have profoundly affected the locality, preventing the development of towns, slowing the introduction of modern amenities and social services, perpetuating poverty, and sustaining high mortality. Subsistence agriculture and fishing dominate the economy, with trade and commerce hampered by the absence of roads, electrification, communication, or ready access to markets. Matlab has remained predominantly traditional and religiously conservative even though some modernizing influences have reached the area over the past decade through widespread access to radios, growing emphasis on education, and increasing contact with urban areas.[11]

It is this context of conservatism, economic deprivation, and minimal modernization that makes the Matlab experiment so important, for, to succeed in such a setting lends credence to efforts elsewhere aimed at introducing fertility change under discouraging circumstances. The Matlab Project is important, however, not only because of its social setting, but also for the unique research possibilities it affords. Matlab was chosen as a field site for population policy research because it is among the few localities in the Third World where demographic data are known to be accurately collected and complete (Cholera Research Laboratory, 1978; D'Souza and Chen, 1981). The complex field management system for demographic surveillance, established in the mid-1960s, was sustained despite the turbulent events accompanying the 1971 Liberation War and the economic crisis leading to the 1974 famine.

The project satisfies the criterion of a formal experiment with a treatment area where services are introduced, and a comparison area without such services but with similar social, economic, and demographic conditions.[12] At the inception of the project in 1977, the treatment area consisted of 70 villages with a population of 89,350, of whom nearly 14,000 were currently married and menstruating women. The comparison population was 85,596, located in 79 villages.

The large population base permits statistical adjustment for random variation in vital rates that could be spuriously attributed to treatment conditions. This is particularly important in rural Bangladesh where natural fertility seasonality is pronounced, and dramatic declines in natural fertility accompanied the 1974–75 famine. Moreover, census and survey data exclude the possibility of baseline contaminating differences between treatment and comparison areas. Small differences in religious composition are not likely to affect experimental results.

In 1974 and 1975, Bangladesh experienced a catastrophic famine that greatly increased mortality, depressed natural fertility, and disrupted the economy. Effects of this disaster on child survival were pronounced in Matlab, perhaps impeding the prospects for successful introduction of fertility regulation services. Moreover demographic regimes were pretransitional at the time of the introduction of the Matlab Project in 1977 (see Chen et al., 1974), with indexes of social, economic, and demographic conditions largely invariant across areas, attesting to the fundamentally traditional context in which the Matlab study was launched.[16] Since fertility regulation, whether by traditional or modern methods, was rare, natural fertility conditions prevailed throughout Matlab. Mortality was high and similar in treatment and comparison areas, evincing no consistent trend that could be interpreted as a sustained decline preceding project interventions.[17]

Despite the advantages of Matlab as a research site, certain limitations are inherent in any rural population-based study. Treatment and comparison areas are contiguous. Migration between villages for marriage is extensive, and a significant diffusion of project-related services occurs across project boundaries. The Matlab treatment center, where services are provided to all individuals who request care, has been an important source of sterilization, IUD, and diarrheal disease treatment services for comparison area residents. Most important, the Matlab comparison area receives the usual services of the government's health and family planning program. The Matlab Project, therefore, assesses the differential between the impact of the government program and the much more intensive outreach system in the project service area. While service activities may have contributed directly to comparison area contraceptive prevalence, thereby contaminating inference about the total magnitude of supply effects, this in no sense compromises the integrity of the design. Contaminating factors tend to understate treatment effects, rather than to introduce spurious project results.

The Matlab Project was thus launched in an impoverished society where a remarkably precise and comprehensive demographic research system was already well established. In the short period of October and November of 1977 the project field staff were recruited, trained, and assigned their work regimen. Although the service system is complex,[18] from the perspective of the rural population, the approach is quite simple: since the study was launched, all currently married and fecund women have been visited fortnightly, consulted about

their contraceptive needs, and encouraged to adopt. These consultations are conducted by young married women who are full-time employees of the Project and are residents of the villages they serve. Encounters include educational themes and motivational messages, but most important, they are oriented toward service delivery. Women who are interested in adopting a method are provided a choice of pills, condoms, foam tablets, or the injectable contraceptive depo-medroxy-progesterone acetate (DMPA) in the course of household encounters. Women who are interested in IUD services can attend a nearby clinic, or receive insertions at home by a trained paramedic who visits households on a prearranged date. Sterilization services are available to husbands or wives who are willing to travel to a clinic in Matlab Bazaar. Nearby health centers treat childhood diseases, maternal health problems, or family planning-related side effects and complications. Health services have been added incrementally over time and include immunization against tetanus and measles, safe birth delivery services, nutritional consultation, diarrheal disease treatment, and detection of maternal and child illness for referral to female paramedical workers or Matlab physicians (see Phillips et al., 1984a and DeGraff et al., 1987).

Project Impact on Contraceptive Use and Fertility

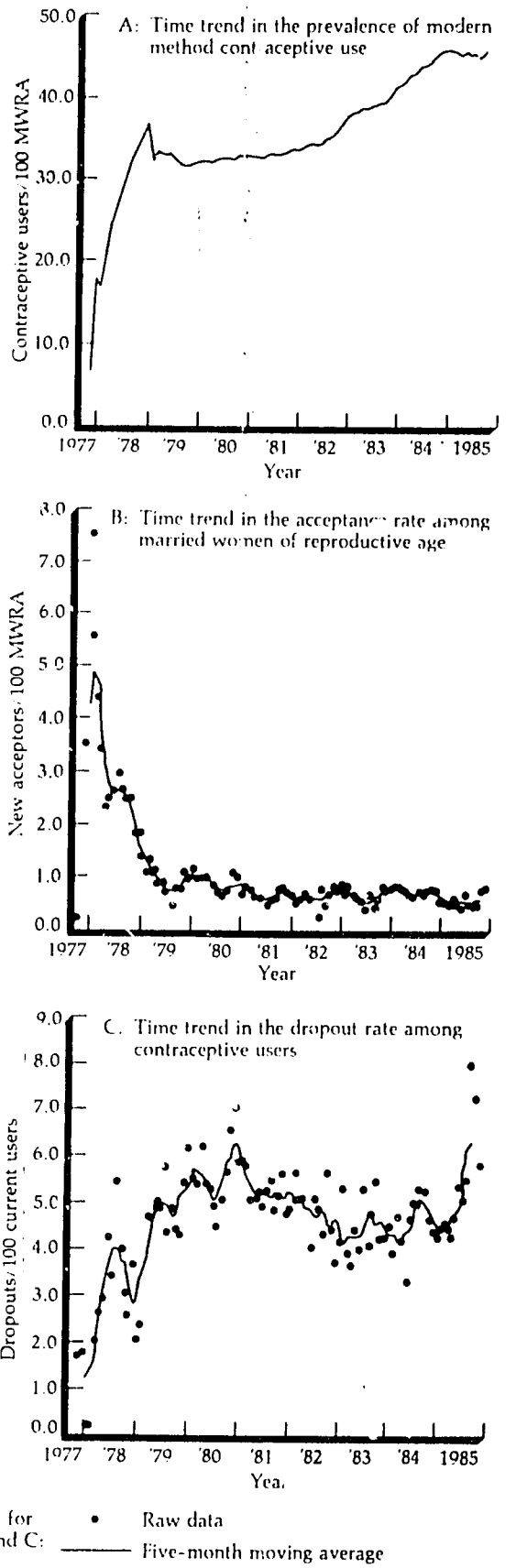
Project impact is now discussed in terms of contraceptive use dynamics, reproductive preferences, and fertility dynamics.

Contraceptive Use Dynamics

The impact of the project on contraceptive use prevalence was immediate and pronounced. Following the introduction of services, prevalence of modern contraceptive use increased from 7 percent to 20 percent in three months, and by an additional 10 percentage points by the end of 1978 (see Graph A in Figure 1). After 18 months of project operation, prevalence had reached 33 percent, a level of use that was sustained over the following two years. In 1981, prevalence again began to rise, although more gradually than the increase recorded in the initial months of the program. By 1983 a distinctive upward trend was evident that was sustained until 1985. A new plateau was reached at 45 percent, where it remained during the 1985–86 period (Phillips et al., 1982, 1985b, 1986).

Prevalence data for the comparison area are based on surveys and are thus less detailed than treatment area results. It is nevertheless known that prevalence was similar to that in the treatment area at the beginning of the project, increased only slightly during the project period, and has remained at levels that are low and comparable to estimates for the nation as a whole.[19] In the baseline period, modern method prevalence was less

Figure 1 The time trend in contraceptive use dynamics in Matlab: monthly prevalence, adoption, and discontinuation rates, October 1977–December 1985



Note: MWRA = married women of reproductive age. Graph A is a plot of raw data.

than 4 percent; by 1981 it had reached 7.5, and in mid-1984, 16 percent (Bhatia et al., 1980; Rahman, 1986).[20]

The level of use prevalence that will ultimately be achieved in Matlab is unknown, but it is important to note that most of the Matlab villages had prevalence rates of less than 10 percent a decade ago, none had rates of over 20 percent, and many of the villages of Matlab now have prevalence rates well in excess of 50 percent. Changes that occurred in the treatment area coincided with the introduction of project services (Rahman, 1986). The patterns of adoption and continuation reveal a close interrelationship between the phenomena of supply and demand (see Graph B in Figure 1). Initial adoption rates for all methods were high, and discontinuation rates were low because, at the onset, the project served those whose demand was most prominent: high parity women, women with closely spaced births or many sons, and the relatively well educated (Bhatia, 1981, 1983). As the service activities of the project progressed, adoption rates were low and stable while discontinuation rates increased.

It might plausibly be hypothesized that the progressive recruitment of less motivated women and women interested in spacing fertility was associated with reduced efficacy of practice and high discontinuation rates. That characteristics of the pool of users were increasingly representative of women at large is consistent with this hypothesis.

Variation in supply factors affected temporal fluctuation in use dynamics. Any interruption in the intensity or quality of contraceptive care was associated with pronounced disjunctures in the discontinuation rate and turbulent use dynamics (see Phillips et al., 1984a and DeGraff et al., 1987). This phenomenon was first observed in 1979 when oral rehydration was introduced as a special campaign, but is most apparent in 1985, a period when emphasis on a vaccine trial and maternal-child health (MCH) service development coincided with DMPA supply shortages nationally. These operational problems were associated with unprecedented increases in discontinuation rates and reacceptance rates, a pattern of discontinuation and method switching that has interrupted upward prevalence trends in Matlab on two occasions.

Trends in contraceptive adoption rates and continuity of use also reflect operational decisions about contraceptive methods. The immediate rise in use in 1977 is attributable not only to the existence of accumulated unmet need but also to the household provision of injectables and the acceptability of this modality to Bangladeshi women. The 1978 prevalence increase coincided with the introduction of tubectomy services that were offered in a Matlab Bazaar clinic. When additional new contraceptive options were introduced, such as household-based IUD insertions in 1981, use of these newly available methods increased, mainly due to method switching, but in part because, with the expansion of choice, a wider range of contraceptive preferences could be satisfied.[21] The addition of the IUD with its associated longer duration of use resulted in switching from methods associated with poor continuity (Rob et al., 1982). This increased availability and adoption of the IUD over the 1982 to 1983 period explains much of the concomitant decline in discontinuation (see Graph C in Figure 1). The dramatic increase in discontinuation in 1985 was due to the expiration of copper in IUDs and the problems associated with encouraging women to readopt following removal. Concomitant shortages of DMPA constrained options for method switching.

Studies of the continuity of use have thus been helpful in achieving an understanding of how the provision of multiple methods contributes to prevalence. Contraceptive behavior is characteristically erratic with frequent switching, high rates of termination, frequent complaints, and poor compliance.[22] Taken together, these behavioral patterns suggest that commitment to fertility regulation is fragile and that concerns about side effects are considerable. That overall durations of use are long despite contraceptive turbulence is a consequence of success on the supply side. Women who are experiencing problems with a method are encouraged to switch methods, are given several options, and are assisted with the choice confronting them (see Bhatia et al., 1980 and Langsten and Chakraborty, 1978).

The prevalence time trends diagrammed in Graph A of Figure 1 were in no sense uniform across the 70 villages in the service area. Areal variance in prevalence was initially high, but has diminished with time. Service effects and their institutional determinants interacted to produce areal variance and to account for its decline (Rahman, 1986). Most prominent among the effects observed is the contribution of worker commitment: where workers understood their job, and were conscientious and caring, prevalence has been consistently high. Largely in response to these findings and recommendations, 25 of the 80 workers in Matlab were replaced in late 1981 and prevalence subsequently increased in villages where worker performance had been low. Caution must, however, be exercised in assigning causal significance to such posited supply effects, since administrative actions were taken without rigorous experimental controls. Nonetheless, the timing of changes in use dynamics and the pattern of interplay between service operations and use dynamics are suggestive of a fundamental causal role of the service program in influencing Matlab fertility regulation behavior. Both use turbulence and areal variance appear to have been affected by the quality and intensity of services.

Reproductive Preferences

The evidence from surveys conducted in Matlab between 1975 and 1984 provides consistent support for the hypothesis of pre-existing demand. However, it must be recognized that the complexities involved in the measurement of demand are considerable, and that sub-

stantial variability exists in reproductive motives and in the intensity with which such preferences are held.[23] While 1977 data from the comparison area are not available, evidence from the treatment area suggests a significant decline in family size preferences. Immediately after the onset of project activities in 1977, one-third of the eligible women in the treatment area expressed a desire for no additional children; by 1984, this percentage had increased to over half of all women. This temporal difference narrows somewhat, however, when the differing age compositions of these two samples are taken into consideration (Khan et al., 1986).

Response distributions to survey questions assessing latent demand were nearly identical in the treatment and the comparison areas in 1984. Women expressed completed family size preferences of about 4.3 children and 2.3 sons. Since preferences in treatment and comparison areas were similar in 1984, changes in family size preferences may imply that preference changes have occurred, not just in the treatment area, but throughout Matlab. This suggests that factors exogenous to the Matlab service system may have influenced family size norms, and that treatment area supply effects on stated family size norms appear to have been negligible.[24]

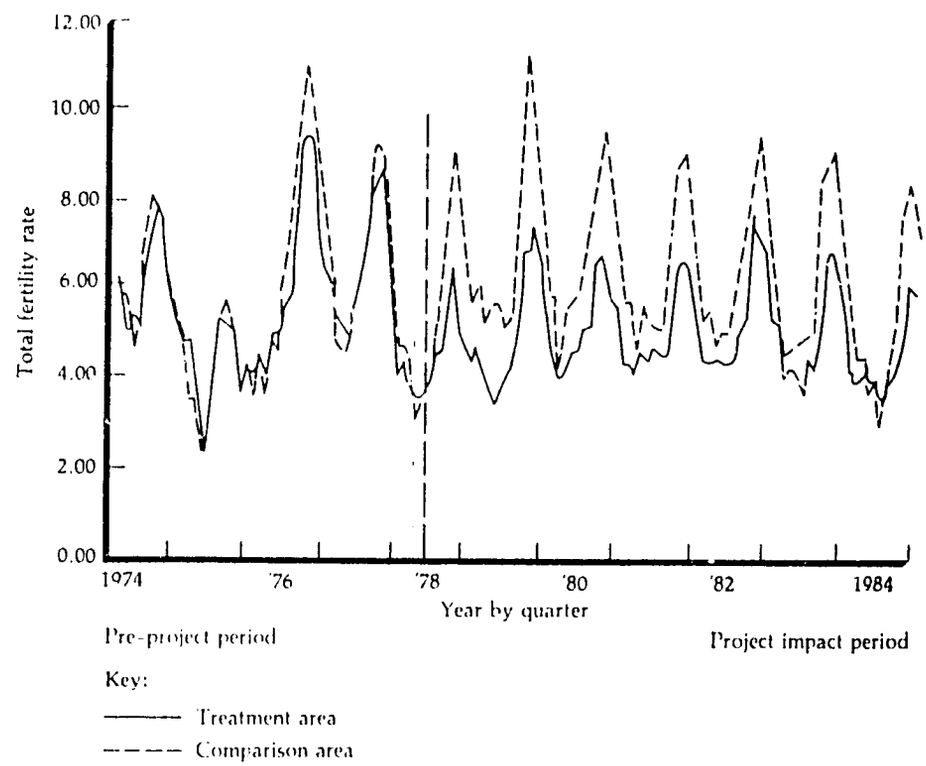
While family size preferences appear to have been changing in Matlab as a whole, the demand for spacing is essentially limited to the treatment area, increasing from 6 percent of all women using family planning in 1977 to 26 percent in 1984. A key element in the success of the Matlab Project thus has been its capacity to generate demand for temporary contraception among women seeking to delay childbearing (Koenig et al., 1987).

Matlab results, furthermore, show that an effective service delivery system produces greater consistency between the intention to regulate fertility and actual behavior. The gap between intentions to practice contraception and actual behavior is reduced in the treatment area but persists in the comparison area. Nonetheless, treatment area data reveal that in 1984 only about half of all women who said they did not want more children were currently practicing contraception. While it must not be assumed that all of these women are in need of services, some unmet demand for family planning may thus still exist after seven years of service effort. Even an effective service system does not automatically transform latent demand into effective use.

Fertility Dynamics

The dramatic increase in contraceptive use in Matlab in the early project period was accompanied by a subsequent decline in fertility. Figure 2 shows that while total

Figure 2 Monthly total fertility rates for Matlab treatment and comparison areas, 1974–84



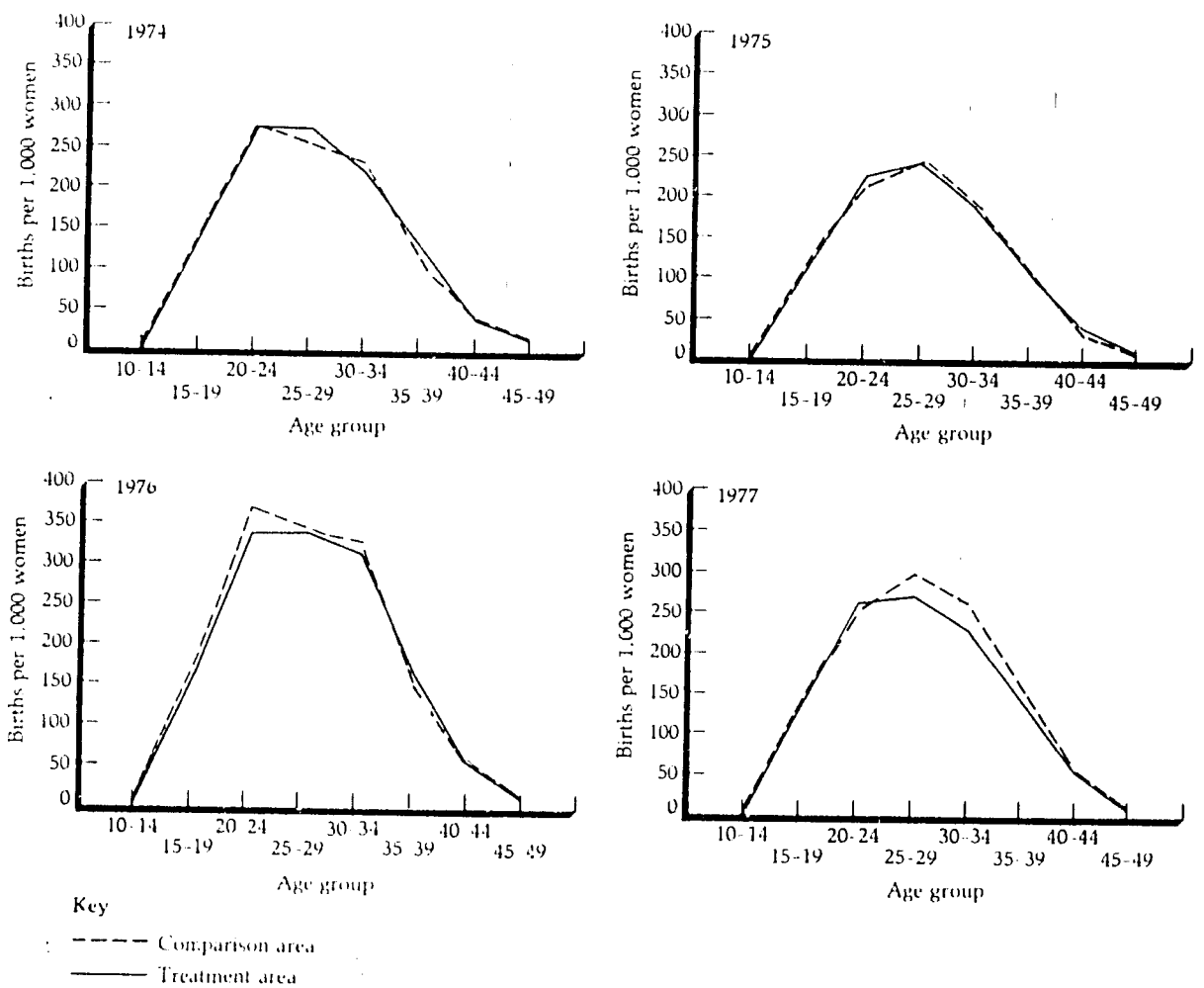
fertility rates for the two groups were approximately equivalent in the pre-project period, a marked treatment differential arose in 1978, nine months after the onset of services, and the differential that emerged has been sustained over time. The rise in prevalence since 1982 is not yet fully reflected in available demographic data, but it is clear from Figure 2 that the impact of the project has not been transitory. A decline in fertility was evident in 1978, grew pronounced by 1979, and has been sustained over time (Phillips et al., 1982).

Trends are somewhat masked by the seasonality in fertility and events external to the project that affected both treatment and comparison areas.[25] A marked decline in fertility occurred over the 1974-75 period owing to the famine. The subsequent rise in natural fertility and oscillations over the 1976 to 1978 period were due to the secondary effect of low famine fertility on the subsequent proportions of women who were pregnant, amenorrheic, or lactating. The effect of the Matlab Project was to maintain the artificially low fertility levels observed during the famine period, while fertility in the comparison area concomitantly returned to prefamine levels.

Figure 3 presents treatment and comparison area age-specific fertility rates for four years prior to the project. Figure 4 presents corresponding data for seven project years.[26] Age-specific rates are useful for addressing the question of whether the system of supply has affected fertility levels, or conversely, whether exogenous social and economic fertility determinants explain what has happened in Matlab independent of the climate of supply. Three considerations are relevant to the issue of validity:

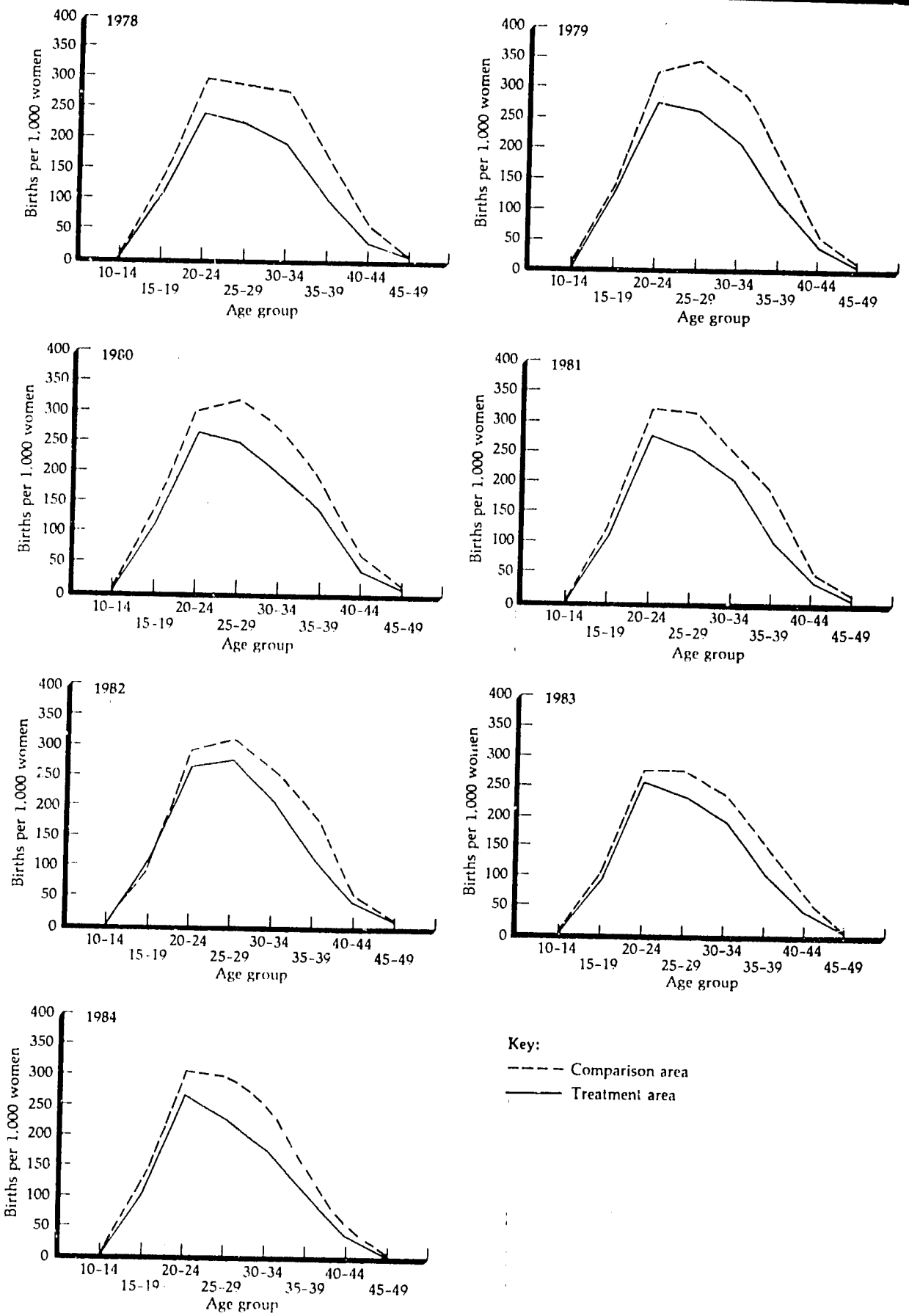
1 Treatment–comparison area fertility differentials should emerge after intervention. Premature differentials could indicate that factors exogenous to the design explain experimental effects.

Figure 3 Treatment and comparison areas age-specific fertility rates for four years prior to project interventions



Note: Years begin in July and end in June of the subsequent year.

Figure 4 Treatment and comparison area age-specific fertility rates over the 1978–84 project impact period



Note: Years begin in July and end in June of the subsequent year.

2 Post-intervention age-specific fertility regimes should reflect patterns typical of historical data on controlled fertility regimes in treatment areas and natural fertility in comparison areas.

3 Supply effects should change fertility abruptly rather than gradually. Changing societal conditions would produce gradual changes, more characteristic of an adaptive process.

Each of these issues is now considered, in turn.

First, as Figure 3 shows, fertility regimes were similar over the 1974 to 1976 period, but a modest treatment–comparison area fertility differential emerged for women aged 20 to 30 in 1977, the year immediately prior to the project period. This differential could indicate that subsequent trends and differentials are independent of interventions. Analyses of long-term pre-experimental fertility levels, patterns, and trends show, however, that the observed areal differentials represent a contamination of the Matlab Project from an earlier Matlab study known as the Contraceptive Distribution Project (CDP), and are thus supply-related.[27] The pre-project differential shown in Figure 3 occurred only in the CDP impact period and in CDP treatment villages that were subsequently treatment villages in the second project (Koenig et al., 1987). This contamination arises from the fact that CDP activities were more systematically implemented in villages close to Matlab Bazaar, where part of the present treatment area is located. Areal time series analysis, which adjusts data for the contaminating effects of the CDP, has shown that the net Matlab Project effect is a 25 percent reduction in fertility. There is no evidence of secular trends, differentials, or determinants other than CDP contraceptive service delivery to account for pre-project areal fertility differentials in Matlab.

The second feature of Matlab fertility patterns concerns the emergence of treatment area fertility distributions that are consistent with patterns observed in historical populations undergoing transition, while comparison area regimes retained their pretransitional character. Research on the European demographic transition has demonstrated that natural fertility regimes are characteristically convex while post-transition regimes are characteristically triangular. The age pattern of fertility thus reflects the extent of fertility control in a population (Coale and Trussell, 1974). The emergence of fertility regulation is illustrated in Figure 4 by the near linear downward slope of the fertility distribution among treatment area women aged 20 and over, in contrast to the convex distribution in comparison areas. In the project impact period, treatment area fertility regimes resemble patterns of controlled transitional fertility regimes, while comparison area regimes are typical of natural fertility populations.

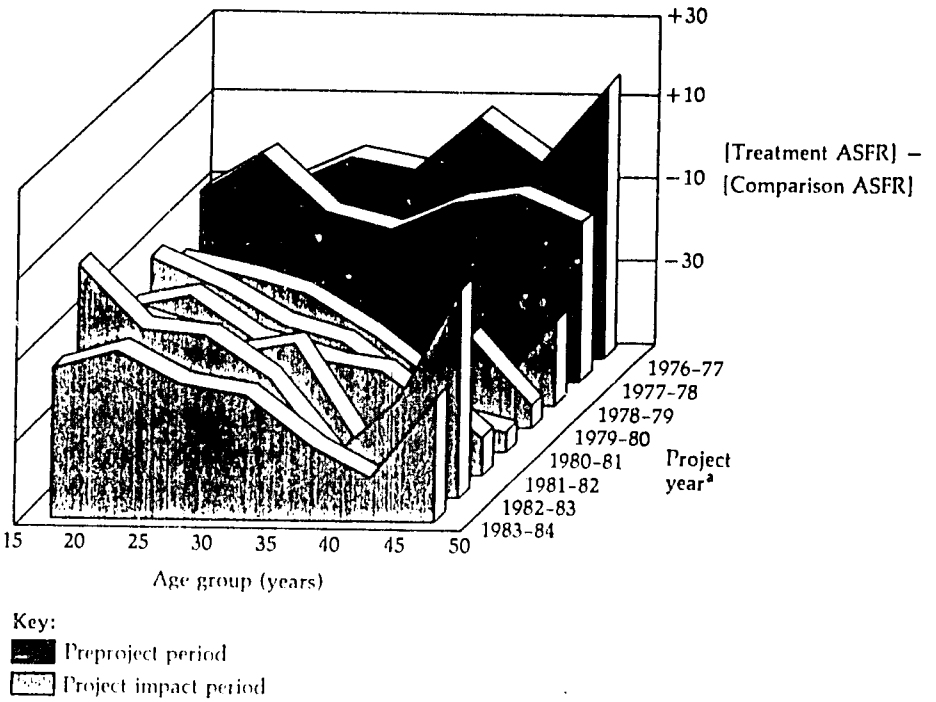
A third aspect of Matlab fertility that is consistent with service effects is the net immediate and pronounced disjuncture in treatment differentials rather than a gradual adjustment. As Figures 3 and 4 show, that effect arose in the immediate post-intervention period rather than gradually. To illustrate this more clearly the fertility differentials shown in Figures 3 and 4 have been calculated by simple subtraction and are presented in Figure 5. That pre-project fertility levels were similar irrespective of age is illustrated by the lack of any age trend in differentials shown by flat distributions in the background, in contrast to the downward sloping distributions for the project period. Figure 5 shows the pronounced effect of the project on the fertility of older women, the sudden discrete nature of this impact, and the absence of any increase in the areal differential over the post-1979 period. This pattern of impact is consistent with the view that a substantial demand for contraception was met in the early stages of the project, that service delivery caused the disjuncture, but that generating incremental demand beyond what was initially achieved has not occurred despite the persistent delivery of services over a ten-year period. Demand is increasing, but changes are occurring in both treatment and comparison areas, reflecting changing economic and social conditions, rather than the impact of services on reproductive preferences (Abdullah and Zeidenstein, 1982).

These findings, taken as a whole, thus point to the role of both supply and demand in explaining the demographic phenomena of Matlab. Evidence on family size preferences suggests that there is demand for family limitation in the area and that the climate of demand may in fact be improving. The likelihood that such changes occurred in both the treatment and comparison areas suggests the potential role of broader social change as well as the possible influence of the national program. The Matlab experience also shows, however, that, in the absence of effective supply, demand has no influence on behavior. The analysis of contraceptive use and fertility in Matlab provides strong evidence that the provision of services has not merely accelerated a pre-existing trend, but that services induced the observed increase in prevalence. The widespread demand for spacing in the treatment area by 1984 is also clearly a consequence of the intensive service delivery program. Contraceptive use has produced a pronounced and sustained fertility impact while in the neighboring comparison area natural fertility regimes, characteristic of pretransitional societies, continued largely unabated.

The Supply-Side Argument

Clearly, something of considerable demographic significance has happened in Matlab. It has been demonstrated that widespread interest in family limitation exists under conditions where demand was widely believed to be ab-

Figure 5 Time trend in treatment versus comparison area fertility rate differentials, by age, 1976–84



Note: ASFR = age-specific fertility rates.
[a]Each project year begins in July and ends in June.

sent. To attain the behavior necessary for extensive demographic change, however, required active and intensive support from the service delivery system. In understanding the Matlab experience, the role of the service program must not be relegated to the status of a residual explanatory category behind the dominant role of demand. Rather, it requires that programs be credited with a causal role for mobilizing and shaping the demand for family limitation to a degree rarely acknowledged in demographic thought. The point here is not to posit the primacy of programs but to focus intellectual discourse more sharply on the character of supply, its institutional determinants, and its interactions with demand.

The potential as well as the limits of programs in effecting demographic change must first be delineated. Limits and potentials arise from the multifaceted character of demand and the varying efficacy with which programs interact with its dimensions. Extensive variation exists in the intensity with which family size preferences are held. A subgroup of highly motivated couples are likely to adopt and continue to practice contraception, even under less optimal conditions than those characterizing Matlab. At the other end of the continuum, there exists a sizeable subgroup of couples for whom the demand for additional offspring is strong. A service program, however intensive, is unlikely to achieve considerable success in changing orientations toward family limitation among this latter group, although the potential for child-spacing exists. In between these two extremes lies a large group—possibly a majority of couples—who are most appropriately characterized by ambivalence in their attitudes toward family size and contraception. While a latent demand for family planning may exist among this group, it is also true that such demand tends to be weak and fragile, and frequently subject to familial cross-pressures.

Under such conditions, a strong service program can independently contribute to demographic change—in part by inculcating and reinforcing the idea that childbearing is subject to personal control; in part by helping to alleviate cross-pressures that can deter contraceptive adoption; and in part by establishing that demographic change is possible with acceptable social and health risks. In much of the literature, family size preferences are considered synonymous with the demand for contraceptive services. In reality, these two dimensions are

conceptually distinct and quite often divergent. Couples may want no more children, but may be unwilling to use available contraceptive methods or service facilities, when perceptions of associated costs or risks outweigh the motivation to limit family size. From the perspective of the rural population, these two components of demand are intricately intertwined. An intensive service program can compensate for weak or ambivalent reproductive motives and create demand for services, leading to contraceptive adoption where it might otherwise not occur.

In the context of rural Bangladesh, such ambivalence and related cross-pressures surrounding family limitation orientations are likely to be particularly pronounced for women. Inflexible systems of patriarchy and *purdah* confine women to positions of subservience and dependency, and the extensive prevalence of health problems is readily confused with the side-effects of family planning, so that perceived risks attributed to contraception may outweigh the perceived advantages of fertility regulation. Abdullah and Zeidenstein have argued that these risks are extensive:

> If a young village woman uses contraception and has problems with it, she is in a very difficult situation. The person who speaks for her if the outside world is involved is her mother-in-law who will hear from her son that there is a problem. The young woman must therefore have their prior approval in order to go to them, and even then there is likely to be embarrassment. If there were no problem within the household, the woman in difficulty is still faced with the real problem of getting adequate attention because there is likely to be no one really knowledgeable about family planning in the village; because travel to a clinic is culturally and physically difficult or costly; because dependable health care relevant to family planning need may not be available at all. . . . It is not hard to understand why, in this setting, many women who may be motivated or interested in contraception, will not take the risk of trying it, or if they do, will stop as soon as they encounter difficulties. It may be genuinely less difficult and even less costly to have another child (1982:187–188).

Women in Bangladesh are caught in a system of decision-making that does not necessarily allow their reproductive preferences to have full play. In this context, the outreach worker of the program provides the social support that enables women to bypass the sociocultural controls against family planning.[28]

Where demand for family limitation is absent, the role of the worker is to motivate the practice of contraception for the purpose of spacing, thereby adding a realm of complexity of choice in reproductive behavior that did not previously exist. Where demand for family size limitation does exist, the availability of a wide range of methods reduces the possibility that the unacceptability of a specific contraceptive method will stand in the way of translating family size preference into contraceptive behavior.

The pattern of method switching in Matlab illustrates this point. While method-specific use continuation rates are low, overall contraceptive use continuation rates are relatively high. This phenomenon reflects the significance of program effort. The Matlab female worker pursues method-switching as a deliberate strategy for dealing with perceived or actual side-effects, when medical relief has failed to alleviate complaints. For this strategy to succeed, the worker must be in close communication with eligible women in her village, ever ready to argue for the importance of continued contraceptive use and to identify appropriate contraceptive choices.

The supply-side argument articulated here should not be read to mean that supply effects are automatic. The challenge for programs is to identify program strategies and implement operational procedures that are congruent with what people want or need. The weaker and more ambivalent the demand is for family size limitation, the stronger is the program effort required in order to initiate or sustain demographic change. It is, therefore important to understand the determinants of program performance in unfavorable societal settings. In Matlab, the overall project effort does, in fact, address both the sociocultural needs of the client population and the administrative–managerial requirements of an effective work system, but even in Matlab, this has not always been the case.

The Contraceptive Distribution Project: A Supply-Side Failure

Some commentators would argue that experimental programs always succeed. That this is not necessarily so, and that the development of the current Matlab Project was based on a great deal of learning as to what constitutes an appropriate sociology of supply in the Matlab setting, is illustrated by the history of the precursor to the current project, the CDP, launched in 1975.[29]

The CDP was a trial of the supply-side hypothesis in its most bare-bones manifestation—a pills-to-all-doorsteps inundation of the population. As an experiment for testing the net effect of the availability of contraceptive technology, it represented a deliberate attempt to *minimize* the role of the supply side: little strategic planning was attempted, orientation and training of workers was minimal, and the organization of work routines, staff management, and work systems development were oriented toward commodity distribution, rather than toward client services. Since it was assumed that prior demand existed, efforts to adapt the service system to social conditions were considered unnecessary—contraceptive adoption would ensue irrespective of how supplies were purveyed. The underlying assumption of the CDP was that the societal response to contraceptive service delivery was largely independent of the manner and quality of the services that a program might provide or the operational design of the supply system, provided that accessibility to contraception was assured.

The CDP strategy could thus be exceedingly simple—154 village women were instructed to visit every household in an assigned work area in quarterly rounds to dispense pills and explain their use. Use prevalence increased from 1 percent to 17.8 percent in three months. It was almost immediately apparent to research staff, however, that this effect was to be transitory. Complaints and rumors were widespread, and the capacity of the staff to respond to field problems was limited. Three months after the launching of the project 30 percent of the initial cohort had discontinued, a rate of attrition that continued unabated. Thus, prevalence declined steadily after the initial surge in the first three months of the project, and returned to pre-project levels within 24 months. Demographic effects were minimal (see Langsten and Chakraborty, 1978; Osteria et al., 1978; Rahman et al., 1980).[10]

A series of studies showed that women apparently wanted to practice, but feared contraception owing to side effects, and yet rarely turned to project staff for help.[11] Notions of relative social status, worker credibility, and inaccessibility prevented effective dialogue between CDP personnel and village women. The limited range of contraceptive options offered in the CDP also appeared to represent a serious constraint on the success of the project. Limited trials of alternative methods suggested that provision of several methods would be more effective than one, since many of the women who discontinued pill use expressed a continuing interest in practicing an alternative method (Phillips et al., 1976).

Results suggested, in summary, support for the hypothesis that demand exists, but not for the CDP supply strategy: the staffing pattern, worker competence, supervisory system, clinical support system, and other features of the CDP were inappropriate for the Bangladesh social setting. When supply strategies are sociologically and organizationally uninformed, demographic change does not occur.

The operational failure of the CDP was crucial to the design of the Matlab Project for, although the CDP failed to have major demographic effects, it demonstrated that "supply" is not simply the provision of people, equipment, and things, but that the sociology of supply is as complicated to analyze and understand as the sociology of demand.[12] The CDP findings lend support to the view that the provision of contraceptive technology alone will not induce demographic change in traditional societies where demand is fragile. Rather, service design must be informed by the organizational imperatives of service delivery where social support for contraceptive behavior is weak.

The Sociology of Supply

The contrasting impact of the CDP and the Matlab Project demonstrates that supply is not simply a variable that is present or absent, nor is it a collection of disparate components of operations—the modalities used, personnel employed, training schemes, and so forth. Rather, the concept of supply refers to complex organizational systems that structure tasks, establish cohesion, and maintain accountability for activities in a manner that effectively fosters social change. The lesson of Matlab is that programs are effective only if they are informed by the sociology of supply: strategic planning must be systemic and informed by an understanding of the broader social environment and adapted to those realities, and also informed by an understanding of mechanisms that generate internal organizational cohesion where it does not naturally arise.

In the context of rural Bangladesh, what are the elements of such a strategy? Several elements of the system are critical to its success: orienting services to address client needs, generating cohesion among staff, maintaining accountability for achieving service goals, and adapting internal processes to the institutional fabric of rural life.

Client-Oriented Services

At the heart of the system are female workers, rural women in *purdah*, who are emboldened, in a sense, by a work system that provides a social support network for their service activities. All were hired from influential families in the villages where they work, and all were literate, young, low-parity women with some contraceptive experience. In the village tradition, such women, by virtue of their social status and youth, rarely undertake extra-familial activities and are typically restricted to their hamlet, but with appropriate systems support such women can interact effectively with their village clientele—discussing the realities of daily life, building rapport and understanding, and providing support for fertility regulation behavior. In this regard, the Matlab system is client-oriented and culturally appropriate: services aim to maximize choice, minimize complaints, provide paramedical back-up to contraceptive practice, and maintain close contact through a system of regular household visitation.

Internal Cohesion

What often impresses external observers of Matlab most is the sociology of work in the project—the cohesion among project staff that is defined by the formal operational design. Diagrams of formal and informal work relationships more closely resemble a network than a Weberian bureaucracy. Informal authority is exerted from below, within, and from the top, with strong staff lateral linkages formalized and developed in a societal setting where hierarchy is coveted, and where social grouping typically militates against cohesion. The organization of the Matlab system is thus both ingenious and anomalous—standing in stark contrast to the way in which things are done in Bengal, and succeeding in ways that defy expectations.

The administrative hierarchy is designed to support the activities of village workers, with supervisory functions delineated by culturally accepted notions of appropriate gender roles. Thus, female paramedics, resident in nearby clinics, provide clinical back-up to the field program, and conduct household visits as needed and requested by village workers.

Male supervisors are charged with community liaison and administrative support, but like their female paramedical colleagues, emphasize responding to requests from village workers for support to deal with disputes and factionalism. They also discuss services with husbands, key elites, and religious leaders. Thus, two lines of support—one clinical and female-operated and the other administrative and male-directed—function to support the needs of village workers.[33]

In a bureaucratic sense, the men in the Matlab system have the administrative power to reprimand workers, evaluate performance, and ensure that work gets done. In the rural Bangladesh context, however, the system confers a remarkable degree of status and authority on its female staff, who are charged with maintaining the quality of care, facilitating MCH outreach by paramedics, and providing most of the services to women in their homes.

Apart from supervisory support, a system of peer support exists wherein workers at each level are informed of difficulties, aware of progress, and continuously exposed to information about performance, problems, and needs.

Generating Accountability

The Matlab system places strong emphasis on achieving regular household visitation for providing as broad a package of services as possible. This has involved systems for ensuring that visitation takes place, and that implementation of the service regimen is actually occurring.

Mechanisms for achieving accountability are closely linked to peer and hierarchical support: a simple-to-use, worker-oriented management information system provides workers with information about the services purveyed to each individual in her work area, and provides supervisors with information about the pace of work, the content of services, and the problems encountered.

Frequent interchange among staff is structured to ensure that peer and supervisory support systems are functioning. Each fortnight 20 workers from a specific area meet in a nearby clinic with paramedics and supervisors. Accountability arises from the fact that workers can readily ascertain their performance from the service registers, all workers know where problems arise, and supervisors are aware of their obligation to understand them and lend support. When workers fail to perform duties, there are administrative consequences; workers who persistently fail to perform are dismissed. Decisions are decentralized, but accountability for performance is ingrained in the Matlab system, and villagers are aware of the integrity of the administrative system and expect the program to respond to their needs (see Phillips et al., 1985a).[34]

Accountability also arises from the fact that administrative obstacles to performance are minimal. Logistics, management, and information systems, so typically imposed from the top down in South Asian bureaucracies, were turned on end: the village worker requisitions supplies, determines work routines of senior staff through requests for back-up services, and provides the basic information on which service decisions are made at higher levels. Goals and objectives are set in terms of feasible operational aims—households to be covered, women to be contacted, services to be offered—not in terms of demographic targets, acceptors to recruit, or other indicators of output that are very often outside of the personal control of individual workers.[35]

The Interface with Social Institutions

The sociology of supply involves much more than internal organizational mechanisms; it includes the strategies and mechanisms for interaction with social institutions. The institutional constraints to effective supply require careful diagnosis and a strategic response from the supply side. Several strategies have been pursued.

From its inception, the Matlab formal organizational structure has been set apart from community leadership systems that are more frequently a source of factionalism than social order. At the same time, informal links to community leaders have been strong. The integrity of this work system buffers workers from societal pressures. Peer and supervisory support in some sense substitutes for social support for services. Where social support for the program is weakest—in the cases where community disputes or factionalism hampers work—the need for system support for services is particularly intense. In the Matlab model, the work system responds in a dynamic way to the social constraints to service delivery in the village.

Geographic service boundaries for outreach work are small and are delineated by geographic areas that are considered socially acceptable for women in *purdah* to freely cover. Because work areas are small, few workers have had to bridge the factional boundaries that so typically fragment village life.

The significance of the institutional determinants of effective supply was substantiated by research. Workers belonging to large and powerful patronage groups, for example, were more effective than workers who belonged to less influential ones. Status, factionalism, and economic relationships profoundly influence the social support for contraception and the style of work and the dedication of service providers to their work. Quite clearly, supply effects are embedded in a complex institutional nexus, whereby workers are in no sense free agents of social change, but nevertheless contribute sig-

nificantly to contraceptive decision-making.[36] The history of contraceptive use dynamics in Matlab suggests that a well organized service system, with links to village leaders, and strategies for relating the program to key social organizational units, can exert an independent causal effect on reproductive behavior.

A lesson that has emerged from these organizing principles is that social cohesion within the team of workers comprising the supply system must be strong where the demand for services is weak. The proximate operational determinant of impact is exchanges between service providers and clientele, not merely for communication, but for the provision of a wide range of services and options that respect the need for personal care in response to individual preferences. As such, the project has become an institution for fostering social change, as important as or more than other determinants of reproductive behavior.

The Relevance of Matlab to National Policy

Commentators on the Matlab findings sometimes question the policy relevance of this research. There is something so particular about the climate of demand in Matlab and the capacity of the ICDDR,B to organize services, they argue, that the overall results have little relevance to Bangladesh as a whole or to pretransitional societies elsewhere.

Concerns about the Unique Nature of Demand

It is argued by some observers that a generation of ICDDR,B presence in Matlab has changed social, economic, and health conditions, thereby altering aspirations, openness to innovation, and reproductive motives in ways that alter reproductive behavior. Support for this proposition, however, requires evidence that such institutional effects are somehow unique to treatment areas, and that the practice of contraception and the demography of Matlab are in some sense atypical of neighboring areas. Investigation of these issues has failed to identify any marked distinction between pre-project demographic dynamics in Matlab and the rest of Bangladesh, or significant differences between the Matlab comparison area and contiguous nonservice localities where ecological and economic conditions are similar, but where the Matlab hospital and research system are not accessible. A survey in contiguous areas has shown that reproductive motives and fertility regimes are similar to the Matlab comparison area.[37]

Some observers have posited that fertility declines in Matlab have been induced by reductions in infant and child mortality produced by the special health services in the Matlab hospital. This conclusion is inconsistent with observed levels of mortality, however, and with the sequence of events observed in the course of the change in Matlab demographic dynamics. Infant and child mortality rates were high in Matlab in the period prior to the study, and were not altogether atypical of levels that have been observed elsewhere in rural Bangladesh. In recent years, rates declined below the national average but this trend is observed only in the treatment area where mortality decline followed, rather than preceded, the fertility decline.[38] While mortality may have declined in the period prior to the Liberation War, it seems clear that the period from 1970 to 1972 and the famine of 1974 to 1975 were major crises affecting nearly all households in the Matlab area, greatly elevating mortality risks among all age groups in the period before the project (Langsten, 1980; Alam et al., 1980).

It is nevertheless likely that the general health service system in Matlab, with the diarrheal disease hospital in Matlab Bazaar as its core, has generated considerable good will and lends credibility to all service work, including the family planning effort. To the extent that they exist, however, these are supply effects arising from the provision of services. Moreover, their impact, if in any way explaining the success of the project, should have been manifest in 1975 at the time of the weak and ephemeral effects of the CDP, not only in the subsequent project.

The clear divergence between demographic patterns in the treatment and comparison areas, as well as additional evidence from other, contiguous areas, thus supports the conclusion that the difference between the two areas is an accurate assessment of the net effect of providing intensive services in rural Bangladesh.

Hypotheses Explaining Latent Demand

If the findings from the Matlab Project cannot be dismissed as spuriously related to unmeasured and unique characteristics of demand in the Matlab locality, then it is reasonable to ask where this demand has come from, and why it remains latent in rural Bangladesh, where contraceptive supplies are available and traditional contraception is widely known. Two interrelated hypotheses may explain latent demand. First, growing economic adversity may have altered the structural determinants of high fertility, producing a demographic transition that is poverty-led.[39] The demand for children is weakened when the wealth of each generation is perceptively worse than that of the preceding generation. Second, growing economic aspirations accompany these changes, since the involution of the economy introduces new forms of wealth that are based mainly in cities and towns, producing an emerging elite that derives wealth from nontraditional sources. This trend, while not representing a transformation of rural society, may undermine supports for high fertility.

The hypothesis of poverty-led demand derives from the observation that economic deterioration has, in fact, occurred. The most widely noted components of dete-

rioration are the growing proportion of landless households, and concomitant declines in agricultural wages. Improvements in productivity have been realized by intensification of agriculture, and this change has been associated with increased, rather than mitigated, adversity. Economic activity in the face of a doubling of the population and fragmentation of land, is increasingly difficult to characterize as rural and agricultural, since family incomes are dependent upon multiple sources, including farming, wage labor, petty trading, and other activities that are collectively nontraditional.

The consequence of deteriorating household economic conditions for demographic behavior is likely to be reflected in the diffusion of behavior that was once characteristic of relatively poor households. Studies have consistently shown that the poorest segments of Bangladesh society have lower fertility than do relatively affluent landed households. Interpretations of this differential vary. Some authors note that proximate determinants of fertility other than contraceptive practice are changing. For example, dowry prices, in relative economic terms, have greatly increased, producing a rising age of marriage. Migration for wage labor is more common now than in decades past, with effects on spouse separation and nuptiality that reduce natural fertility.[40] Some studies suggest, however, that contraceptive practice is more prevalent among the landless poor,[41] although this finding is the subject of debate. If confirmed, it appears likely that institutional supports for high fertility erode under conditions of worsening poverty. Given the relative poverty of young adults in comparison to their parents, it is plausible that children are perceived less as insurance against risk than as a burden in the short run with little insurance value in the long run. (See the exchange on this issue by Robinson, 1986 and Cain, 1986.) Older people, in turn, may view younger people as poorer than they themselves were. Thus, the deterioration in the rural economy may diminish the importance of intergenerational wealth flows as a fertility determinant, or even reverse traditional patterns of dependence, disrupt established patronage systems, or weaken the economic role of the extended household.

Decisions to limit fertility, under such circumstances, may represent a rational response to extreme adversity, since growing landlessness, population pressure, and a general deterioration in the state of the rural economy undermine the household mode of production. The fragmentation of land holdings greatly complicates household efforts to provide employment for its members. The resulting nucleation of poor families reduces their incentives for having children, since children who leave home for employment elsewhere are no longer as able or willing to contribute to the household economy.[42] The social and structural effects of growing adversity may have diminished the traditional economic value of children.

While the economic value of children may be changing, constraints on fertility regulation may also be diminishing. Impoverishment of rural society loosens restrictions on the role of women in ways that influence their reproductive motives. High fertility in rural Bangladesh is associated with relatively affluent, landed, and agrarian families. *Purdah* is emphasized in higher-status households, where gender roles are strictly delineated. Growing rural poverty undermines these traditional supports for high fertility, since women must share the economic burden of survival. *Purdah*, by necessity, must be relaxed as the need for wage labor, trading, and unconventional economic roles emerges. Divorce rates increase, reflecting the pressure of poverty on the extended family, *bari*,[43] and patronage systems, as well as weakening the role of these institutions in constraining fertility regulation.

Combined with growing rural poverty are emerging aspirations to partake in the tangible benefits of progress and modernity. These aspirations, added to the weight of poverty, undermine the institutional supports of high fertility (Freedman and Freedman, 1986). New forms of urban wealth are emerging, derived from trading, remittances from the Middle East, and the emerging export trade in textiles, garments, and other manufactured goods. These trends enhance the role of the urban economy and increase urban rural income disparity. Rural income, in turn, is increasingly supported by itinerant wage labor, and by links to the urban economy. This has led to a proliferation of modern forms of communication and a growing disparity between aspirations and familial resources. These changes, while not representing economic betterment, may lead to modernization of reproductive motives through their effects on exogenous fertility determinants. For example, the changes that have occurred enhance the importance of education, diminish the historic importance of inherited wealth, and expose rural households to numerous nontraditional ideas. The complex conditions of subsistence, previously derived from one's village, must increasingly require communication, travel, and planning. Once established, such conditions lend credence to the notion that children should be educated and that fertility should be planned.

The critical contribution of Matlab is the finding that poverty-based demand remains latent in the absence of rigorous supply. In the Matlab comparison area, where such influences were presumably operating, no change in reproductive behavior occurred. This demonstrates that reproductive behavior in a traditional impoverished society will remain traditional despite emerging reproductive aspirations that are in some sense modern. The situation of couples who are confronted both with great poverty and with the option to practice contraception reflects an interchange between supply and demand for contraception that is, in some sense, culturally anomalous and recent, emerging over the past three decades while traditional values and norms were largely intact. If demand is induced by the poverty–aspirations gap,

then service systems that provide credible care by trained and sympathetic workers can represent critical catalysts of reproductive behavioral change where such change would not otherwise occur.

The Relevance of Matlab to the National Program

If demand for family limitation is indeed widespread in rural Bangladesh, the proposition that demand explains failures of the national program is not satisfactory. A shift in emphasis is needed from an analysis of the institutional determinants of demand to those of supply. The determinants of weak bureaucratic infrastructures to provide the cohesive, client-oriented services that proved instrumental in producing reproductive change in Matlab need attention. The policy significance of the Matlab Project must, therefore, at least in part, be seen in a shift in understanding of what constitutes the leading questions about the demographic transition in Bangladesh and in other societies experiencing similar constraints.

Matlab's relevance to national program policy has been questioned because of its command over an unusual array of resources—expert Bangladeshi and expatriate leadership, speedboats, and other special human and material inputs.[44] Since the climate of controversy leading to the project concerned the overriding issue of whether any supply-oriented approach could succeed in Bangladesh, it was appropriate to insulate the project from operational constraints, and to address the question of what would happen if service design was optimal. Having succeeded in Matlab, it is now appropriate to address the question of what can be accomplished in the national program.

While the special resources of the ICDDR,B were indeed instrumental in developing program operations, the project's operational features and mode of service delivery provide a great deal of insight into what constitutes an appropriate sociology of supply in rural Bangladesh. While it seems likely that elements of the Matlab system are relevant to the public sector program, this hypothesis must be tested through careful organizational research elsewhere in Bangladesh.

In fact, these considerations have formed the basis for a new project undertaken jointly by the ICDDR,B and the government of Bangladesh, whose major purpose is to utilize the Matlab experience in an effort to strengthen the national health and family planning program (Phillips et al., 1984b). The particular operational design of the Matlab Project holds no universal appeal for programs elsewhere, but the organizing strategy does; it has been demonstrated that organizational mechanisms can be developed that compensate for weak social support for fertility regulation in society at large. Developing a cohesive service system in this context is a formidable undertaking, however, even in the context of an experimental project operating outside of the governmental sector. While the Matlab findings lend support to the view that service programs can make a difference in countries such as Bangladesh, the task of systems development, especially when it must occur within public bureaucracies, remains an undertaking of immense political and organizational proportions, and an area of social scientific analysis much neglected in the population field.[45]

Conclusion

Over the past decade a series of carefully conducted studies of the institutional determinants of fertility have concluded that major demographic effects are not to be anticipated from supply-oriented policies in rural Bangladesh. In Matlab, where a rural pretransitional population subsists in a state of great poverty, substantial demographic change has occurred in response to service-oriented policies. Matlab results cannot be dismissed as spurious; the integrity of the research design is inconsistent with competing interpretations. Findings, therefore, challenge conventional theory.

The principal aim of the Matlab Project has been to address the issue of whether service programs can succeed in a rural traditional setting where social and economic conditions have not improved.[46] As shown here, Matlab neither vindicates the view that systems of supply inevitably succeed nor supports the contrasting position that demand for family limitation is absent. The experiment attests to the need for reassessing theoretical perspectives on both supply and demand.

Consider first the implications of Matlab for conventional perspectives on the role of contraceptive supply. The first Matlab Project showed that ill-informed and sociologically inappropriate strategies will most assuredly fail in traditional societies where demand is weak. Matlab findings thus challenge the view, so prominent among proponents of family planning programs, that population problems in traditional societies can be solved with the provision of commodities, facilities, or imported service strategies. In addition to the provision of technology, a social system for the provision of services must be created that is robust in the face of societal constraints on its effective operation. This, in turn, requires internal cohesion in the work system, mechanisms for effective interchange with the institutional setting, and strategies for building the credibility and acceptability of the services rendered.

Despite these important qualifications, Matlab lends fundamental support to the "supply school" position. Findings demonstrate that an appropriate system of supply—with structures and functions that are adapted to familial needs and interfaced with village institutions—can profoundly affect reproductive behavior, even in the absence of societal conditions that independently induce demographic change. While Matlab brings into question conventional notions of supply, it demonstrates that the supply side can comprise an important institutional determinant of fertility change.

Findings attest not merely to the importance of the supply side, however, but to the policy significance of the interrelationship between supply and demand, and the salience of simultaneous attention to both sets of determinants in fertility research. Demand is "fragile" in rural Bangladesh, not absent as some observers have posited. Matlab demonstrates, however, that demand represented a necessary but not sufficient condition for fertility decline, since rigorous contraceptive service delivery was the critical catalyst of the Matlab fertility transition. Once the organizational imperatives of service delivery in a particular social setting are met, the supply side can mobilize ambivalent demand and engender acceptability of services. Matlab thus challenges the view that when programs fail, lack of demand is the inevitable and sole cause.

Fragile demand nevertheless poses formidable organizational challenges to the design of an effective service delivery system. While weak demand in no sense precludes the prospects for the success of supply-oriented policies, unanswered questions emerge from the Matlab experience concerning the capacity of the public sector program to replicate this experience. In demonstrating that demographic change can be induced by contraceptive services despite limited demand, Matlab has thus shifted the focus of research to the supply side. The central question to emerge from the Matlab experience is whether a bureaucratic transition can be induced and sustained by sociologically informed interventions in the government program. The central dilemma of policy development in Bangladesh is that institutional constraints to fertility decline also constrain program development and government action (see Demeny, 1975 and Phillips et al., 1985a). Public policy must address a complex nexus of interrelated problems involving supply, demand, and their exogenous societal determinants. For this reason, it is unlikely that disjointed research focusing on isolated problems and piecemeal solutions will contribute significantly to improved program performance.[4] New paradigms for organizational change and development are needed, building upon lessons from the Matlab holistic approach to service systems development.

Perspectives on the demand side also merit review in light of the Matlab experience. The experiment challenges the view that demand for contraception arises from economic improvement or social betterment alone, or that development is a prerequisite to supply-side success. The traditional agrarian society so thoroughly described in the policy literature on Bangladesh no longer fits contemporary reality. Receptiveness to fertility regulation may be grounded in growing poverty and rising economic aspirations, and the social and institutional consequences of this trend. Originating in the growing atomism of social life, and sustained by the diminishing value of children as a source of security and wealth, demand for contraception may be poverty-led, and may have been so for some time. Traditional institutional fertility determinants remain—sustaining high fertility despite demographic pressure on households—but weakly so when services are delivered in a manner that provides couples with support for fertility regulation. The concept of poverty- and aspirations-led demand is but a hypothesis, however, not a finding from the Matlab Project. The climate of demand for contraception, and its economic origins and social consequences, merit careful investigation in light of the Matlab experiment. Thus, while the Matlab Project demonstrates that supply effects are substantial, a balanced research agenda is needed, focusing on both supply-side and demand-side issues. The apparent anomalies posed by Matlab findings will be resolved by investigating the determinants of emerging demand in rural Bangladesh—demand that remains latent in the absence of effective supply; and by investigating the sociology of supply—service delivery that is successful despite fundamental societal constraints to fertility decline. Matlab findings lend support to the view that fertility theory must more formally address the sociology of supply, particularly in rural traditional societies such as Bangladesh, where widespread fertility regulation behavior will not spontaneously arise. To succeed in such settings, program structure and design must be adapted to social realities. While no single strategy will serve all sociocultural settings, the study of programs and the sociology of the supply side deserve the same degree of rigor accorded to research on the sociology of demand.

Notes

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1 The Matlab Family Planning-Health Services Project is referred to throughout this report as the Matlab Project. The design of the Matlab Project is described by Bhatia et al., 1980. Changes in the design are described by Phillips et al., 1984a and Phillips et al., 1985a. The initial impact of the Matlab Project is assessed in Phillips et al., 1982. The project was launched in October, 1977.

2 This view derives from early interpretive reviews of the European demographic transition (e.g., Notestein, 1945), and was widely accepted at the time of the launching of the Matlab Project (see, for example, United Nations, 1973). More recently, opinion about this issue has been more diverse. In the period preceding the Matlab Project, for example, conventional wisdom held that prior development has been universally present where fertility has declined. More recent analyses of Asian transitions note, however, that economic development is not universally present (e.g., Jones, 1984). The hypothesis that development is a prerequisite for fertility decline is thus the subject of debate. Mortality decline, however, has occurred in all contemporary transition societies (cf. Jones, 1984, Bongaarts, 1986).

3 The economic value of children in Bangladesh has been analyzed by Cain, 1977a and 1977b; Cain and Mozumder, 1980; Briscoe, 1979; and Rahman, 1978. The insurance rationale for children is analyzed by Cain, 1980, 1981, 1983. Pronounced son preference is analyzed by Ahmed, 1981. The economic life cycle of the family poses numerous constraints to contraceptive practice in rural Bangladesh (Cain, 1977b and 1980).

4 Discussions of the human ecology of Bangladesh appear in Ahmad, 1956 and 1968 and its effects on social organization in Bertocci, 1969 and 1976. The demographic and social effects of this environmental situation are discussed in accounts of the social and demographic effects of famine in Langsten, 1980; Bhatia, 1967; Arthur and McNicoll, 1978.

The familial consequences of the diffuse social structure of Bangladesh are described in village studies by Hartman and Boyce, 1983 and by the Bangladesh Rural Action Committee, 1983a and 1983b.

5 Some social theorists have argued that where institutional conditions for fertility change are absent, individual service-oriented approaches are likely to fail (McNicoll, 1975). In this holistic view, individuals are in constant interaction with and under the influence of higher structural forces (Van den Feden and Huttner, 1982).

6 Although some authors argue that known technology could more than keep pace with population growth (e.g., Etienne, 1977), increases in the productivity of agriculture have not kept pace with population growth (see Alamgir, 1975; Hossain, 1977; Wennergren, 1983), requiring increasing importation of basic commodities. Most analyses conclude that the pressure of population growth constitutes a threat to rural development (e.g., World Bank, 1984). For discussions of the consequences of rapid population growth, see reviews of growing dependency (Haque, 1983), worsening economic equity (United Nations ESCAP, 1981; Islam, 1981; Ittikhar, 1974; and Alamgir, 1974), and declines in land holding size and real wages (World Bank, 1984). Of these trends the most significant is the decline in land-holding and per capita agricultural income, which has impaired capacities to innovate among owners (cf. Ahmad, 1984; Chaudhury, 1980).

7 See United Nations, 1981; Miranda, 1980; Ruzicka and Chowdhury, 1978. Marital dissolution is more prevalent in landless and nonagricultural rural households (Khuda, 1982).

8 For a discussion of the effects of the Liberation War, see Curlin et al., 1976. The effects of the 1974-75 famine may have been even more catastrophic (cf. Chowdhury and Chen, 1977 and Langsten, 1980).

9 The economic status of women relative to men may be worsening because women disproportionately bear the effects of economic deterioration (cf. Lindenbaum, 1981; Westergaard, 1983; Abdullah and Zeidenstein, 1982; Saleha and Greeley, 1979; Greeley, 1983). The proportion of households that are female-headed is increasing in Bangladesh (Quddus et al., 1985), possibly elevating morbidity and mortality risks to the mothers and children affected (see, for example, Westergaard, 1983; Banu, 1978).

10 A gradual decline in caloric intake and nutritional balance is documented in successive *Statistical Yearbooks* of the Bangladesh Bureau of Statistics (1985), and in the report of the Institute of Nutrition and Food Science, 1977. Per capita declines in rice production have been mitigated by increased imports and consumption of potatoes and wheat (Chen and Chaudhury, 1975). Nutritional balance, most notably protein, has deteriorated markedly over the past two decades.

11 Current mortality levels and trends are much debated in Bangladesh. Official statistics suggest that mortality rates have declined. Estimates based on special studies suggest, however, that declines have not occurred in recent years, and that conditions may be worsening (see Robinson, 1984 and Population Development and Planning Unit, 1984). In the period immediately prior to the Matlab Project, a time of famine, infant and child mortality was double the average rate for the previous decade (Mitra, 1979).

12 For a discussion of the evolution of population policy in Bangladesh, see Duza, 1985. The feasibility of the goals of Five Year Plans (see Ministry of Planning, 1983 and 1986) has been repeatedly questioned (e.g., Demeny, 1975; Khuda and Howlader, 1985).

13 Successive Five-Year Plans document failures to achieve past aims as well as ambitious plans to resolve difficulties (see Ministry of Planning, 1977-1983, and 1986; Khan, 1985).

14 The original purpose of establishing the research station in Matlab was to test the efficacy of vaccines against cholera—a rare disease, even in rural Bangladesh. Candidate areas were relatively densely populated, yet rural, isolated, riverine, and impoverished in comparison to settings to the north or west of Dhaka.

15 In the absence of rigorous experimental design, causal inference about the role of the supply of services is impaired, since it can be argued that exogenous and unmeasured societal determinants of fertility could contaminate supply effects (see Hauser, 1962). The limitations of inference from alternatives to formal experiments are discussed in Hernandez, 1981b; Dixon, 1978; and Tolnay, 1986.

16 Areal variance in Matlab social and economic characteristics is not appreciable (Rahman, 1986), and treatment and comparison area characteristics were similar prior to the project (Chowdhury and Phillips, 1984).

17 Modern method prevalence was less than 5 percent prior to the project (cf. Huber and Khan, 1979; Osteria et al., 1978; Bhatia et al., 1980). Mortality and fertility dynamics were similar prior to the project (Phillips et al., 1982).

18 For evaluation of the operational design see discussions of training (Bhatia, 1981), implementation (Bhatia et al., 1980), management information (Rahman, 1983), organizational structure (Phillips et al., 1984b and 1985a), and service strategy (Bhatia et al., 1980).

19 In 1983 the national Contraceptive Prevalence Survey estimate of modern method prevalence was 13.8 percent. Traditional method prevalence was 5.4 percent, although the use-effectiveness of traditional contraceptive practice in rural Bangladesh is probably very low (Mitra and Kamal, 1985). Prevalence increased over the 1983-85 period (Mitra, 1986).

20 Traditional contraception is rarely reported in service records in Matlab treatment areas because services are oriented to modern methods only.

21 Matlab first-method continuation rates and segment rates are low in comparison to studies conducted elsewhere in Asia. All-method continuation rates, which measure the probability of use of any method after contraception is adopted, are high (cf. Akbar et al., 1982; Rob et al., 1982; Bhatia and Kim, 1984).

22 Compliance with the oral pill regimen is exceedingly poor in Matlab (Seaton, 1985).

23 Matlab surveys suggest that many women who do not want additional children are often not practicing contraception (Osteria et al., 1978; Koenig et al., 1987). Stated intentions to practice contraception often fail to predict future behavior (Bhatia, 1982). A set of attitudinal questions can be predictive of contraceptive use, however (Chowdhury et al., 1985).

24 It must be appreciated, however, that 1984 similarities between treatment and comparison areas could stem not only from social forces undermining the supports for high fertility, but also from the influence of the national program. There also is some possibility that similarity in family size preferences may to some degree be a function of the diffusion of norms between the two areas resulting from frequent social interchange among residents.

25 The pronounced seasonality evident in Figure 2 has been analyzed by Becker and Sardar, 1980.

26 Because the Matlab Project was launched in October of 1977, project impact years are defined by ordinal years commencing nine months later in July 1978. Figure 3 therefore presents data compiled by July to June years.

27 The two studies in Matlab represent a "cross-over" design that aimed to minimize contamination: half of the CDP treatment villages were allocated to half of the subsequent treatment area, while half of the CDP comparison area subsequently became treatment villages. It is the CDP treatment-Matlab Project treatment quadrant of this four-celled cross-over design that consisted of the relatively high-prevalence CDP villages, and accounted for the contamination of the Matlab Project (Phillips et al., 1981). This contamination was modest and transitory, however.

28 Analyses of worker-client exchanges and their impact on contraceptive behavior appear in Simmons et al., 1984; Simmons et al., 1986; and Simmons et al., 1988. Statistical analysis supports the hypothesis that exchanges have a net effect on contraceptive practice (see Phillips et al., 1986b).

29 See Rahman et al., 1980. The CDP was launched to test the hypothesis of Ravenholt and Chao, 1974, which holds that demand for contraception exists and can be met with distribution of commodities.

30 Early and encouraging results from the CDP were reported by Huber and Khan, 1979. Its modest and transitory fertility effects are reviewed in Stinson et al., 1982.

31 High discontinuation rates were, in part, due to low worker credibility (Rahman et al., 1978).

32 This issue is analyzed by Simmons et al., 1984, 1986, and 1988. The broader social environment has implications for service design (Simmons and Simmons, 1986).

33 The Matlab dual leadership system for delineating authority by appropriate gender roles is described in Phillips et al., 1984b.

34 It should be noted that Matlab has had its share of administrative problems. These difficulties have been ad hoc and unsystematic, however, and are not informative.

35 In keeping with this perspective, organizers of the Matlab Project assiduously avoided notions of *individual* rewards, targets, and incentives, whether to workers or clientele.

36 The hypothesis that demand for children is in some measure affected by supply has not yet been systematically investigated in Matlab, but merits careful consideration (Koenig et al., 1987).

37 A 1981 survey of the six subdistricts of Munshiganj Division, an area contiguous to Matlab but inaccessible to its service programs, provides evidence to suggest that demographic, social, or reproductive preference characteristics of the population were indistinguishable from the Matlab comparison area (see Phillips et al., 1984c).

38 The dynamics of mortality and fertility decline are consistent with the hypothesis that family planning services may have contributed significantly to reductions in childhood mortality (Phillips et al., 1987; Koenig et al., 1986). Thus, mortality decline in Matlab appears to be a consequence of fertility decline, not its cause.

39 In an analysis of the demographic changes that have occurred in East Java, Freedman et al. (1981) have noted that program success was often most pronounced in villages that were relatively impoverished. In a recent discussion of the situation in Bangladesh, the hypothesis of poverty-led demand is proposed as the possible basis for latent demand (Freedman and Freedman, 1986). In this view, pervasively worsening poverty exists simultaneously with the opening of villages to outside communication, consumer goods, and a cash economy. Aspirations are inconsistent with high fertility, and reproductive motives change as a consequence (see also McIntosh, 1983).

In an analysis of a recent drought and famine in South India, Caldwell et al. (1986) showed that the crisis changed marriage patterns, but had no effect on contraceptive behavior. While gradual and sustained economic deterioration may affect institutional determinants of fertility, there is no evidence that periodic crises produce short-term adjustments in fertility regulation behavior.

40 Higher economic status and ownership of land have been associated with relatively high family size desires (Stoeckel and Chowdhury, 1979; Amin and Faruquee, 1980). The fertility differentials between high and low economic status households tend to be small, however, and largely determined by factors other than contraception, such as spouse separation and marital dissolution (see Cain, 1986). It is nevertheless apparent that stated reproductive preferences among low-income respondents suggest that the rural destitute couples are more motivated to practice contraception than are landed couples (see, for example, Mosena and Stoeckel, 1972). Recent Contraceptive Prevalence Survey results suggest that use is more prevalent among the poorest economic strata, particularly for terminal methods (see Phillips et al., 1986b; Mitra and Kamal, 1983 and 1985).

41 See Khuda and Howlader, 1985; Alauddin and Faruquee, 1983. The hypothesis that increasing economic adversity leads to increasing contraceptive use is not always accepted. Cain (1981) noted that the relationship of landlessness with fertility in a Mymensingh village is attributable to spouse separation. Major fertility declines occurred in Matlab in 1975 during the famine, to crude birth rates of 20, or half the prefamine level. Although proximate determinants are not fully understood, this famine-induced fertility decline is known to be unrelated to contraception.

42 Community studies have shown that economic changes have affected social institutions known to influence fertility. For example, as the economic importance of land and agriculture has diminished, patronage groups have increasingly served varying purposes, with individuals compelled by circumstances to belong to several different groups for various economic, social, or religious purposes. The diffuse social structure of rural Bangladesh has become more so owing to these changes (see, for example, Khan, 1967; Greeley, 1983; McIntosh, 1983).

43 The *bari* is an exogenous cluster of households, often but not necessarily comprised of a common lineage, and known to exert a strong collective influence on social and economic behavior (see Rahman, 1986).

44 A discussion of the relevance of the Matlab Project to policy planning appears in the report of a conference on the fertility impact of development programs in Bangladesh (Population and Development Planning Unit, 1985). The impact of the Matlab Project is probably not unique. Several successful nongovernmental projects exist (Alauddin and Khan, 1985), although none have been subjected to precise demographic assessment. What is questioned is the replicability of the unique supply capabilities of small scale organizations.

45 Some exceptions to this generalization are Simmons et al., 1983; Simmons et al., 1975; Misra et al., 1982.

46 This view is derived from survey research on contraceptive use intentions and estimates of the potential demographic impact of addressing this demand (cf. Lightbourne, 1985; Nortman, 1982).

47 For example, much attention has focused on the hypothesis that reproductive behavior is related to the accessibility of service points (Tsui et al., 1981). Analyses of survey data have typically produced weak estimated effects, however (e.g., Pebley and Brackett, 1982). This finding may derive from the simplistic assumption that the supply-side is a single variable, rather than a complex set of formal organizational and societal interrelationships.

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