Integrating Health Services into an MCH-FP Program: Lessons from Matlab, Bangladesh

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Since 1977 the International Centre for Diarrhoeal Disease Research, Bangladesh has conducted a field experiment in family planning and MCH in its Matlab research station. The project began with an emphasis on family planning and MCH services were added in stages. This paper uses time series regression methods to address the question of whether the addition of health services contributed to family planning efficacy in Matlab in a program launched with minimal MCH services. The results show that some MCH interventions increased contraceptive prevalence, some decreased it, and others had no effect. The broader significance of these findings for implementing integrated programs is discussed.

Ever since the World Population Conference in Bucharest in 1974, and, even earlier, since the inception of public sector involvement in the provision of contraceptive services, the idea of integrating family planning and health activities has occupied a pivotal role in the population field. As Etzioni has argued, *integration* can mean many different things and as a consequence has a "weak guiding capacity" both philosophically and from a policy perspective.[1] Basic questions about the effectiveness of integration remain unanswered. This paper presents evidence on one of these questions: Does the integration of health services with family planning facilitate the use of contraception?

Merging family planning and health service components is a widely accepted strategy for improving family planning effectiveness. The World Health Organization, for example, has argued:

> Where infant and childhood mortality are high, isolated family planning programmes are unlikely to convince unresponsive or resistant couples. Many field-workers have found that when family planning programmes are not integrated with or based on family health care provided in health services, it is difficult to sustain their initial impact. Of even greater significance are the more positive reactions of parents to programmes which include family planning among the other family health care measures directed towards reducing child morbidity and mortality, as opposed to programmes concerned solely with family planning. Further documentary evidence is needed to support this observation.[2]

Such evidence, however, remains scant. Yet the hypothesis is widely accepted that combining maternal and child health (MCH) services with family planning enhances the effect of family planning. The Narangwal study in Punjab, India, one of the few and frequently cited field studies addressing the issue, examined trends in contraceptive use in villages provided with different combinations of health, family planning, and nutrition services. Results from this study, while leading some analysts to conclude that integrated services are more effective than family planning by itself, have yet to be properly interpreted and may not, in fact, support the integration hypothesis.[3]

The present paper examines these issues in the context of another widely known field study, the Matlab Family Planning and Health Services Project (FPHSP), which was launched in 1977 by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), in its Matlab research station in Comilla District, Bangladesh. The analysis aims to determine whether additional health and MCH services enhance the effectiveness of a comprehensive family planning program that contained limited MCH components from the beginning.

The Integration Hypothesis

Integration is typically defined as the process or outcome of merging service or administrative components with each other. The specification of a framework for the in-

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terrelated hypotheses about the effect of integration is, with some exceptions, typically lacking in the literature.[4] This lack of clarity about variables and their causal nexus impairs research design and analysis. Nevertheless, the term *integration* is used widely in reference to several interrelated hypotheses covering two questions. (1) What is the best or most appropriate mix of service components from the perspective of the client? and (2) What is the most effective or efficient package of service and administrative mechanisms from the perspective of national program design and implementation? Our focus in this analysis is on the client acceptability hypothesis, which is statistically tested with areal time series data.

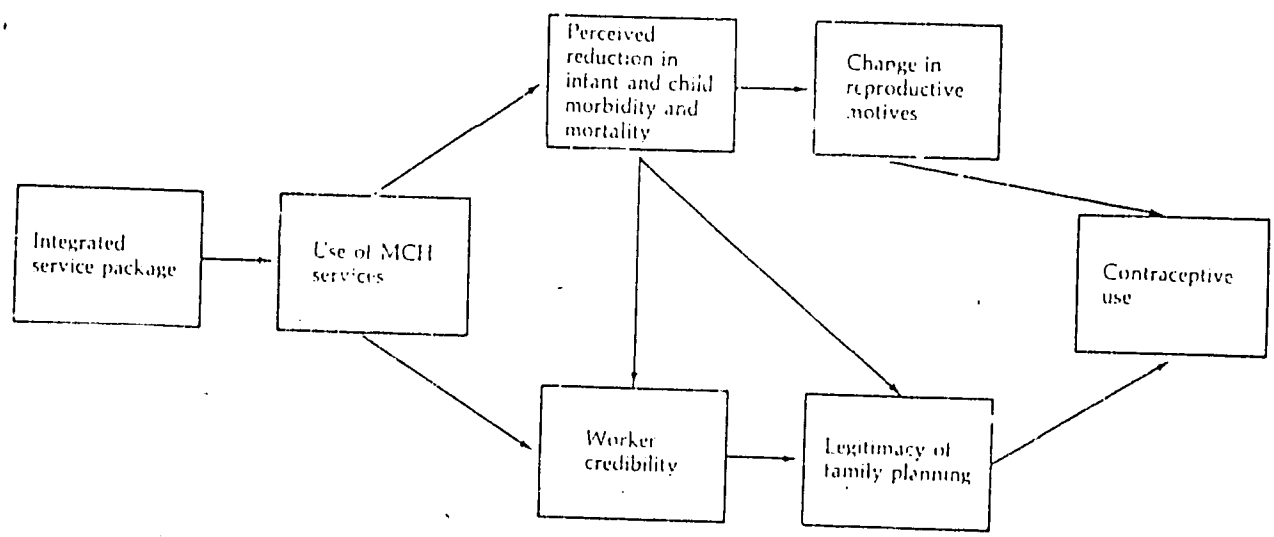
The integration hypothesis, viewed from the user's perspective, is complex (Figure 1). If services are introduced where organized MCH and family planning services are otherwise not available, the hypothesis posits that providing a combined package of MCH and family planning services enhances worker credibility. This contributes to the legitimacy of family planning, which, in turn, activates latent demand for family planning, thereby increasing contraceptive use. Worker credibility is enhanced because the benefits of MCH services are more immediately apparent to users than those of contraception, and because lower morbidity and mortality may be noticed by villagers. Permanent contraception is likely to be perceived as more legitimate if mortality risks are low. A further dimension of the hypothesis is that integration has indirect effects through its influence on mortality and consequent alteration of reproductive motives. If child mortality is lowered, women can expect that more of their children will survive, they will desire fewer children than women who anticipate a higher mortality rate, and they will be more effective users of contraception.

These considerations, however, do not address the question of the amount of MCH or basic health services that must be made available in order to ensure the pathway outlined above. For example, Figure 1 shows that integration can be viewed as a continuum of service packages from a minimal package of family planning services at one extreme to comprehensive family planning, MCH, and primary health care services at the other. In between these extremes are a range of service models that first broaden the range of contraceptive services available, and subsequently the range of MCH and primary health care service components.[5] These major service packages can be conceptualized as lying on a continuum of highly differentiated service models. In this paper we examine the effect on contraceptive prevalence of an incremental shift from Package 3 (comprehensive family planning with limited MCH services) to Package 4 (comprehensive family planning with intensive MCH services)

FPHSP Design

Prior to the FPHSP, the experience of the ICDDR,B with a contraceptive distribution project led to the conclusions that (1) a broad range of family planning services must be provided, and (2) minimal MCH care is necessary to ensure worker credibility.[6] In terms of the Figure 2 continuum, it can be said that Package 1 was tested in an earlier study known as the Contraceptive Distribution Project (CDP) and shown to have failed to produce lasting effects,[7] while Package 2 was never launched. Thus, from the onset of the FPHSP, it was an integrated health and family planning project at Package 3 of the Figure 2 continuum.[8] After the launching of the FPHSP, village-based service components were added over a five-and-one-half-year period. Although emphasis was on the MCH components, two family planning components were added: IUD insertion in clinics in January 1978 and IUD insertion in clients' homes in April 1982. Village-based MCH components that were added included

Figure 1 The integration hypothesis: The impact of MCH services on contraceptive use



tetanus vaccination for pregnant women, oral rehydration therapy, tetanus vaccination for all women, measles vaccination, antenatal care, and training of traditional birth attendants. Each additional element was integrated only after previous components were fully functioning.

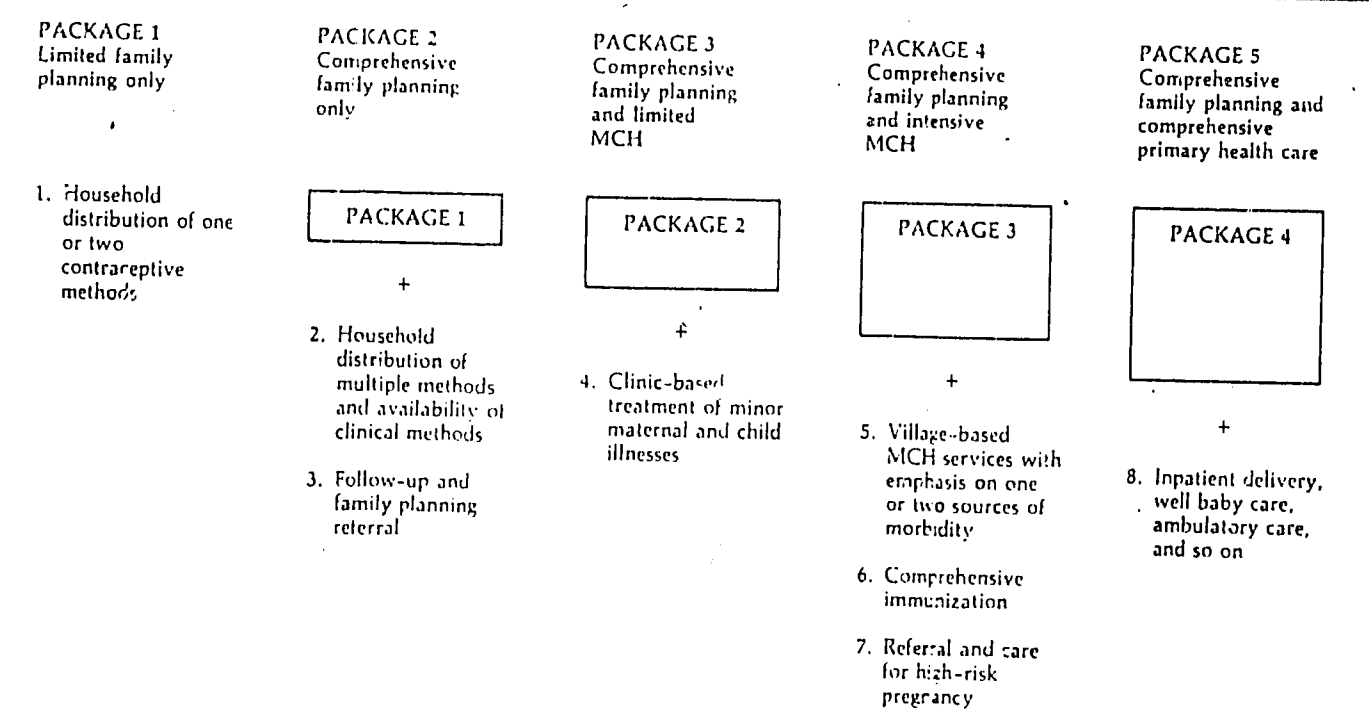
The study area consisted of four blocks of 20 villages (denoted Blocks A, B, C, and D); in the comparison area, interventions were not provided but there was demographic monitoring. Beginning in 1982, MCH components were implemented in Blocks A and C with greater intensity than in Blocks B and D. Thus, areal variation exists in the intensity of MCH service development over the post-1982 period. The present analysis is predicated on the hypothesis that the variation in MCH service availability should covary with trends in contraceptive use over time if MCH services have a direct causal link with family planning efficacy. The Matlab FPHSP thereby permits analysis of the question of whether the gradual expansion of the program from Package 3 to Package 4 contributes to contraceptive prevalence.

The initial FPHSP was a village-based program focused on family planning, health education, and distribution of drugs for minor ailments; clinical health services were available in nearby rural clinics known as family welfare centers. Village-based contraceptive services were provided by community health workers—a cadre of young, literate, married women who used contraception and were from respected families in the local community. Each block in the service area had a centrally located family welfare center. These facilities were simple one-room structures donated by the community, staffed by a resident trained female paramedic (family welfare visitor), and equipped to deal with minor maternal and child health problems and family planning needs. Each family welfare center was visited fortnightly by a female physician, and each medical visit was preannounced to ensure community involvement and efficient utilization of services. In addition to the community health worker, the family welfare visitor, and physician, there was a cadre of male supervisors, one for each block, who in turn had two supervisors for general research work. Overall service and research work was coordinated by a male field manager.

As of 1 October 1977, all staff on the project had been trained and assigned to their respective service areas. Next, two-week courses were conducted simultaneously in the four blocks to introduce community health workers to family planning concepts, motivational methods, service record keeping, health concepts including care for side effects, and basic reproductive physiology. Once the project was under way, one refresher training class was conducted for a full day each week over the period from October 1977 to September 1978. This ensured that practical field problems would be the focus of training.

The comprehensive family planning package was largely developed by January 1978, and by March 1978, family welfare centers in all blocks were providing referral services for family planning and treatment of children under five years old for scabies, fever, worm infestation, and diarrheal disease. The addition of the village-based service components was then begun. The incremental service development of the project permitted assessment of the incremental effect of each MCH component that was added to an established array of family planning services. Effective project implementation is a

Figure 2 Service packages on an integration continuum



prerequisite for testing the hypothesis that adding MCH services enhances family planning efficacy. The FPHSP was conducted by an extraordinarily effective management system. Nonetheless, the introduction of MCH components imposed new and challenging organizational requirements. It is possible that these additions were accompanied by unintended shifts in emphasis away from family planning. Thus it has to be kept in mind that increases or decreases in contraceptive prevalence may be due to the addition of the MCH components, less emphasis on family planning, or both.

Results

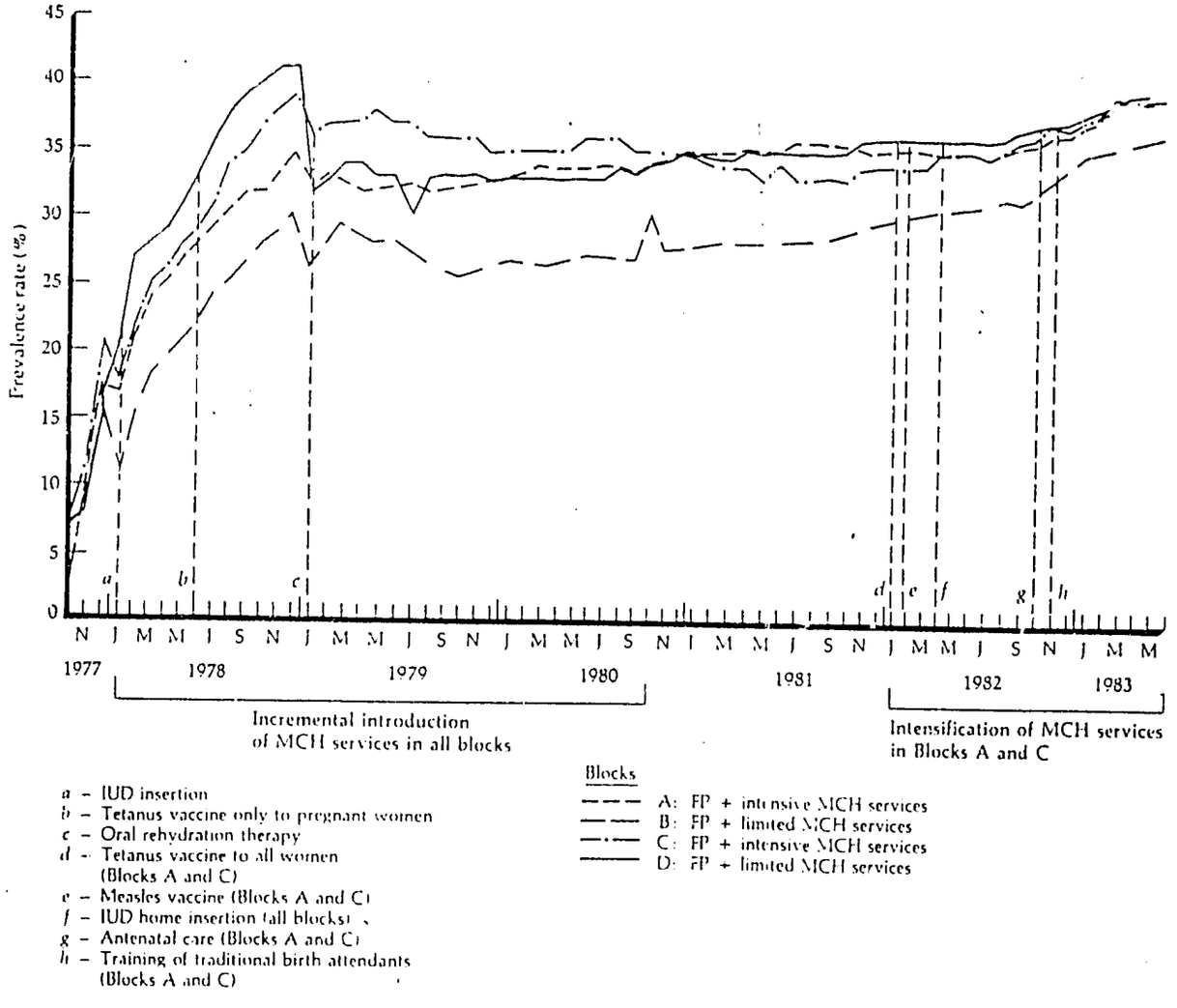
Figure 3 shows time trends in contraceptive prevalence from October 1977 to June 1983 for the four service blocks. Vertical lines show the timing of interventions. In 1982, MCH services were added in half of the FPHSP treatment area (Blocks A and C), and IUD insertions in clients' homes were added in the total treatment area.

Trends in prevalence suggest that initial FPHSP effects were pronounced in all four blocks: Use prevalence increased to 25 percent in the first six months and to 32 percent within a year.[9] This was followed by a general fertility rate decline of 25 percent.[10]

Although there were initial differences between blocks, prevalence gradually converged to 36 percent by mid-1983 and rose further to 43 percent by mid-1984. The use of contraceptive services increased in some areas more rapidly than in other areas. Block B, for example, is regarded by Matlab workers as a relatively conservative area. In this area there is a widely respected religious leader who neither supports nor strongly opposes family planning. While it is not possible to examine the sources of the low Block B prevalence in the present analysis, the Figure 3 trend is consistent with the hypothesis that such conservative influences may have initially depressed the response to the program, but that in the long run, villagers grow to accept its message.

The addition of IUD insertions to the work regimen

Figure 3 Matlab monthly contraceptive prevalence rates for four service blocks, October 1977–June 1983



in January 1978 required modifications in the work pattern. As Figure 3 shows, there was a brief drop in prevalence in three blocks followed by marked increases in all blocks.

In June 1978 the tetanus toxoid program was introduced to prevent tetanus neonatorum. The strategy was to identify women at an early stage of pregnancy and administer two doses of vaccine before delivery. The proportion of pregnant mothers immunized was monitored, and each community health worker was responsible for maintaining cold chain procedures in the field, persuading the women to accept the vaccine, and administering the injections.[11] No apparent disjuncture in the contraceptive prevalence trend occurred despite the complex operational difficulties of developing a cold chain in a rural riverine area where electrification, roads, and other modern communication networks are absent. This successful introduction of tetanus immunization without major disruption to the provision of family planning services was achieved by using the male supervisors as organizers of logistics so that the new service component did not interrupt the regular family planning work regimen of community health workers.[12]

Prevalence continued to increase until January 1979, at which time two interventions were introduced—"packets" and "*labon-gur*" for treating diarrheal disease with oral rehydration therapy. The packets are a premixed sugar and electrolyte powder that is dissolved in a liter of water. A packet distribution and community-based solution preparation scheme was introduced in Blocks A and C. Labon-gur, introduced in Blocks B and D, is a homemade mixture of locally available salt and molasses that has been shown to be as effective as the packets and costs less.[13]

Starting in January 1979, special attention was given to training community health workers to train villagers in solution preparation and morbidity record keeping. This work temporarily diverted attention from family planning to new and complex health education and community organization activities. Packets had less of a negative effect than labon-gur, perhaps because packets are a ready-made mixture that workers can dispense freely with less attention to community organization and training than is required for labon-gur. Labon-gur, while it is less expensive than packets, is not perceived as a medicine by villagers and thus represents an intervention that requires continuous attention to community organization, training, and motivation. The low cost of labon-gur is therefore apparently offset by the laborious support requirements that are more disruptive to family planning and other services than a packet program.

In January 1982 the FPHSP was modified to further enrich the MCH program in Blocks A and C. First, the tetanus vaccine strategy was changed to a mass maternal immunization program. This was in response to findings showing the disappointing coverage of the program when it was limited to pregnant mothers.[14]

Next, within six weeks, a measles immunization program was launched for children with no history of measles. The measles immunization was phased in only after there was complete coverage by the tetanus program. Despite the obvious operational complexity of the vaccination program, there is no evidence in Figure 3 of a downward disjuncture in the contraceptive prevalence trend. On the contrary, evidence in Figure 3 suggests a rising prevalence rate in all blocks, including A and C where immunization was introduced.

In April 1982 household insertion of IUDs (Copper T) was launched in all blocks. The family welfare visitors, who previously inserted the device only in the family welfare centers, were given a roster, prepared by the community health worker, of insertions to perform each month. Although Figure 3 affords little evidence that this affected overall prevalence, the new strategy was accompanied by a pronounced increase in IUD prevalence and concomitant declines in the prevalence of other methods. The strategy altered the mix of methods but not overall use.

In October 1982 the antenatal care program was launched in Blocks A and C, followed shortly thereafter by a program to train community health workers in identifying and training traditional birth attendants to use a simple delivery kit. Although contraceptive prevalence rose, similar increases were observed in the nonintensive MCH blocks, B and D.

The Figure 3 trends show, in summary, that the major increases in prevalence since October 1977 have occurred in the period prior to the introduction of incremental MCH services. After oral rehydration therapy was introduced, prevalence declined slightly and remained roughly constant for two years. In 1982 prevalence increased, but increases were observed in all blocks and not merely those receiving special MCH services. Figure 3 suggests that, with the exception of oral rehydration therapy, there is no difference between an incremental addition of MCH services and a basic package of comprehensive family planning with minimal MCH services. To clarify these relationships further, we estimated a time series regression to test the hypothesis that each new intervention has a net independent effect on contraceptive prevalence.[15]

Table 1 presents the results of the regression. The coefficients represent the net contribution of each intervention to overall prevalence. Significance tests on the coefficients indicate that the two oral rehydration therapy interventions detracted from prevalence, child care in the family welfare center contributed to prevalence, the effect of household IUD insertion was weakly positive, and other interventions had no significant effect. The magnitudes of the coefficients show that packets were associated with a 4.00-point reduction in prevalence from levels to be expected in the absence of the packet program. The labon-gur effect was −8.23, over double the effect of the packets. The child care coefficient shows that an average of 1.48 points were contributed to the prevalence rate for every 1,000 children treated at a family welfare center, when the effects of other Table 1 variables are controlled.

Table 1 A first-order generalized least-squares regression of contraceptive prevalence on MCH and family planning service interventions in Matlab, 1977–83.

Variable	Coefficient (in hundreds)	Standard error (in hundreds)	t
Family planning			
Home IUD insertion	1.19	0.74	1.61*
MCH services			
Tetanus vaccine (pregnant women)[a]	−0.06	1.75	−0.03
Measles + tetanus vaccine (all women)[b]	−0.36	0.98	−0.37
ORT			
Packet	−4.00	0.73	−5.48***
Labon-gur	−8.23	0.86	−9.57***
Antenatal care, TBA[c] training	1.16	1.04	1.12
Child care caseload[d]	1.46	0.31	4.71***
Maternal care and family planning caseload[d]	−0.70	0.75	−0.92
	Summary statistics		
Lag coefficient	64.67		
Mean (dependent variable)	0.31[e]	0.0015[f]	
Observations	276	272[g]	
R	0.57		
R^2	0.32		
F	15.45	(8/263)***	
SE (est.)	0.017		
D	1.58[h]		
Box-Pierce χ^2	175.31	(d.f. = 26)	$.5<p<.75$

* $p<.10$ (one tail)
*** $p<.001$ (two tail)
[a] Cumulative percentage immunized.
[b] Owing to the concomitant introduction of tetanus and measles immunization programs, the two variables are collapsed into a single indicator for whether or not either was incremental.
[c] Traditional birth attendant.
[d] Cumulative caseload in thousands.
[e] Mean prior to subtraction of residuals.
[f] In the time series model the mean is the deviation from the step one predicted value. This is approximately zero.
[g] The sample size is reduced owing to lagging dependent variables in calculations of the mean.
[h] Durbin-Watson statistic for the ordinary least squares.

The somewhat surprisingly weak effects of the maternal care variable are to be explained in terms of the mode of operation of the Matlab referral system. Each community health worker is trained and equipped to deal with side effects. Problems nevertheless arise that require paramedical or medical intervention. A high caseload at a family welfare center reflects a high volume of cases of "clinical side effects" and thus a breakdown in the household-based community health worker treatment system. Clinical care of children is different, however, since this involves treatment of illnesses best managed by a medic or paramedic. An effective referral system therefore screens out a large child care caseload, as reflected by the positive coefficient in Table 1. The significant coefficient for child care caseload and the nonsignificant maternal care coefficient thus attest to the importance of both the family welfare center and the village-based backup system for family planning in Matlab. The importance of child care in the FPHSP to family planning suggests that the strong administrative links between the health worker and the welfare center clinical program contribute to FPHSP success.

Implications

The FPHSP moved incrementally from a package of comprehensive family planning with limited MCH services to a package of comprehensive family planning with intensive MCH services. Family planning and minimal MCH services were clearly the priority in the early stage; MCH interventions were made a priority only at a later stage of the project. Family planning with a minimal MCH program closely parallels the plans of the family planning division of the Ministry of Health and Population Control (MOHPC)—service plans that are widely interpreted in Bangladesh as "disintegrated." Under this plan, family welfare centers provide basic MCH and family planning services and female service workers provide household family planning and MCH referral services. In Bangladesh, immunizations, oral rehydration, and other health services are the responsibility of the health division. Thus *integration* is taken to mean a strategy for combining primary health care activities beyond the limited MCH components into the joint service regimen of a health and family planning service team. Viewed in terms of technical components along the Matlab experience, comprehensive family planning with minimal MCH is tantamount to implementing the MOHPC family planning division service strategy and then adding the health division services piecemeal to the ongoing family planning program.

Our analysis indicates that much of the success of the FPHSP was attributable to this "comprehensive family planning, limited MCH services" approach. "Limited MCH," however, implies a very substantial service program: (1) a family welfare center program with curative care and contraceptive backup services provided by trained resident paramedics, carefully organized referral links from the field with meetings to ensure coordination between the welfare center and the community health worker, and basic pharmaceuticals free of charge; (2) a trained female work force with basic health knowledge so that health themes and referral could be incorporated into motivational discussions, thereby lending credibility to discussions of family planning; and (3) basic MCH outreach to include discussions of nutrition, sanitation, and child care and dispensation of aspirin, vitamins, and iron tablets.

Our regression results are consistent with the hypothesis that the family welfare center services and the referral system confer credibility upon the family planning program. As one health worker recently stated when interviewed on this theme:

> Initially I did not start telling [mothers] about family planning. I used to go to houses and advise people about health and cleanliness. If someone was sick, if a child had skin disease or diarrhea, I referred them to the subcenter or usually brought them there to get medical services.

This theme of the vital link between field operations and the welfare center is frequently cited by Matlab workers. It would be incorrect, however, to infer from the Matlab experiment that more centers should be constructed by the MOHPC. Apart from the fact that the facilities in Matlab are makeshift buildings donated by the community, buildings for family welfare centers are no guarantee that a system of services will be instituted. Moreover, it is reasonable to posit that community health workers link MCH services in the family welfare center with family planning, leaving the impression that MCH care is only available to family planning users. Therefore the child care effect could be as much a consequence as it is a cause of family planning practice in the service area. This issue bears further investigation.

This analysis has not produced evidence that further expansion of health services is essential to family planning. None of the immunization or maternal care strategies contributed to family planning efficacy in the FPHSP. Oral rehydration detracted from family planning performance undoubtedly because of the intense activity that it requires. Thus the addition of MCH components to a comprehensive family planning and basic MCH service system should be accompanied by careful attention to requisite field support so that new activities do not divert energy from existing ones. The successful introduction of vaccination is instructive in this regard. Male supervisors were deployed to inform the community, organize logistics, and generally ensure that the program would not disrupt ongoing services. That these subsequent interventions had no negative effect shows that step-by-step introduction of MCH services can produce a broad base of services without detracting from family planning activities. The negative effect of oral rehydration therapy on contraceptive prevalence attests to the importance of attending to the support of existing services when new service components are added.

The regression analysis showed that adding health components to a package of comprehensive family planning and minimal MCH services had no effect on contraceptive prevalence, but this result must be interpreted with caution. The data may not be able to measure this effect. It might be the case, for example, that worker credibility and a health service climate were established while the project was still in its "comprehensive family planning, minimal MCH" phase. Workers might have succeeded in persuading the village population of a genuine concern for their well-being and the health of their children before technical components for the reduction of infant mortality were introduced. In the eyes of the villagers, a relationship of genuine trust may—in the short run—be sufficient to affect contraceptive acceptance. If the establishment of a climate of trust occurred early, and much impressive evidence supports this idea, the effect of providing an array of health services cannot be assessed from the point when they become available.

A further reason for interpreting the regression results with caution concerns the duration of the project. While our analysis controls for duration of exposure to experimental conditions, it remains limited to a total period of approximately six years. The effect of additional health services on family planning acceptance might become manifest over a longer period of time as infant mortality declines and perceptions of such reductions become prevalent among the rural population, affect their reproductive norms, and lead to contraceptive acceptance.[16]

What are the implications of this analysis for public sector family planning and health programs? It is tempting to conclude from the findings presented here that public sector programs can attain the relatively high contraceptive prevalence rate of Matlab by implementing a package of comprehensive family planning and minimal MCH services. As we pointed out earlier, not only a particular service component but also the organizational context in which it is implemented must be considered. The Matlab FPHSP benefited from years of experience of establishing well-run, effective service programs in this particular thana; it profited from the availability of special human and physical resources and the ability to establish a small-scale, autonomous field organization. The combination of unusual resources with organizational expertise characterizes most pilot projects but cannot be easily duplicated on a national scale within the context of public sector bureaucracies.[17] This paper and the results of the Matlab FPHSP do not address how the weak implementation capability of the public sector can be improved. Nevertheless, the implication of the early success of the FPHSP is that a limited service package, if carefully implemented, will be effective even without the prior introduction of comprehensive MCH services.

References and Notes

Service implementation of the project was directed by Dr. Shushum Bhatia from 1977 to 1979, and by Dr. A.P. Satterthwaite in 1982. The authors gratefully acknowledge their important contribution to this project. Mr. David Leon developed the time series analysis package and installed it on the ICDDR,B's IBM S-34 minicomputer. Mr. Leon's work is supported by a grant to the ICDDR,B from the Population Council. The Matlab project is funded by the United Nations Fund for Population Activities and the US Agency for International Development.

1 See Amitai Etzioni, "Beyond integration, toward guidability," in *World Population and Development: Challenges and Prospects*, ed. Phillip M. Hauser (New York: Syracuse University Press, 1979).

2 United Nations, *The Population Debate: Dimensions and Perspectives*, Papers of the World Population Conference, Bucharest, 1974 (New York: United Nations, 1975), Volume 2, p. 466.

3 Faruqee discusses the design of the Narangwal study and notes that the experiment has several treatments implemented sequentially over time. In all treatments, ever use

of contraception, current use of contraception, and current use of modern contraception increased markedly during the study. But Faruqee analyzes the differential impact of treatments without controlling for duration of exposure. Since "integrated" treatments were first to be implemented, much of the increase in prevalence is an artifact of the longer exposure to the experiment in integrated service areas. See R. Faruqee, "Integrating family planning with health services: Does it help?" World Bank Staff Working Paper, no. 515, Washington, D.C., 1982. Regression results based on the random allocation of experimental conditions are therefore difficult to interpret because a time duration variable is needed to control for the potentially confounding effects of duration of exposure.

Similar problems mar the analysis of the determinants of use, wherein the duration of contraceptive use is a dependent variable and MCH service indicators are incorporated among predictors. In this analysis, no adjustment is made for censoring, so that the individuals allocated to nonintensive health service conditions, by design, will have spuriously shorter durations of use than individuals residing in intensive health care villages where services were started early in the project. See R.L. Parker, W.A. Reinke, R.S.S. Sarma, and N.U. Kelly, "Determinants of the use of family planning," in *Child and Maternal Health Services in Rural India: The Narangwal Experiment*, Vol. 2: *Integrated Family Planning and Health Care*, Research Coordinators, C.E. Taylor and R. Faruqee (Baltimore, Maryland: Johns Hopkins University Press, 1983).

4 Two exceptions are Chan Onn Fong, Kwang Woong Kim, and Gayl D. Ness, "Integration and family planning program performance: An interpretive summary," Population Research Leads, no. 12, ESCAP, Bangkok, 1982; and United Nations, "Proceedings of the regional seminar on evaluation of schemes and strategies for integrated family planning programs with special reference to increased involvement of local institutions," Asian Population Studies Series, no. 51, New York, 1981.

5 Figure 2 identifies five distinct service packages; several additional models might be specified between options four and five. For the purposes of this discussion, it is not important to do this, however. An assumption of Figure 1 is that there are positive effects of integration from the user's perspective, but a competing hypothesis can be advanced from the perspective of national policy and service providers. Figure 1 is valid if family planning services are provided with unabated vigor as MCH services are introduced. In fact, the addition of each MCH service component can be an additional burden that distracts workers from family planning. Moreover, health services, when combined with family planning, can divert resources from the family planning program effort. Conversely, family planning activities can distract workers from health tasks if job pressures emphasize the importance of making family planning services readily available. Thus integration, while it is instituted with the aim of improving services, could have unintended dysfunctional effects on the quantity and quality of services provided.

One should note parenthetically that MCH interventions might reduce credibility. For example, when benefits are not readily observable or less than expected, as was the case for tetanus immunization for pregnant mothers, adding MCH services to family planning activities might have a negative rather than a positive effect on the prevalence of contraceptive use.

6 See M. Rahman, W.H. Mosley, A.R. Khan, A.I. Chowdhury, and J. Chakraborty, "Contraceptive distribution in Bangladesh: Some lessons learned," *Studies in Family Planning* 11, no. 6 (June 1980): 191–201.

7 In comparison areas, birth, death, and migration rates were monitored, but there was no monitoring of contraceptive use. A 1981 survey showed use prevalence to be 7.5 percent in comparison areas.

8 The Matlab FPHSP is described by S. Bhatia, W.H. Mosley, A.S.G. Faruque, and J. Chakraborty, "The Matlab Family Planning Health Services Project," *Studies in Family Planning* 11, no. 6 (June 1980): 202–212; and by J.F. Phillips, R. Simmons, G. Simmons, and Md. Yunus, "Transferring health and family planning service innovations to the public sector: An experiment in organization development in Bangladesh," *Studies in Family Planning* 15, no. 2 (Mar./Apr. 1984): 62–73. The design of this study was guided by experience with an earlier and less successful project, the Contraceptive Distribution Project (CDP). A useful review of the CDP design and its policy implications can be found in Rahman et al., cited in note 6. The CDP had only limited effect (see, W.S. Stinson, J.F. Phillips, M. Rahman, and J. Chakraborty, "The demographic impact of the Contraceptive Distribution Project in Matlab, Bangladesh," *Studies in Family Planning* 13, no. 5 (May 1982): 141–148), which led to modifications in the work force, training, and supervision. The FPHSP thus differed both technically and operationally from the CDP: More family planning methods were offered with more rigorous follow-up, and care for users and health services were gradually enriched to include a variety of maternal and child health services. Although the present paper emphasizes the technical aspects of integration, operational differences between the CDP and the FPHSP were substantial and may account for much of the relative success of the FPHSP (see Phillips et al., cited in this note).

9 This time series is presented for specific methods by J.F. Phillips, W. Stinson, S. Bhatia, M. Rahman, and J. Chakraborty, "The demographic impact of the Family Planning Health Services Project in Matlab, Bangladesh," *Studies in Family Planning* 13, no. 5 (May 1982): 131–140. The proportion of injectable users was initially high, but declined to about half of all users as sterilization and IUD services were introduced in 1978. With the introduction of Copper T IUD services in the home, many pill and injectable users switched to the IUD. Thus, by 1983 all modern methods contributed significantly to overall prevalence.

10 See Phillips et al., cited in note 9.

11 See M. Rahman, L.C. Chen, J. Chakraborty, Md. Yunus, A.I. Chowdhury, A.M. Sardar, S. Bhatia, and G.T. Curlin, "Reduction of neonatal mortality by immunization of nonpregnant women and women during pregnancy with aluminium absorbed tetanus toxoid," *WHO Bulletin* 60 (1982): 261–267.

12 Although tetanus was successfully introduced as a village-based program, acceptance rates were low owing to beliefs about detrimental effects of injection during pregnancy. See M. Rahman, L.C. Chen, J. Chakraborty, Md. Yunus, A.S.G. Faruque, and A.I. Chowdhury, "Factors related to acceptance of tetanus toxoid immunization among pregnant women in a maternal-child health programme in rural Bangladesh," *WHO Bulletin* 60 (1982): 269–277.

13 S. Zimicki, Md. Yunus, J. Chakraborty, and S. D'Souza, "A field trial of a home based oral rehydration solution," In-

ternational Centre for Diarrhoeal Disease Research, Bangladesh; 1984 (unpublished manuscript).

14 See Rahman et al., cited in note 12. The impact of the package of MCH interventions is discussed in L.C. Chen, M. Rahman, S. D'Souza, J. Chakraborty, A.M. Sardar, and Md. Yunus, "Mortality impact of an MCH-FP program in Matlab, Bangladesh," *Studies in Family Planning* 14, no. 8/9 (August/September 1983): 199–209.

15 More formally, we estimate the spline regression of prevalence on time given by

$$\lambda(t) = \beta_0 + \beta_1 t + \beta_2 t' \qquad (1)$$

where t is ordinal time and t' is 0 for months prior to the disjuncture in prevalence in Figure 3 and ordinal months thereafter. See J. Neter and W. Wasserman, *Applied Linear Statistical Models* (Homewood, Illinois: Richard D. Irwin, 1974). Next we define the effect of MCH services on family planning with the model

$$P_t - \lambda(t) = \omega_1 P_{t-1} + \ldots + \omega_j P_{t-j} + X\gamma + Z\delta \qquad (2)$$

where P_t is the use prevalence rate at time t; $\lambda(t)$ is the predicted prevalence rate at t from Equation (1) that defines the underlying trajectory of prevalence over time; ω_j is the jth unknown vector of J lag coefficients adjusted for the autocorrelation among residuals across successive observations; X is a $K \times 1$ vector of K interventions implemented as of the cutoff data for this analysis; γ is a $K \times 1$ vector of unknown effects of K interventions to be estimated under the null hypothesis that each such effect is not 0; Z is a 2×1 vector that specifies the month t cumulative caseloads for maternal care, X_1, and child care, X_2, respectively, in the family welfare center; and δ are unknown effects of the cumulative clinic caseload variables as of time t to be estimated under the null hypothesis that each such effect is greater than 0. An analysis of the autocorrelation function of alternative lag models suggested that a single lag was sufficient to adjust for autocorrelated residuals.

The intervention variables Z can be viewed as net additive "disturbances," each having an immediate and lasting effect on P_t. In this manner, Equation (2) posits that each intervention has an independent effect on contraceptive prevalence. The subtraction of $\lambda(t)$ from P_t linearizes Equation (2) and adjusts for the fact that effects of an intervention introduced early in the time series would otherwise be spuriously accentuated. An assumption of this approach, subsequently confirmed in the analysis, is that the intercept is zero.

16 We are grateful to Dr. Atiqur Rahman Khan for drawing our attention to this possibility.

17 A new study fielded by the ICDDR,B in collaboration with the MOHPC investigates the transferability of the Matlab system. This is discussed in Phillips et al., cited in note 8.