

# The Impact of Outreach on the Continuity of Contraceptive Use in Rural Bangladesh

**Mian Bazle Hossain**  
**James F. Phillips**



**CENTRE**  
FOR HEALTH AND  
POPULATION RESEARCH

International Centre for Diarrhoeal Disease Research, Bangladesh  
Mohakhali, Dhaka 1212, Bangladesh

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## **ABSTRACT**

Various surveys in Bangladesh indicate that the prevalence of contraceptive use increased dramatically in the past two decades. As the adoption of contraceptives and contraceptive use have grown, continuity of use represents an increasingly important determinant of programme effectiveness. Results of the surveys indicate that household exchanges have an impact on continuity of use among all types of contraceptive users, including the adopters of long-acting methods, such as IUD. Findings of the surveys suggest that outreach not only introduces women to adopt family planning, but also provides support for the continued use of contraceptives over time. Moreover, this role of outreach increases with time. Theoretical and practical policy implications of these findings are reviewed.

## INTRODUCTION

Until recently, debate about the demographic role of the Bangladesh family planning programme was focussed on the question of whether the programme services could work in that setting, given the economic and social constraints on demand for services. This "first generation" question is being supplanted by "second generation" questions: With the growing evidences from the experimental studies that the programme can have an impact, and evidences from surveys that a demographic transition has begun, debate has shifted to the question of whether intensive programme services are needed to sustain the pace of reproductive change over time. A key issue in the policy debate is the role of the female outreach workers who have been recruited and trained to provide information about family planning and household services for resupply methods. Outreach has played an important role in fostering the adoption of family planning in Bangladesh. Throughout Bangladesh, the custom of *purdah* restricts the mobility of women, preventing travel for health services and family planning. Even in settings where *purdah* is not rigorously enforced, travel is difficult and expensive, and isolation of households and hamlets is the norm. The outreach services have, therefore, played an important role, particularly in areas of the country where prevalence is low and where the outreach services lend support to family planning behaviour that is not forthcoming from the traditional community and familial institutions.

What is controversial about outreach is the sheer cost and scale of this operation. As use of contraceptives increases, the possibility exists that outreach has achieved its fundamental aim: Nearly every couple has been repeatedly approached about family planning; the adoption of family planning has become normal rather than an exceptional behaviour. Fixed contraceptive supply points at clinics, satellite clinics, and social marketing outlets exist at convenient locations throughout the country. In this context of ubiquitous availability, household contacts may achieve little more than substituting expensive outreach supply for less expensive static service supply. Having launched the demographic transition with intensive services does not mean that such services are required to sustain reproductive innovation over time.

A perspective that has gained considerable currency is the notion that services affect reproductive behaviour by fostering the diffusion of new ideas about reproduction itself—that services not only fulfill demand, but also generate new demand (1-4). Diffusion theorists, in explaining the role of CBD, emphasize workers as change agents, introducing new ideas and catalyzing new demand in providing convenient village-based services (5-7). In this view, the outreach workers are "change agents" who introduce new fertility regulation ideas and capabilities to rural couples. Reproductive innovation and ideational change fostered by outreach programmes can generate demand for contraceptive supplies that would not otherwise arise (3). In this view, outreach is something that introduces innovation, but is not a necessary mechanism for sustaining contraceptive behaviour over time.

The argument in support of the continuing intensive outreach services is premised on the notion of "fragile demand" for family planning in rural Bangladesh. In this view, family planning represents a risk to women involved with continuing social, psychological, and monetary costs that cannot be sustained by individuals. The outreach services lend a measure of support to the use of contraceptives that would not otherwise arise. This implies that the outreach services will be necessary to sustain contraceptive behaviour even though contraceptive prevalence rises and use becomes the norm (8). Family planning services achieve their effects by mitigating costs, where costs are the social, psychological, and monetary costs of contraception. In this view, the support that programmes provide is required if the costs of contraception continue. Cleland (9) argue that outreach has its impact by mitigating these social, psychological, and monetary costs.

This paper examines the fragile demand hypothesis by testing the role of service outreach in sustaining the use of contraceptives. Longitudinal data have been compiled from two rural *thanas* of Bangladesh by the Maternal and Child Health and Family Planning Project. Our analysis is premised on the view that the "fragile demand" and "reproductive change" hypotheses are not mutually exclusive: The rigorous administration of the outreach services may have a continuing role in supporting contraceptive use, but outreach may also have changed reproductive aspirations. The joint effects of this impact are unknown. Analyzing the changing role of outreach in sustaining contraceptive behaviour provides useful insights into the long-term strategic needs of the Bangladesh family planning programme.



## BACKGROUND

Results of the 1991 Contraceptive Prevalence Survey (10) show that virtually all Bangladeshi women have some knowledge about modern contraception; for example, 49.3 per cent had tried a method, and 39.9 per cent were currently using a modern method. Within two years, survey research showed that ever use exceeded 60 per cent and current use was 45 per cent. Thus, although the prevalence of contraceptive use is rapidly increasing, the growing gap between ever use and current use suggests that the high incidence of discontinuation is increasing as well. Research on the determinants of discontinuation show that most discontinuation arises from confusion about methods, unjustified health concerns, and misinformation about the true nature of risks and side-effects (11-13). Perceptions of side-effects are compounded by the fact that women are isolated from health-care providers and others who could provide professional advice (14-15). Even if side-effects were not a problem, women's autonomy to make health or reproductive decisions is often severely constrained by traditions enforcing modesty, *purdah*, or subordination of decisions to the will of husbands, mothers-in-law, or kin whose advice on discontinuing contraception must be accepted without question. Spousal opposition to use is a major determinant of discontinuation (16). Lack of understanding of contraceptive regimen also contribute to discontinuation (17).

Contraceptive continuation rates assessed in various studies carried out in Bangladesh vary markedly by the methods. The use rates of pills and condoms are lower than corresponding use rates of IUDs and injectables (12,18-21). In general, pill, IUD and DMPA continuation rates are somewhat lower in Bangladesh than the use rates observed elsewhere in the region. The use rates of condoms are substantially lower than the use rates estimated elsewhere (12,15,19). DHS-based estimates, using the calendar method, indicates that 72 per cent of all condom users discontinue in five years, versus 55 per cent of injectable method users, 45 per cent of pill users, and 37 per cent of IUD users (22).

Policies and strategies have been addressed to "the prevention of dropouts." A distinction is made between "involuntary" dropouts (due to the

shortage of supply and remediable side-effects) from "voluntary" dropouts (planning to have a child) (15,20). Male child mortality is associated with discontinuation (23). Son preference also affects continuity of use (24). Although the programme strategies aim to reduce the involuntary dropout rate to as low a level as possible, the survey responses suggest that involuntary decisions account for most discontinuation and that programme support could lead to a substantial increase in prevalence if the barriers to the continuity of contraception were removed (25-26).

To address the apparent need for programme support for continuing contraception, the Government of Bangladesh instituted female village worker recruitment, training, and posting designed to improve access to contraception and provide support for family planning in villages throughout Bangladesh. This programme, initially launched in 1978, established a cadre of 14,000 female workers, known as Family Welfare Assistants (FWA), who are charged with the task of visiting women in their homes, explaining the contraceptive methods, encouraging the adoption of, and supporting ongoing use with resupply, information, and referral services. With evidence that FWA outreach contributed to the increase of contraceptive use, their numbers have been increased to nearly 24,000 workers. The prevalence of contraceptive use was shown to be higher in the vicinity of FWA residence (27). Moreover, FWA-client exchanges influence method choice (28) and contraceptive use (29). In this expanded programme, each FWA covers an area corresponding to three to five villages and is expected to visit each household once in two months, serving, on an average, 850 rural women.

Survey data suggest that this programme has blanketed the country with information and services. Nearly all women have been contacted at least once by an FWA, and more than a third have been contacted at home in the six months prior to survey interviews. The qualitative studies suggest that FWAs are the primary link between the Ministry of Health and Family Welfare (MOHFW) programme and rural women (3,4,30). Their responsibility is to visit households, promote the use of contraceptives, supply contraceptive methods and assist in the management of side-effect (provide counseling and client referral to Family Welfare Centers (FWC) for service). Research indicates that the quality of outreach services explain contraceptive

continuation (31). Although research has demonstrated that FWA contact with rural women significantly increases the probability of adoption of contraceptives and use in the initial years of this programme, the long-term role of FWAs in sustaining use is unknown.

This paper, therefore, aims to determine whether the FWA programme has any impact on the continuity of contraceptive use as its proponents have planned. Much of what is said about the need for follow-up is based on conjecture rather than formal investigation. This paper also aims to determine whether this role has been sustained over time. With the steady increase in the prevalence of contraceptive use rates over time, and the increasing evidences of social acceptance of contraception, it is possible that the need for outreach is diminished by the ideational changes that accompany demographic transition whereby growing demand for contraception dissipates the need for intensive household outreach with time.

## METHODS AND PROCEDURES

The present analysis will test the null hypothesis that worker-client exchanges have no effect on continuation. We hypothesize that the likelihood of the discontinuation of a method will be lower in the case where FWAs provide better services to deal with side-effects than in the case where such services are relatively poor or are not at all provided. We also hypothesize that effects of outreach will be time conditional: In the early phase of outreach, the introduction of family planning will be associated with greater impact of FWA visits than similar visits conducted later in the programme, even if statistical adjustments correct for contraceptive-use history, client characteristics, and other factors that influence reproductive behaviour.

### Data

Data for this study were provided by the Maternal and Child Health and Family Planning (MCH-FP) Extension Project, a field research programme of the International Centre for Diarrhoeal Disease Research, Bangladesh. Field sites of this project are located in the rural subdistricts of Sirajgonj and Abhoynagar, in central and western Bangladesh respectively: Since 1982, the MCH-FP Extension project has been working in collaboration with the Ministry of Health and Family Welfare (MOHFW) in these two areas. Since its inception, the MCH-FP Extension Project has been maintaining a longitudinal surveillance system, known as the Sample Registration System (SRS), in these two field sites. To monitor the impact of its different interventions on the use of contraceptives, SRS collects data on the use of contraceptives, workers contact, workers' discussion with the clients and their services to the clients. The project's trained female interviewers, who are independent of service, collect data from rural women through interviews in a 90-day (one round) cycle. The FWA visitation rate in the project sites is higher than the national average: 76 per cent of married women in Abhoynagar and 66 per cent in Sirajganj per quarter by the middle of 1992. From the 1991 CPS (11), FWA visitation rates and CPR for the country as a whole were 36 and 39.9 per cent respectively in 1991.

Until mid-1992, nearly 32 rounds (eight years) of longitudinal data on the rural women's use of contraceptives and programmatic variables (number of FWA visits, nature of discussion with the women and type of service provided to the clients while visiting) are incorporated in the analysis. In addition to the programmatic variables, age and education of women, religion, desire for additional children, and household area are used as explanatory variables in the analysis.

### **The Dependent Variable: Contraceptive Attrition**

Table 1 presents data on the contraceptive attrition process to be analyzed below. The life-table continuation rates are reported by method-first-adopted according to the first-method and all-method-use duration criteria. As the table shows, attrition among users is substantial in this study population. A third of the users discontinue within the first 6 months, half within a year, and three quarters within three years. As the bottom panel shows, this attrition is offset somewhat by method switching, but the overall discontinuation rates are nonetheless high. The 36-month continuation rate is about 40 per cent.

Table 1 also shows marked method differentials for continuation by the method-first-adopted, a relationship that is further illustrated in Fig. 1. The IUD adopters have substantially higher continuation rates than those of other adopters; condom adopters have the lowest continuation rates. All-method continuation rate differentials are similar to patterns observed for the first-method rates<sup>1</sup>. Attrition among adopters varies considerably by method, with differentials reflecting patterns that are observed elsewhere in Asia. Irrespective of the method adopted, however, substantial gains in the duration of use are achieved when women switch methods. This is illustrated, in Fig.1, by the large gap between all-method and first-method use continuation curves.

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<sup>1</sup> In this, and all subsequent tables, continuation refers to the duration of use of any method of contraception from the time of first adoption. Termination corresponds to the onset of pregnancy or a 90-day round of non-use, whichever occurs first. Clients lost to observation are assumed to have used for half of the final round of observation. These assumptions accord with procedures proposed by Potter, 1969 (32).

**Table 1.** First and all method proportions of women continuing condoms, oral pills, injectables, and IUD, by ordinal month since adoption in two rural areas of Bangladesh, 1984-1991

Ordinal month	First method accepted				All methods combined
	Condoms	Oral pills	Injectables	IUD	
Starting number	383	1,233	968	236	2,820
First method continuation rates (in months)					
6	44.8	65.7	73.5	84.5	67.2
12	29.3	53.1	58.9	70.1	53.4
18	21.2	44.6	48.2	57.9	43.9
24	a	36.5	39.4	50.8	36.2
30	a	30.0	31.8	40.0	29.4
36	a	24.8	26.6	a	24.2
Median duration of use (in months)	4.9	13.8	16.8	24.6	13.8
All method continuation rates (in months)					
6	62.4	74.9	81.8	91.3	77.0
12	50.6	64.9	70.4	84.4	66.6
18	41.0	56.9	60.9	76.8	57.9
24	37.9	48.7	53.5	70.0	50.8
30	34.7	43.0	46.7	66.2	45.3
36	30.9	38.5	41.9	58.6	40.5
Median duration of use (in months)	12.3	22.1	27.5	44	24.8

<sup>a</sup> Fewer than 30 cases entered the month indicated

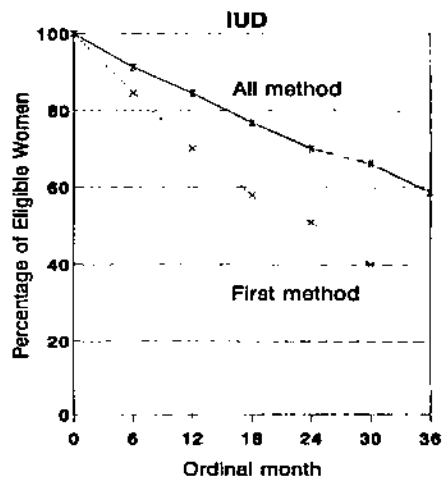
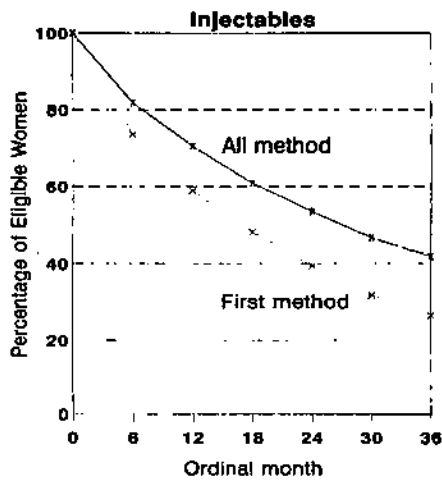
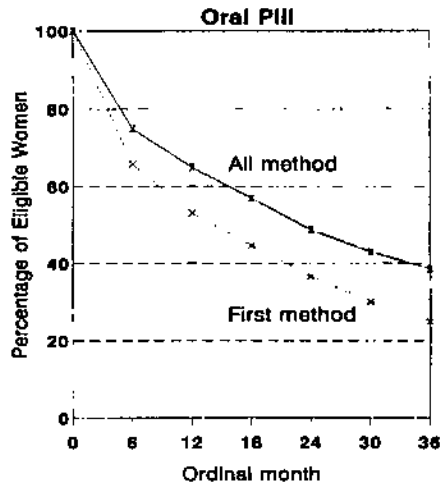
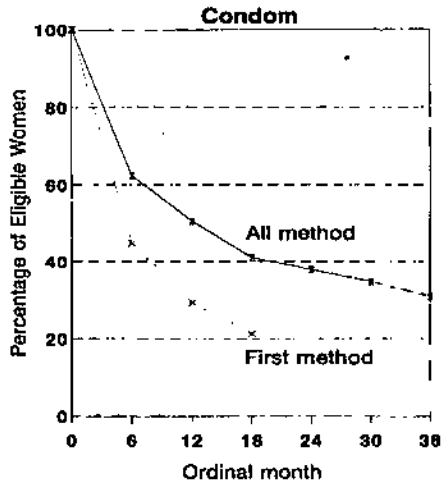
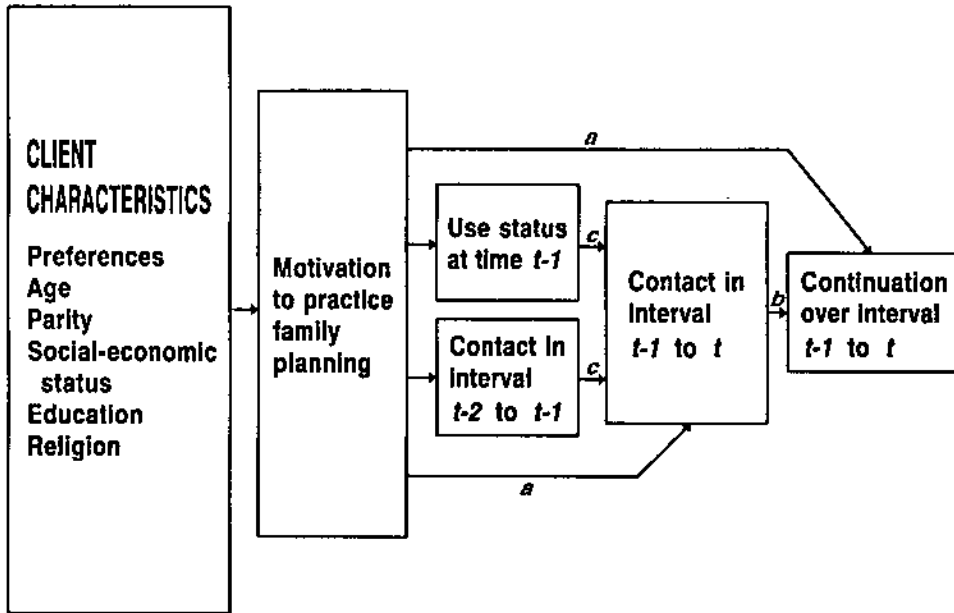


Fig. 1. First-method and all-method continuation rates by contraceptive method-first-adopted, MCH-FP Extension Project, 1984-1991

## The Covariates

Conventional hazard regression procedures for studying the role of covariates in an attrition process are not appropriate for research on the role of outreach. Proportional hazard models assume that an underlying attrition process is elevated or diminished by the uniform effect of a covariate over time (33). Extension of the proportional hazard assumptions allow for covariate effects to vary systematically with time. This is illustrated by the diagram in Fig. 2 which shows the role of covariates over two discrete time intervals. If background characteristics are the only covariates of interest, hazard models could be estimated that gauge their conditional effects as illustrated by pathway *a* in Fig. 2: Motivation is a function of client characteristics, each exerting a net additive effect on continuing use. The objective of the analysis is to estimate the effect of *b*, adjusting for the confounding effects of *a*. Considered as a general attrition process, however, the *b* effect is also a consequence of continuation: Women contacted were women requiring resupply, women who were not contacted in previous rounds, or women known by workers to want services. Contraceptive use patterns and visitation patterns of the past shape current worker visitation priorities and outreach behaviour (pathway *c* in Fig. 2). If ignored, this important source of endogeneity would spuriously inflate the estimated effects of outreach. For the present analysis, it is appropriate to segment contraceptive use histories into discrete time segments and analyze continuity across segments with appropriate adjustments for endogeneity arising from selective outreach behaviour based on relevant events in the past. Workers know client use histories in the recent past. Marshaling statistical adjustments based on client behaviour in the past permits correction for the selectivity of outreach encounters. That is, the longitudinal data of the Extension Project permit rather precise estimation of the net effect of outreach encounters on decisions to continue or stop using a method over a specified time interval. Statistical models for this estimation are presented in Appendix A.





**Fig. 2.** A framework for analyzing the role of worker visits on continuation of a given method over two discrete time intervals

Our analysis aims to interpret the attrition process illustrated in Fig. 2 with covariates that are presented in Table 2 and 3. Descriptive statistics in Table 2 report the "crude contact rates" at five points in time in the decade of observation of the study population. This refers to a 90-day recall of one or more visits in the past three months of FWA to respondents' houses. Visits which do not involve discussion or services are "contacts" for the analysis. As the data show, contact rates in the project areas increased in the early period of the project owing to interventions designed to improve field management operations. In the period following 1986, the geographic density of FWA was increased by hiring additional workers. A pilot of this programme in the study areas was associated with a pronounced increase in contact rates in the period following the FWA expansion. As expected, the

frequency of contacts increased markedly in the period following the expansion of the FWA workforce.

**Table 2.** FWA contact rates and contraceptive prevalence rates (CPR), Extension Project and national Contraceptive Prevalence Surveys (CPS)

Extension Project	Year				
	1984	1986	1988	1990	1992
<b>Sirajgonj</b>					
Contact rate	25.6	46.0	61.6	71.6	65.7
CPR	9.2	15.3	20.4	39.6	40.3
<b>Abhoynagar</b>					
Contact rate	41.2	55.4	83.8	79.2	76.2
CPR	27.3	33.3	39.7	46.0	46.3
National (CPS)	Year				
	1983	1986	1989	1991	
Contact rate (6 months)	30.0	27.0	25.0	36.0	
CPR	19.0	25.0	31.0	39.9	

Table 3 presents statistics for characteristics of the study population. Respondents have an average age of less than thirty. Most are illiterate, and the mean duration of schooling is only 1.6 years. The demand for family planning is apparently pronounced (47.1 per cent want no more children). This finding recurs in successive national surveys in Bangladesh. Demand for family planning occurs among all population strata and is pronounced (9). These characteristics are typical of data reported in the national surveys of married women of reproductive age.

**Table 3.** Descriptive statistics for the study population

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<b>Means</b>	
Age of respondent	28.6
Years of schooling of respondent	1.6
Square feet of dwelling space	248.9
<b>Proportions</b>	
Want no more children	47.1
Muslim	86.9

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## RESULTS

Estimates of the coefficients of Model (1) are presented in Table 4. Table 4 reports the results of the two-stage generalized logit regression analysis of the effect of client characteristics and worker contact on the continuity of use. The first-stage results show that sources of endogeneity illustrated by pathway *c* in Fig. 2 are highly significant. Workers clearly target their outreach according to their previous household visitation efforts and what they know about the client's use history in the immediate past. Stage 2 results show that contact effects exert a strong net influence on the continuity of the use (posited as pathway *b* in Fig. 2) that is not explained by client motives and characteristics (pathway *a* in Figure 2). Client characteristics have significant, but relatively weak effects. The strongest effect is demonstrated by the odds ratios for wanting another child (0.85) indicating that voluntary discontinuation for planning additional children increases the attrition process by 15 per cent. Other client characteristics, such as education and religion, are weak, however. The odds associated with the contact effect is pronounced (0.35) suggesting that the 90-day odds of discontinuation are reduced by 65 per cent. This supports the hypothesis that worker visits sustain contraceptive use beyond levels of practice that would arise in the absence of household outreach. Further regressions, not presented in Table 4, show that the effects of client characteristics are unchanged if contact is dropped from regressions. This result, and the strong estimated net effect of contact, shows that contact is an incremental effect that is independent of client motives or characteristics.

**Table 4.** Generalized logit regression estimates of the relative risk of discontinuation for worker contact, client characteristics and contraceptive method used in two rural areas of Bangladesh, 1984-1991

	Early	Middle	Recent	Entire period
<b>Stage 1</b>				
Constant	-0.81***	-0.19***	-0.33***	-0.53***
Prior round FP worker visit	3.09***	2.67***	4.24***	3.73***
Prior round contraceptive use <sup>a</sup>	1.75***	2.25***	2.98***	2.85***
Multivariate Wald statistics	1112.45***	1436.59***	3170.76***	5851.06***
df	3	3	3	3
<b>Stage 2</b>				
Constant	-2.91***	-2.27***	-1.92***	-2.31***
Predicted current round FP worker visit	0.36*	0.12***	0.12***	0.35***
<b>Client characteristics</b>				
Age	1.01	1.01	0.98*	0.98***
Education	0.97	0.97	0.99	0.99
Dwelling unit area	1.00**	1.00	1.00	1.00***
Muslim <sup>b</sup>	1.11	1.24	1.15	4.82***
Want no more children <sup>c</sup>	0.57***	0.77*	0.88	0.85*
<b>Method used<sup>d</sup></b>				
Condom	9.58***	10.92***	10.67***	10.25***
Oral pill	7.07***	6.89***	7.82***	8.75***
Injectable	6.36***	4.89***	6.50***	5.26***
Multivariate Wald statistics	1125.48***	1664.00***	2726.79***	2499.82***
df	10	10	10	10

\*p = 0.05; \*\*p = 0.01; \*\*\*p = 0.001

<sup>a</sup> Reference category (RC) = non-users, previous round; <sup>b</sup> RC = Hindu and other religions;

<sup>c</sup> Want more children, up to God, unsure; <sup>d</sup> RC = IUD

Table 4 also presents results segmenting the analysis by time period, thereby assessing whether contact effects diminish or increase with time. Early adopters are likely to be highly motivated, high-parity women who adopt to limit rather than space future childbearing and who sustain contraceptive use over time with a greater degree of commitment than later

adopters. If the ambivalent adopters are growing as a proportion of all users, the involuntary discontinuation would also grow with time and the demographic significance of household visits would increase. Results of regression analysis in Table 4 are consistent with this perspective: Effects increase markedly from the early to mid-time period, and the mid-to-recent period. In the early period, reproductive preferences exert a pronounced effect: Discontinuation odds are 43 per cent less among women wanting no more children than among women who want more. By the recent period, this role of preferences drops to insignificance, suggesting that motivation as a determinant of the use diminishes if the role of contact is held constant. These findings suggest that the importance of contact grows as the proportion of committed users diminishes.

That early adopter effects of preferences are so pronounced suggests that voluntary discontinuation plays an important role among early adopters, but less so among recent adopters. The relative importance of unplanned, involuntary discontinuation may be growing with time.

## DISCUSSION

This analysis has examined the findings, observed in numerous studies, that discontinuation dramatically reduces the demographic impact of contraceptive adoption. Our focus has been on the role of outreach as a strategy for mitigating the effects of discontinuation. The assumption that worker outreach addresses the dropout problem is used to justify a large-scale investment in worker salaries. As costs of this programme grow, the need to test this assumption has become critical to the Bangladesh Government and to donors that have financed the outreach programme.

Overall odds of discontinuation are reduced by 65 per cent if women are contacted at home indicating that the role of outreach is independent of client characteristics and, thus, represents a direct contribution of the programme to contraceptive use.

That main effects of worker visits grow with time suggests that the role of outreach is undiminished. This tentative conclusion was examined further by comparing results based on the early programme period with results that emerge from the most recent period. Results imply that a different role for outreach increases over time: When prevalence was low and users were limited to a few innovators, client characteristics sustained contraceptive use. As the user pool has increased, and adopters are more typical of women at large, sustained practice depends more on outreach, because users are more typically temporary contraceptive experimenters, who try methods as a temporary measure. Results suggest that household outreach substitutes for client motivation, providing incentive for contraception that would not otherwise arise. As time progresses, this role increases.

This analysis has been motivated by policies, often promulgated but rarely evaluated, that aim to sustain continued use of contraception by fostering direct encounters between programme workers and contraceptive users. Fielding workers to follow up clients has been a central strategy of programmes for four decades. This activity is justified by the aim of sustaining user satisfaction with services through outreach exchanges that

minimize misunderstanding of methods and maximizing convenient resupply. If decisions to terminate use are volitional decisions, driven solely by personal choice, client characteristics alone would explain variance in the attrition process. However, findings from this study support the view that involuntary discontinuation is a prominent factor driving contraceptive attrition. In the absence of an active household outreach, many women will discontinue practice, not because they plan to do so, but because they depend upon the programme for outreach support. As prevalence increases, the proportion of all users who are ambivalent, temporary contraceptive users, grows. Although sustained, demand-driven contraception may eventually become the norm, this analysis suggests that temporary contraception increases as prevalence grows, and that outreach is, therefore, more important to users now than has been the case in the past.

Policy deliberations on the merits of scaling back outreach operations should thus be pursued with great caution. In the interest of fostering sustainability of the programme, scaling back household service delivery, may instead undermine the sustainability of contraceptive practice.



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### A Two-Stage Procedure for Estimating the Role of Worker Visits in Contraceptive Continuation

The analysis for this study must address two distinct econometric problems. First, worker-client contact at time  $t$  is a covariate of contraceptive attrition that is also a consequence of past contraceptive use. Workers selectively target outreach on clients known to be in need of services. While some of this effect of outreach represents a real impact of contact on continuity, some is simply client-demand-driven worker response to resupply needs. Endogeneity arising from selective outreach must be addressed by the analysis. Second, statistical models that adjust for endogeneity must also use repeat observation data. Workers target outreach on the basis of what they know about client contraceptive use in the immediate past and the services they have provided to a client in the past. Repeat observation analyses construct episodes of observation that have pronounced autoregressive error that must be addressed with generalized logit models that correct error terms for within-individual correlation.

A two-stage regression procedure for addressing these statistical issues is given by:

$$\text{logit } W_{it} = \alpha_i + \beta U_{it-1} + \gamma W_{it-1} + \epsilon_{it} + \epsilon_{iit} \quad (1)$$

where

$W_{it}$  = a discrete indicator at time  $t$  of outreach contact between workers and client  $i$  over the 90-day time interval  $t-1$  to  $t$ ,

$W_{it-1}$  = the corresponding indicator of time  $t-1$  contact in the previous round,  $t-2$  to  $t-1$ ,

$U_{it-1}$  – contraceptive use status, as assessed at time  $t-1$ ;

and

$\alpha_i$  – is the stage 1 intercept,

$\beta$  – a parameter for the effect of use status on subsequent follow-up,

$\gamma$  – a parameter for the effect of previous follow-up priorities on current worker follow up,

$\epsilon_{it}$  – a stage 1 term for the within-individual  $i$  component of error, and,

$\epsilon_{it1}$  – a stage 1 term for the time  $t$  between individual component of error;

and by estimating a second stage regression given by:

$$\text{logit } C_{ijt} = \alpha_2 + \delta \hat{W}_i + \sum_{j=1}^J \zeta_j X_{ij} + \epsilon_{i2} + \epsilon_{it2} \quad (2)$$

where

$C_{ijt}$  – an indicator of continuity of use over the interval  $t-1$  to  $t$  for individual  $i$  with characteristic  $j$ ,

$\hat{W}_i$  – the predicted probability of contact for individual  $i$  given parameters of stage 1,

$X_{ij}$  - the  $j$ th characteristic of individual  $i$ ;

and where

$\alpha_2$  - a stage 2 intercept,

$\delta$  - a parameter for the net effect of worker contact,

$\zeta_j$  - the effect of the  $j$ th characteristic, and  $\epsilon_{i2}$ ,  $\epsilon_{it2}$  are stage 2 within- and between-individual error terms respectively.

Estimation procedures employ the repeated bootstrap method of Moulton and Zeger, 1989 (34).