Family Planning Program Effects on Contraceptive Use in Morocco, 1992-1995

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Abstract: This study assesses the impact of improvements in public sector family planning services on the prevalence of contraceptive use in Morocco during the 1992-95 period. Data from a panel of women interviewed in both the 1992 and 1995 Morocco Demographic and Health Surveys were used in the study, along with "program" data from Service Availability Modules undertaken in conjunction with each survey round. Fixed-effects estimation methods were used to control for the non-random allocation of program resources. The results indicate that changes in the family planning supply environment, in particular increased presence of nurses trained in family planning at public clinics, played a significant role in the increased use of modern contraceptives during the study period. However, program efforts to broaden the mix of contraceptive methods used by Moroccan women were less successful.

Key words: Contraceptive Use, Family Planning Programs, Morocco, Quality, Supply Environment

Introduction

Do organized family planning programs hasten the transition from high to low fertility and, if so, what is the magnitude of their contribution to fertility decline vis-a-vis other determinants of societal fertility levels (e.g., levels of infant mortality, socioeconomic development, education, etc.)? These questions have long been the subject of debate in the international population community (see Bongaarts, 1994 and 1995; Knowles et al., 1994; Pritchett, 1994 for recent contributions to this debate). In recent years, the question of effectiveness of family planning and other social-sector interventions in developing country settings has become more than an academic question, as policy-makers, legislators, and the international donor community have increasingly sought information on the relative effectiveness of programs competing for scarce resources to guide resource allocation decisions.

Unfortunately, assessing the impact of development initiatives such as family planning programs is a less than straightforward undertaking. Several factors complicate attempts to obtain "clean" estimates of program impact. First, the use of randomized experiments, the "gold standard" for measuring net effects or impact, is generally infeasible for national-level programs, necessitating the use of weaker study designs. Secondly, many national programs are at certain stages in the evolution targeted at geographic areas and

population sub-groups deemed to have either a high need or high demand for services, further complicating efforts to obtain unbiased estimates of program impact. Finally, contemporary family planning programs are being implemented in environments characterized by rapid social/economic change and multiple development initiatives, making it difficult to separate out program effects from other influences.

In a recent highly regarded study, Gertler and Molyneaux (1994) demonstrate the use of a fixed-effects, panel methodology as a means of overcoming some of the key methodological constraints to undertaking strong impact assessments of national family planning program efforts in developing country settings. In the study, the researchers take advantage of long time-series of community-level data on family planning program inputs and outcomes (i.e., contraceptive prevalence rates and fertility levels) in Indonesia and apply fixed-effects estimation methods in order to control for the non-random allocation of family planning program resources. The study, the results of which indicated that both family planning program and economic factors contributed significantly to declining fertility in Indonesia over the period studied, provides an excellent example of how relatively strong impact assessments might be undertaken in other developing country settings.

The major constraint against the application of this methodology in other settings is, of course, the lack of comparable time-series of adequate quality data. However, the data from the national demographic/health surveys being conducted on a recurring basis in many developing countries in connection with the Demographic and Health Survey (DHS) program combined with data family planning program performance obtained from facility surveys, which have become increasingly available in recent years, hold promise as a substitute for fully developed routine data systems. If the facility data are collected in the same sample "clusters" as the household surveys, plausible estimates of program impact are provided by the magnitude of dose-response relationships between changes in program indicators and changes in family planning program-relevant outcomes (after the effects of changes in other exogenous factors have been controlled statistically) using either sample clusters or sample women as the unit of analysis. Fixed-effects

estimation methods are used to control for the distorting effects of unobserved common determinants of levels of program inputs and reproductive outcomes. Further discussion of the methodology in connection with family planning program evaluation may be found in Bertrand et al. (1996).

Despite the potential of the methodological approach and the fact that both the required household and facility survey data have been gathered in a sizeable number of countries over the past ten years or so (although not in the same sample clusters in many countries), to date there have been few opportunities to utilize fixed-effects estimators to investigate the impact of family planning programs. However, suitable data are available from Morocco for the 1992-95 period. In this paper, we report the results of an attempt to apply the fixed effects panel methodology to assess the impact of Moroccan National Family Planning Program efforts on contraceptive use during this period.

Data and Methods

Data

Data from two sources were used in the study. Data on contraceptive use and individual- and household-level determinants thereof were obtained from DHS surveys conducted in 1992 and 1995. A total of 5,118 women 15-49 years of age were interviewed in the 1992 Morocco DHS-II survey (Azelmat et al., 1993). The sample design for the survey was a conventional stratified, two-stage cluster probability design. In the 1995 Morocco Panel Survey, 107 of the 212 sample clusters in the 1992 DHS-II were randomly chosen, and field workers were instructed to revisit the same households chosen for the 1992 survey and interview all women aged 12-46 years in 1992 who had been recorded in the household roster for that survey, along with all new female household members aged 15-40 years (Azelmat et al., 1996). When a household interviewed in 1992 moved within the sample cluster prior to the 1995 survey, an attempt was made to locate this household. When a household had moved out of the sample cluster, the 1995 interview was conducted with the new household that resided in the same dwelling. No attempt was made to locate either individuals or entire

households that had moved outside the sample cluster during the period between the 1992 and 1995 surveys. A total of 2,481 women aged 15-49 years were interviewed in the 1995 Panel Survey, of whom 1,983 had also been interviewed in the 1992 DHS-II. Dropped from this analysis are women who reported not being married to the same husband in 1995 (176 women), women whose reported number of children ever born in 1995 was inconsistent with that reported in 1992 (108 women), and women whose reported age in 1995 was grossly inconsistent with that reported in 1992 (19 women). As a result of these restrictions, the total sample size for the analysis reported in this article is 1,680.

Information on the supply environment for family planning services and characteristics of sample communities was obtained from the Service Availability Modules (SAM) implemented in conjunction with the two household surveys. For each sample cluster, information was gathered on community infrastructure (e.g., schools, roads, markets, etc.) and on the number and types of facilities offering health and family planning services located within 30 km. of each cluster. The nearest of each type of facility (hospital, public clinic, private clinic, private doctor, and pharmacy) was also visited and information on these facilities and their service delivery operations obtained. From the information that was gathered, a series of indicators measuring selected aspects of the family planning service environment in the vicinity of sample clusters were constructed. In choosing "supply-side" indicators for inclusion in the analysis, priority was given to aspects that were either (1) key features of the family planning supply environment in Morocco or (2) the focus of public-sector family planning program efforts during the reference period for the study. The operational definitions of the variables chosen for analysis are provided in Table 1. Changes in the supply environment for family planning services were measured by changes in these indicators during the 1992-95 period.

Conceptual Model and Estimation Procedures

To guide our model specification of the determinants of modern contraceptive use, we use Easterlin's "synthesis" framework of fertility-related behavior (Easterlin and Crimmins 1986). In this multidisciplinary

approach, a couple's decision of whether to adopt a deliberate fertility control technique is hypothesized to be determined by factors that affect the couple's desired family size, their biological capacity of having children, and the regulation costs of using family planning. Regulation costs are directly influenced by the family planning supply environment, and enter the decision calculus only if the couple's desired family size is lower than the number of children the couple *could* have if they do nothing deliberately to control their fertility. If this is the case, it is hypothesized that improvements in the family planning supply environment, as measured by the accessibility and quality of facilities and providers that offer family planning services, increase the likelihood that a couple will decide to utilize modern contraceptive methods.

The choice of a fixed-effects, panel estimator is logical in view of the data available for estimating program impact (i.e., household and facility survey data for a sample of communities at two points in time). Because the study design is non-experimental, the allocation of program resources by community is guided by factors that are either unobserved to the researcher or unrelated to research concerns. As a result, we must allow for the possibility that both the level of program inputs and implementation performance might vary from community to community. In effect, we have an "intervention" that varies by community in terms of intensity and quality of implementation. Given observations on "program" and outcome variables at two points in time, program impact is appropriately measured at the magnitude of the net dose-response relationship between program performance and outcome indicators using communities (i.e., sample clusters) as the unit of analysis.

If program resources were to be allocated to communities equally or randomly, the estimation of program impact could proceed without major difficulty. However, an important statistical problem emerges when program resources are allocated to communities in a "targeted" fashion. For example, the allocation of family planning program resources on the basis of either high unmet need or high demand for services is a fairly common practice in resource-poor developing country settings. Program targeting may be illustrated in the case of the Morocco national family planning program. The program was established in the mid-60s, and

due to the limited number of trained personnel in rural areas and the perceived greater receptivity to family planning among urban as compared to rural residents, initially concentrated on establishing services in the cities. However, in the past two decades the government (with assistance from international donors) has targeted rural communities for improvements in the availability of health facilities that offer family planning services and supplies, the number of contraceptive methods offered, and service provider training (Zarouf and Oucherif, 1992).

If the factors on which resources allocation decisions were based are known to researchers and were measured in connection with the evaluation study, program targeting can be adequately accounted for by including appropriate control variables in multivariate statistical models. A problem arises, however, when targeting takes place on the basis of "unobserved" factors (i.e., factors that are either unknown to the researcher or were not measured as part of the research) that are correlated with outcomes under study.

The problem may be most easily illustrated by reference to a simple cross-sectional multivariate model relating family planning program outcomes to several classes of determinants. Consider, for example, the following model:

$$C_{ij} = \beta_0 + \beta_1 X_{ij} + \beta_2 Y_j + \beta_3 Z_j + \beta_4 \omega_{ij} + \epsilon_{ij} \qquad (1)$$

where C_{ij} is a dichotomous variable indicating whether woman i in cluster j uses a modern contraceptive method, X_{ij} represents a vector of individual- and household-level characteristics, Y_j represents a vector community-level characteristics, and Z_j represents a vector of characteristics of the family planning supply environment (i.e., "program variables"), ω_{ij} represents a vector of unobserved individual- and community-level characteristics, and ϵ_{ij} represents a random disturbance term that is assumed to be uncorrelated with the independent variables in the model.

For the purposes of impact assessment, the parameters of primary interest are contained in the vector

β_3, indicating the effects of family planning supply environment factors on the propensity of a woman to use a modern contraceptive method. However, when program resources are allocated on the basis of unobserved factors that are correlated with the outcomes under study, Z_{ij} (the observed characteristics of the family planning program) will also be correlated with ω_{ij} (unobserved determinants of fertility behavior). It can be demonstrated that under such circumstances, the estimates of β_3 will be biased (Greene, 1990). This "omitted variables" bias results from the fact that the "unobserved" factors were not included in the model.

If panel data are available from both individuals and communities, then the omitted variable bias can be controlled statistically by using a fixed-effects estimator. In this approach, differences in contraceptive use can be regressed against differences in individual- and community-level factors, as shown in the following equation:

$$C_{ij2} - C_{ij1} = \beta_1 (X_{ij2} - X_{ij1}) + \beta_2 (Y_{j2} - Y_{j1}) + \beta_3 (Z_{j2} - Z_{j1}) + (\epsilon_{ij2} - \epsilon_{ij1}) \qquad (2)$$

The vector ω is "differenced" out of the model, and as a result, estimation of equation (2) does not result in biased coefficient estimates of β_3. Because the measure of our dependent variable, C_{ij}, is dichotomous, we use a fixed-effects logit model to estimate the effects of the family planning program.

The disadvantages of fixed-effects models are well known. First, the approach, which is equivalent to including a separate dummy variable for each individual in the sample, is costly in terms of the degrees of freedom lost. Second, the fixed-effects estimator tends to exacerbate bias that is a result of measurement error (See Griliches (1986) for a discussion of measurement bias and fixed-effects models). Third, because time-invariant variables drop out of the model, the effects of individual-, household-, and community-level variables that do not change over time cannot be examined except through the introduction of interactions terms. Finally, results obtained from a fixed-effects estimation procedure are conditional on the sample used in the study, which makes out-of-sample predictions problematic. The advantage of the fixed-effects

approach, however, is that it yields consistent estimates of the relevant parameters of program characteristics and on other variables that may be correlated with unobserved factors.

An alternative estimation strategy would be to use random effects methods along the lines suggested by Angeles et al. (1994). However, identifying the effects of unobserved variables requires the selection of appropriate instruments – variables that are correlated with program characteristics but not with contraceptive prevalence. Because we are not aware of any variables in our data set that can be used as instrumentals, we believe the fixed-effects method, despite its disadvantages, is the most appropriate estimator for this study.

Results

Trends in Contraceptive Behavior and Fertility

Between 1980 and 1995, the contraceptive prevalence rate (CPR) in Morocco has increased from 19.4 percent to 50.3 percent among currently married women, while the total fertility rate has fallen from 5.9 to 3.3 children (Table 2). These long-term trends continued during the 1992-95 period, the reference period for the present study. During this three-year period, the CPR among currently-married women increased from 41.5 to 50.3, while the total fertility rate fell from 4.0 to 3.3.

Despite the choice of methods available in the Morocco program, there has been an persistent dominance of oral contraceptives in the method mix. As of 1992, 68 percent of contraceptive users in Morocco used the pill, while only eight percent used IUDs. In an effort to diversify the method mix, the MOH undertook a major initiative to train service providers in IUD insertion and counseling techniques the early 1990s. Over 1,300 doctors and nurses were trained from 1991 to 1995 in connection with this effort. The initial emphasis on the IUD as an alternative to the pill relates to the fact that in the early 1990s Depo-Provera and NORPLANT had yet to be introduced in Morocco, and voluntary sterilization was not widely accepted in this Muslim culture. Thus, the IUD represented an important alternative to the pill, although more

recently injectables and NORPLANT have also become available. In 1993, NORPLANT was introduced in four regional centers (Rabat, Casablanca, Marrakech, and Agadir), followed by the injectable in the next year (initially on a pilot basis in 12 health facilities). Currently, injectables are available in government facilities throughout the country.

Despite efforts to broaden the mix of contraceptive methods being used by Moroccan women, data from the 1992 and 1995 surveys do not suggest that marked changes in method choice occurred during the three-year period (data not shown). While the reliance on oral contraceptives may have fallen slightly, the level of use of IUDs, which were actively promoted, apparently increased only slightly. The lack of observable changes in method mix may have been due to the short period of time considered and the fact that the promotion of some "alternative" methods (e.g., injectables) did not begin until 1994. Qualitative research also suggests that popular misperceptions concerning the IUD contributed to its slow rate of acceptance (Hajji and Lakssir 1996).

Changes in "Program" Indicators

Table 3 provides summary data on the magnitude of changes in key program variables during the 1992-95 period. For convenience, the variables are divided into four categories: access, supplies, training, and infrastructure. The following observations may be made from these data. With regard to "access" variables, the only change observed was a small decrease in the proportion of sample clusters served by home visits. This change is likely the result of the program strategy implemented during the 1992-95 period to provide family planning services to populations residing more than 10 km. from public clinics by means of mobile teams instead of home visits per the earlier program strategy. However, the 1992 and 1995 SAM data revealed no corresponding increase in coverage via mobile teams. No new health facilities were built by the Ministry of Health during the study period.

Significant improvements are observed for two of the four "supplies" variables considered:

availability of IUDs at public clinics, which is reflective of program efforts concerning the IUD, and availability of oral contraceptives at pharmacies. Although not a public-sector initiative, pharmacies are an important source of oral contraceptives in Morocco (especially in urban areas) and it was necessary to include pharmacies in the analysis. The data also indicate smaller changes in overall method availability measured at the community level (positive) and in oral contraceptive availability at public clinics (negative).

Significant increases are observed from the SAM data in the availability of both doctors and nurses at public clinics trained in family planning service. These changes reflect the priority attention given to service provider training during the reference period for the study. Modest improvements in facility infrastructure were also observed on both individual facility- and community-level measures.

Changes in Socioeconomic Indicators

Because Morocco has a rapidly developing economy, it is important in any attempt to assess family planning program effects on reproductive behavior to take into account the effects of changes in socioeconomic determinants thereof. Table 4 provides summary data on the magnitude of changes in relevant household-level socioeconomic indicators. As may be observed, the indicators suggest that many Moroccan households were able to accumulate durable assets during the reference period for the study, with all but two indicators being more favorable in 1995 than 1992. Substantial positive changes are noted with regard to the proportion of households owning bicycles, automobiles, refrigerators, and with a source of potable water. No change was observed in the proportion of households owning a radio, which was already quite high in 1992 (89 percent). The decline in the proportion of households residing in communities with sewage systems likely reflects the rapid growth of urban fringe areas that has outpaced the provision of public sanitation infrastructure.

Multivariate Results

The results of the fixed-effects logit model are shown in Table 5. Looking first at the results for urban and rural areas combined, the five "program" variables, considered together as a block, emerged as having a significant effect on contraceptive use ($p<.05$) when the effects of the individual- and household-level factors are controlled statistically. When the five variables are considered separately, only the presence of nurses trained in family planning at health facilities emerged as a significant determinant on contraceptive use. In view of program training efforts during the reference period for the study and the emphasis placed on improved counseling of family planning clients, this is indeed an encouraging result. That the presence of trained physicians did not emerge as a significant determinant of contraceptive use is also sensible in the Moroccan context, as doctors are not the main providers of the dominant contraceptive method used by Moroccan women (oral contraceptives). Different results might be observed in future program evaluations should some of the alternative methods introduced during the reference period for the present study gain acceptance among Moroccan women.

To measure the age of the woman, our model specification included a series of dummy variables indicating age group of respondents at the time of each interview. This allowed us to include age as an independent variable because a substantial proportion of women aged into older age-group categories over the three-year reference period. Table 5 indicates that these age-category dummy variables emerged as significant, undoubtedly reflecting a life-cycle effect. Although significant changes were observed with respect to socioeconomic indicators during the study period, none of these factors alone account for a significant share of the observed change in contraceptive prevalence when changes in other factors were controlled.

In view of the differential pace of economic development and expansion of family planning services in urban and rural areas, separate analyses were undertaken. The results, shown in Table 5, indicate that effects of the five program variables, considered together as a block, are statistically significant among women in rural areas ($p<0.01$), but not among women in urban areas. This makes intuitive sense, as MOH

program officials placed more emphasis on training family planning providers and improving method mix in rural than in urban areas during the reference period for the study. When the five program variables are considered separately, it will be noted that the presence of nurses trained in family planning at the nearest public clinic is marginally significant in rural areas ($p<.10$), but not in urban areas. However, the magnitude of the effect of this factor in both the rural and urban models is roughly on the order of that in the aggregated model. The failure to achieve statistical significance in the urban model is in all likelihood due to limited statistical power due to the limited number of urban clusters in our data. The disaggregated results also indicate that the infrastructure available at the nearest public clinic had a marginally significant ($p<.10$) positive impact on levels of contraceptive use.

Models that included a measure of the availability of IUDs at alternative types of facilities were also estimated, but the parameter estimates were not statistically significant. In addition, interactive models in which each of the program variables of interest were interacted with a dummy variable for urban residence were estimated, but the conclusions drawn from this analysis were essentially the same as those shown in Table 5.

Discussion

The 1992-95 period witnessed a continuation of a longer-term trend toward higher levels of contraceptive use and lower fertility in Morocco. The above analyses indicate that national family planning program efforts, in particular the training and deployment of nurses at public-sector health facilities, made an important contribution to increased contraceptive use during this period. Although broader development factors contributed to this trend, these do not appear to have been as crucial determinants of changes in contraceptive behavior during the three-year study period as “program” efforts with regard to staff training. Efforts to broaden the mix of contraceptive methods used by Moroccan women were, however, less successful. Further efforts to promote the use of alternatives to oral contraceptives are clearly needed.

The study illustrates the use of panel data and a fixed-effects estimator to investigate the impact of family planning program inputs on contraceptive utilization. By controlling the potential bias resulting from common unobserved determinants of program resource allocation decisions and program outcomes, the methodology helps overcome an important constraint to the use of non-experimental study designs in undertaking meaningful impact assessments. This is an especially important advance in developing country settings in that it permits the use of data that have become increasingly available in such settings in recent years (periodic demographic/health survey data and facility-level data on program performance) to undertake stronger impact evaluations than are possible using other available (and plausible) methods. However, what is needed in many settings to take advantage of the methodology is for data collection strategies to be adjusted to gather population- and facility-level data in the same geographic areas or sample clusters (as has been done recently in Morocco, Peru, Tanzania, and Uttar Pradesh State in India).

With regard to utilization in other settings, two points concerning the application of the methodology reported in this article warrant mention. First, because the 1995 DHS in Morocco was undertaken as a panel study of respondents interviewed in the 1992 survey, the analyses were undertaken for an actual panel of women of reproductive age. However, panels of individual respondents are not required for the application of the methodological approach. What is required is for the same sample clusters to be covered in the data collection at two or more points in time, even if independent samples of women are taken from sample clusters in each survey round. However, under this design, the appropriate unit of analysis would be the cluster instead of individual women. Gertler and Molyneaux (1984) demonstrate the application of fixed-effects panel methodology to cluster-level data.

Secondly, while the present study used DHS Service Availability Module (SAM) data to provide information on the supply environment for family planning services, other data collection protocols may also be used. The Population Council's "Situation Analysis" protocol, for example, measures many of the same facility-level indicators as the SAM, and since it provides more detailed information on how services are

being delivered, it may be preferable to the SAM. However, if a Situation Analysis-like protocol is to be used, it is important to also gather information on other community-level factors that have been documented as important determinants of reproductive behaviors (Situation Analysis currently does not do this).

The Morocco application also points to two potential practical limitations of the prototype evaluation methodology. One limitation concerns the measurement of "program" factors. In a mature program, the primary programmatic changes are likely to involve the more qualitative aspects of service delivery (e.g., staff training, counseling skills, communication with clients, etc.), as opposed to changes in physical access to services and method availability that one might expect to see in less mature programs. In Morocco during the 1992-95 period, for example, the primary areas of program emphasis were the training and deployment of doctors and nurses in under-served areas, promotion of the IUD as an alternative to oral contraceptives, and improved client counseling. These "qualitative" aspects are more difficult to measure than physical access and availability type indicators, and more refined measurement tools than the SAM protocols are needed if changes in programs are to be accurately measured in program evaluation efforts. Of the three key program components in the Moroccan case, only the availability of IUDs was well measured in the SAM data. While we were able to detect staff training effects in our impact analysis, the manner in which staff training is measured in the SAM is not specific to training provided under the program with regard to either content or timing (i.e., having been received during the reference period for the impact evaluation), and thus is likely subject to some "noise." Indeed, stronger effects might have been observed in the present study had more specific information on the length, timing, and nature of training received been available.

A second point concerns the loss of statistical power that results from the use of the clusters as the unit of analysis for the measurement of "program" variables (and for outcome variables if only data for a panel of clusters, as opposed to a panel of individual women, is available). Although it is intuitively reasonable that supply-side characteristics should be measured at the community level since they are common to all residents of a given community or cluster, it mandates that the variances of estimated "program" effects

be calculated based upon the number of communities or clusters from which data were gathered, and not the size of the sample(s) of individual respondents. The effect of this constraint is to diminish the statistical power of the study design. In the application in Morocco reported in this article, for example, although data were gathered from over 1,600 women, "program" effects were estimated based upon data from only 107 sample clusters. Thus, as a practical matter, samples of several hundred communities or sample clusters (such as are found in most DHS) are required for the meaningful application of the methodological approach.

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Table 1: Definitions of Family Planning Program-Specific Variables Used in the Analysis.

Variable	Definition
Access	Access to community-based distribution Dummy variable indicating whether the community-based distribution is available in the community
Supplies	
Clinic: availability index	Index for the closest public clinic measuring the availability of oral contraceptives, IUDs, and condoms (the principal methods used by Moroccan women). For each method, each of the visited facilities were assigned a score of 0 if it did not offer the method or if it did offer the method but experienced stock-outs during the previous six months, and 1 if the facility offered method without stock-outs over the previous 6 months.
Clinic: no pill stock-outs	Dummy variable indicating whether the closet public clinic had no stock-outs of pills in the previous month.
Clinic: no IUD stock-outs	Dummy variable indicating whether the closet public clinic had no stock-outs of IUDs in the previous month.
Pharmacy: no pill stock-outs	Dummy variable indicating whether the closet pharmacy had no stock-outs of pills in the previous month.
Training	
Doctors trained in closest public clinic	Dummy variable indicating whether the closest public clinic employs a doctor trained in family planning
Nurses trained in closest public clinic	Dummy variable indicating whether the closest public clinic employs a nurse trained family planning
Infrastructure	
Clinic: presence of infrastructure	Dummy variable indicating whether the closest public clinic has electricity/running water and a gynecological examination table.

Table 2: Contraceptive Use and Fertility Trends in Morocco, 1980-1995

Indicator	1979/80	1987	1992	1995
Contraceptive Prevalence - all methods, currently married women	19.4	35.9	41.5	50.3
Total Fertility Rate	5.9	4.4	4.0	3.3

Table 3: Community-Level Family Planning Supply Environment Indicators, 1992-1995.

	1992	1995	Change
Access			
Access to community-based distribution	0.56	0.53	-6%
Supplies			
Clinic: availability index	4.72	4.88	3%
Clinic: no pill stock-outs	0.85	0.80	-5%
Clinic: no IUD stock-outs	0.55	0.77	41%
Pharmacy: no pill stock-outs	0.67	0.81	20%
Training			
Doctors trained in closest public clinic	0.42	0.54	26%
Nurses trained in closest public clinic	0.59	0.71	20%
Infrastructure			
Clinic: infrastructure index	0.67	0.82	22%

Table 4: Mean individual-level and household-level characteristics, 1992-1995.

Variable	1992	1995	Change
Fertility-Related Behavior			
Total live births	3.54	4.06	15%
Ideal family size	3.86	3.82	-1%
Birth in the previous year	0.10	0.13	24%
Use modern method	0.39	0.47	21%
Use traditional method	0.07	0.08	14%
Individual Characteristics			
Age			
19 years or younger	0.04	0.01	-88%
20-24 years	0.14	0.08	-43%
25-29 years	0.19	0.17	-12%
30-39 years	0.44	0.44	-1%
40-49 years	0.18	0.31	67%
Education			
1-3 years	0.04	0.05	18%
4 years or more	0.21	0.21	-0%
Household Characteristics			
Bicycle	0.14	0.22	55%
Motor	0.18	0.19	3%
Electricity	0.53	0.55	3%
Television	0.65	0.71	8%
Car	0.14	0.18	23%
Radio	0.89	0.89	0%
Good floor	0.69	0.72	4%
Refrigerator	0.32	0.38	17%
Good water source	0.80	0.93	16%
Sewage	0.47	0.38	-19%

Table 5: Fixed-effects logit results for contraceptive use model

Independent Variable	Total Coefficient	Std. Err.	Z	Rural Coefficient	Z	Urban Coefficient	Z
Pill at clinic	-0.048	0.245	-0.196	-0.374	-1.000	0.262	0.688
Pill at pharmacy	0.154	0.194	0.795	0.389	1.568	-0.354	-0.935
Doctors trained	-0.138	0.168	-0.821	-0.107	-0.376	-0.411	-1.523
Nurses trained	0.577	0.191	3.022	0.530	1.870	0.495	1.569
Infrastructure index	0.450	0.292	1.542	0.864	1.790	-0.490	-0.939
Age 20-24 years	1.177	0.477	2.465	1.103	1.868	1.156	1.359
Age 25-29 years	2.534	0.606	4.184	2.443	3.220	2.736	2.587
Age 30-49 years	3.012	0.664	4.538	3.060	3.608	3.068	2.709
Educational attainment	-0.309	0.652	-0.473	0.648	0.568	-0.644	-0.773
Bicycle	0.037	0.225	0.163	0.224	0.715	-0.116	-0.339
Motor	-0.167	0.264	-0.633	-0.195	-0.467	-0.146	-0.405
Electricity	0.397	0.556	0.714	0.447	0.678	0.622	0.447
Television	0.408	0.345	1.181	0.372	0.901	-0.249	-0.266
Car	-0.474	0.283	-1.678	-0.796	-1.686	-0.287	-0.763
Radio	0.079	0.274	0.289	0.303	0.863	-0.332	-0.655
Good floor	0.070	0.304	0.231	-0.120	-0.345	1.091	1.235
Refrigerator	0.398	0.324	1.230	0.386	0.654	0.363	0.916
Good water source	0.455	0.281	1.619	0.506	1.568	0.059	0.080
Sewage	-0.115	0.142	-0.810			-0.141	-0.965
Pseudo R2	0.12	0.12		0.20		0.07	
Chi Square Test of Joint Significance of Supply Variables	13.02			20.13		5.37	
Prob > Chi Square	0.0232			0.0012		0.3727	