EVALUATION OF THE IMPACT OF FAMILY PLANNING PROGRAMMS ON FERTILITY: A CASE STUDY ON EAST AZERBAIJAN PROVINCE (IRAN)-2000

BY:

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Abstract

This study evaluates the impact of family planning program run by Ministry of Health on fertility in East Azerbaijan province-2000. The evaluation research is the application of social science research procedures to judge and improve the ways which social programs are conducted by. The evaluation of family planning programs includes both program monitoring and impact assessment. Based on the existing methods of evaluating the impact of family planning program on fertility, the basic cross sectional multilevel regression model has been applied in this study. The relationships between variables have been tested utilizing multilevel regression procedures. Multiple multilevel regressions modelling procedure has been used to test the relationship between independent variables and fertility, while multilevel binary logistic regression has been applied to test the relationship between independent variables and binomially distributed variable of ever use of contraceptives. The criterion of the selection of the variables is conceptual framework developed by Tsui et al. The most recent studies on evaluation of family planning programs have also been reviewed.

The study uses the Iran Demographic and Health Survey-2000 data for East Azerbaijan province and some other data have been collected from program records. The target group of the study is ever – married women of age group 10-49 who don't attend the non – program source of contraceptives within East Azerbaijan sample of DHS in year 2000. Total sample size is 3016; 1366 from urban and 1650 from rural areas.

Multivariate analysis of factors affecting fertility shows that the variables - contraceptive ever use, marital status, conjugal patterns, duration of marriage, duration of contraception, education, breastfeeding, family planning program supply side, accessibility of family planning services, child death, demand for children, and quality of care in SDPs - with nearly 95% determinant coefficient explain the variance of fertility. Path analysis of the impact of independent variables on fertility indicates that individual factors have the highest impact on fertility regulations and community and program are the second and third factors in regulation of fertility in the sample of this study, respectively.

Acronyms

SDP	Service Delivery Points
MCH	Maternal Child Health
MOH	Ministry of Health
IPPF	International Planned Parenthood Federation
NGO	Non Governmental Organization
CBD	Community Based Distribution
CPS	Contraceptive Prevalence Study
FP	Family Planning
FPP	Family Planning Program
DHS	Demographic and Health Survey
BLS	Base Line Survey
SCI	Statistical Center of Iran
UNFPA	United Nations Fund for Population Activities
TFR	Total Fertility Rate
CBR	Crude Birth Rate
ASFR	Age Specific Fertility Rate
CYP	Couple Years of Protection
IEC	Information-Education-Communication
CEB	Children Ever Born
LAM	Lactation Amenorrhea Method
NFP	Natural Family Planning
IGLS	Iterative Generalized Least Square
PQL	Penalized Quasi Likelihood
MCMC	Monte Carlo Markov Chain
RIGLS	Restricted Iterative Generalized Least Square
OLS	Ordinary Least Square
MH	Metropolis Hasting
Cons	Constant
Edu	Education
Nomarage	Number of marriage
Sposage	Spouse age
Womstats	Women status
Seindiv	Socio-economic status at individual level
Chdemnd	Child demand
C.I.	Confidence Interval

Demfp	Demand for family planning
Abort	Abortion
Brestfed	Breast feeding
Durcnt	Duration of contraception
Agemar	Age at marriage
CEU	Contraceptive Ever Use
Infantm	Infant death at individual level
Sedevso	Socio-economic development of societies
Chldlbr	Child labor
Chldcst	Child cost
Womedu	Women Education
Womstats	Women status
Conjugal	conjugal and childbearing patterns
Infantmrsoc	Infant mortality of societies
Supply	Family planning supply side
Servutil	Service utilization
Access	Accessibility of family planning
QOC	Quality of Care
Agree	Acceptability of family planning

1- Introduction

Evaluation is the application of social science research procedures to judge and improve the ways in which social policies and programs are conducted from the earliest stages of defining and designing programs through their development and implementation (Rossi and Freeman, 1993). Evaluation results should inform program management, strategic planning, the design of new projects or initiatives, and resource allocation.

The evaluation of family planning programs includes both program monitoring and impact assessment. Monitoring is used to determine how well the program is carried out at different levels and at what cost; it tracks changes that occur over time in resource inputs, production, and use of services. Impact assessment measures the extent to which this change can be attributed to the program intervention (cause and effect) (Bertrand J.T.et al, 1996: 7).

As in many other developing countries, until the First World War, Iranian population had experienced a very slow rate of growth. High rates of mortality, caused by poor nutrition, lack of sanitary conditions as well as periodic droughts, famines, and destructive invasions by marauding nomadic tribes, prevented high growth rate as a result of high fertility rates, caused by pro-natalist values and norms which have characterized the Iranian culture during both pre-Islamic and Islamic times. The beginning of modernization process and adoption of western technology, education and way of life slowed down the high mortality rates, whereas fertility remained unchanged. This imbalance led to rapid growth of population.

In 1967 the Ministry of Health started to offer contraceptives and a multi-agency “Demographic Council” was established. After the 1979 Revolution attempts to keep fertility down were stopped because of pro-natalist policies of the revolutionary regime. Publication of the 1986 census gave the shocking results that the total population size had raised by over 15 million since 1976 and growth rate equal to 3.9. Total population size was 33.71 millions in 1976. The results occasioned the need for fertility control and family planning. Revival of family planning program coincided with the end of Iraqi imposed war that wasted a lot of resources, reduced oil income, and the heavy damage to industry (Mehryar, A.H., WP No:2: 1-10). These conditions decreased the economic power of population. Revival of family planning program and new economic conditions jointly reduced the population growth rate from 3.9 in 1986 to 1.8 in 2000[1].

This study evaluates the impact of family planning program run by Ministry of Health on fertility in East Azerbaijan province-2000. Based on methods of evaluating the impact of family planning program on fertility, the basic cross sectional multilevel regression model has been applied in this study. The criterion to select the variables is conceptual framework developed by Tsui and et al. Multivariate analysis of factors affecting fertility shows that variables – contraceptive ever use, marital status, conjugal patterns, duration of marriage, duration of contraception, education, breastfeeding, family planning program supply side, accessibility of family planning services, child death, demand for children and quality of care in SDPs with nearly 95% determinant coefficient – explain the variance of fertility. Path analysis of the impact of independent variables on fertility shows that individual factors have the highest impact on fertility regulations and community and program are the second and third factors in regulation of fertility in the sample of this study, respectively.

1-1-Initial Questions

Inflow of advanced medical products to developing countries, especially after World War Π, led to high decrease in mortality rates of these societies. Most governments started FP programs for reducing fertility in those countries. National and international agencies tried to reduce fertility by implementation of family planning programs. Since the implementation of these programs were coincided with other attempts at the development of these countries, so, many argue that the decline in fertility of these countries relate to development programs, not to family planning programs. The initial question of this research is:

- *Whether there is any relationship between program factors and fertility when the individual and community factors prevailing?*

1-2- Importance of Study

Evaluation results are important inputs into strategic planning and program design. Measures of program performance, output, and population outcomes describe the current state of the demand for services and the program environment. In short, those responsible for implementing programs and those who fund programs should require

[1] Iran DHS - 2000

that evaluation be an integral part of any intervention. In the current climate of budgetary constraints, evaluation results point to the most rational use of scarce resources – human and material – to achieve results.

1-3- Research Goals

The research goals are:

- To study the impact of family planning program on fertility in East Azerbaijan Province in Iran.
- To answer following research question:
    - Relationship between family planning supply factors and fertility prevailing for individual and community variables.
- Multivariate analysis of the modified model.

2- Review of literature

- Freedman and Takeshita, (1969) in their experiment known as Taichung experiment, assess the impact of an effort to increase contraceptive awareness and use in the city of Taichung, Taiwan during the early 1960s. Local areas, or " lins," in the city were randomly assigned as one of four experimental groups: (1) full package, husband and wife: households in this group received home visits by health workers, mailings of information, and neighborhood meetings; (2)full package, wife only: same intervention as in the first group excluding the home visit to the husband;(3)mailings only; and (4) no intervention other than family planning posters that were distributed throughout the city (i.e., the control group). Lins were allocated to experimental groups as follows: (1) n=427, (2) n=427, (3) n=768 and (4) n=767. Results showed that after twenty-nine months of implementation, an increase in the contraceptive acceptance rate of 7 per 100 married women may be attributed to the "full package-husband and wife" intervention (i.e., calculated as the acceptance rate for this experimental group, 25 per100, minus that for the control group, 18 per 100). Including husbands in home visits had no effect on contraceptive acceptance rates as may be inferred from the similarity in contraceptive acceptance rates for "husband and wife" and "wife only" experimental groups; nor apparently did the mailing of information (Bertrand, J.T, and et al 1996:47).

-**Bertrand et al (1987)** applied the Nonequivalent Control Groups Quasi Experimental Design in order to assess the impact of three communications strategies designed to increase awareness and acceptability of vasectomy in Guatemala "before and after" measurements were taken in four communities of similar socio-demographic characteristics. The three communications strategies were: (1) radio, (2) male promoter, and (3) both radio and male promoter. One community was chosen in which to implement each of the strategies to be tested, while a fourth was chosen as a control community. Baseline and follow-up survey data were collected for n=400 men of reproductive age in each of the four communities in June 1983 and again in July 1984 along with service statistics indicating the (monthly) number of operations performed in each community. Effects of communications program on knowledge and attitudes were assessed by comparing pre and post intervention measures of selected indicators. Logistics regression procedures were used to control for initial differences among the four communities and for possible "history" effects. Impact was assessed by comparing pre-and post-intervention vasectomy rates in the respective communities. The results showed that the program did not raise interest in having a vasectomy in the target group (men who had heard of the operation, wanted no more children, were not already sterilized, nor were their wives); that is, the increases in the three communities did not differ significantly from the increase in the control community. In terms of actual vasectomy prevalence, only in the "promoter only" community did the change in prevalence exceed that observed in the control community by a statistically significant margin (Bertrand, J.T.et al 1996: 53).

-**John Bongaarts, (1993)** in "The Fertility Impact of Family Planning Programs" provides new estimates of gross and net impact on fertility reductions from family planning (FP) programs for 31 developing countries in Africa, Latin America, and Asia. A comparison is made of net and gross measures and the interaction with the level of development is identified. The conclusion is reached that FP has been crucial in reducing fertility in many countries. Without FP, the total annual number of births in the late 1980s would have been 164 million instead of 120 million. In his study, the prevalence method (Bongaarts modified version) was used based on statistics on the source of contraceptives. This method estimates contraceptive prevalence by source and then estimates fertility decline attributable to program contraceptive. The estimation procedure assigns effectiveness as 95% for modern methods and 6% for traditional methods. The prevalence estimates for program and non – program sources are indicated. The average equals 1.3 births/ woman, which was 27% of the average observed fertility of 4.8 births/ woman. China had the largest number of births averted. Net fertility reduction estimates relied on regression estimation based on the level of each country's development and the average of the 1982 and 1989 program effect scores calculated by Lapham and Mauldin and by Mauldin and Ross. The largest net effects in births averted were in China. The net weighted average was 1.39 births which implies about a 50% impact on fertility decline (Bongaarts, J, 1993: Abstract).

- **David R. Hotchkiss, (1998)** in "Family Planning Program Effects on Contraceptive Use in Morocco, 1992-1995" assesses the impact of improvements in public sector family planning services on the prevalence of contraceptive use in Morocco during the 1992-95 periods. 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 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 (Hotchkiss, D.R., 1998: Abstract).

- **Eini Zinab, H. (2002)** in his article on "Evaluation of the Impact of Family Planning Programs on Fertility: Using Prevalence Model for Selected Districts in Iran-2001[2]" evaluates the fertility impact of family planning programs by using prevalence model developed by John Bongaarts. The study uses the Base Line Survey (BLS-2001) data collected by Statistical Center of Iran (SCI) and UNFPA-Iran in selected districts of Bushehr, Golestan, Kurdistan, Sistan &Bluchestan, and Tehran provinces. The findings of the study show a high reduction rate in TFR and CBR in Marivan district, and a low reduction rate in Zahedan district. The findings also reveal that the high reduction in ASFR belongs to age groups 30-34 in Marivan, 35-39 in Islamshahr, Gonbadkavoos, and Bushehr, 40-44 in Zabol, Divandareh and Kangan districts and 45-49 in Zahedan and Minoodasht districts. In terms of each method contributions in reducing fertility, results confirm that the highest contribution of program contraceptives in preventing births are female sterilization in Bushehr, Divandareh and Islamshahr and pill in other districts.

3-Conceptual Framework

3-1-Program Components

In its broadest conceptualization, a family planning program can be viewed in terms of four distinct elements: inputs, process (or activities), outputs, and outcomes.

- Program inputs refer to the set of resources (i.e., personnel, facilities, space, and equipment supplies, etc.) Those are the raw materials of the program.
- Program processes refer to the set of activities in which program inputs are all utilized in pursuit of the results expected from the program processes including the service delivery operations (management, training, commodities and logistics,

[2] This article was presented in First Population Conference of "Population Society of Iran" and was awarded as the best article presented by young demographers on Feb, 2003. Revised version of this article has also been accepted for a poster presentation in European Population Conference – 2003 Warsaw, Poland

information-education-communication, and research and evaluation) that the program conducts in order to provide family planning services.

■ Program outputs are the results obtained at the program level through the execution of activities using program resources. There are three types of program outputs:

- Functional area outputs, such as the number of persons trained and the number of IEC talks.

- Service outputs, such as access to services and quality of care.

- Service utilization, such as couple-years of protection (CYP), and the number of new acceptors.

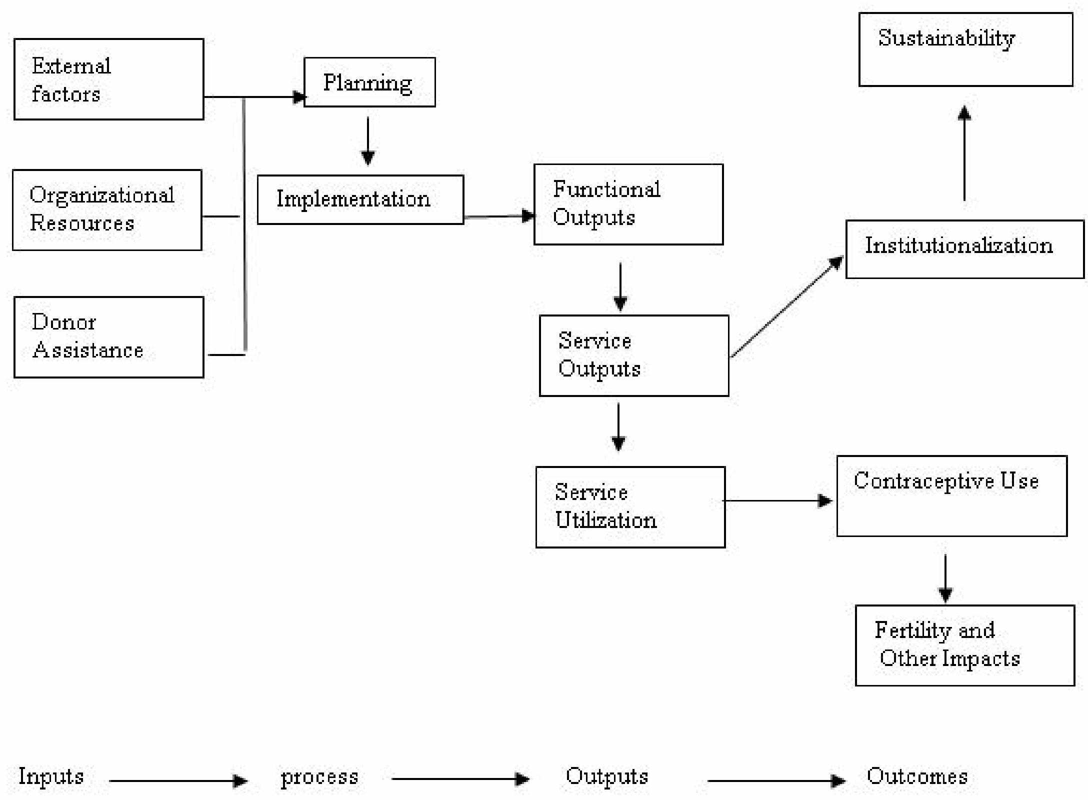
■ Program outcomes are the set of results expected to occur at the population level due to program activities and the generation of program outputs. These may be divided into two components: intermediate outcomes, and long-term outcomes. Intermediate outcomes are the set of results at the population level that are closely and clearly linked to program activities and program level results. Changes in intermediate outcomes generally occur within 2-5 years of program inception.

Long-range outcomes refer to the set of results at the population level that are long-term in nature and are produced through the action of intermediate outcomes. Although health and fertility rates can change abruptly in response to external forces, there is generally a considerable time lag (5-10 years) between the inception of the program and observance of change in these rates. Inputs (program recourses) are fed into processes (program activities), which in turn produce outputs (program results) and ultimately outcomes (change in population behavior). The first three - inputs, processes, and outputs - relate to activities and results at the program level (Bertrand J.T, et al, 1996:14-6).

Figure III-1 shows the program components in terms of input-process-output-outcome and figure III-3 gives details of the family planning supply environment).

Figure III-1:

Components of Program Impact:



Source: Tsui, A.O. and P.D. Gorbach, 1996. Framing Family Planning Program Evaluation: Cause, Logic and Action. The EVALUATION Project, University of North Carolina at Chapel Hill.

The conceptual framework is the basis for identifying appropriate program indicators and specifying the pathways by which program inputs produce outputs and ultimately brings changes in the behavior of the target population. A conceptual framework describing the linkages between family planning program inputs and fertility change is shown in figures III-2 and III-3.

Figure III-2: Conceptual Framework of FP Demand and Program Impact on Fertility

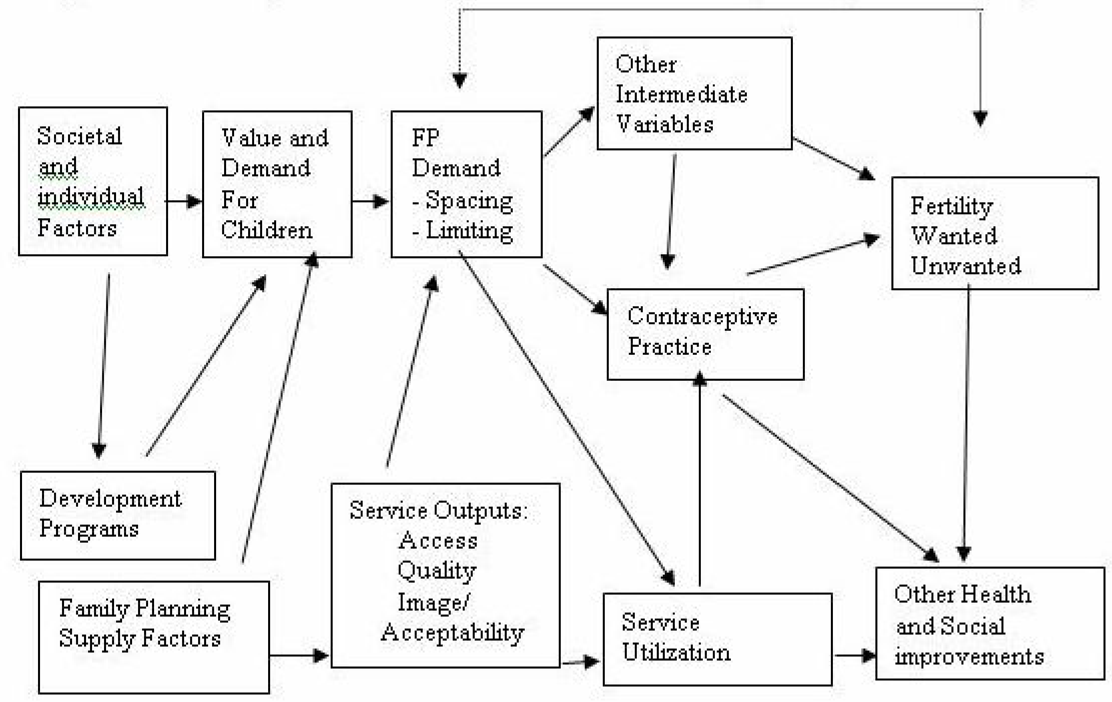
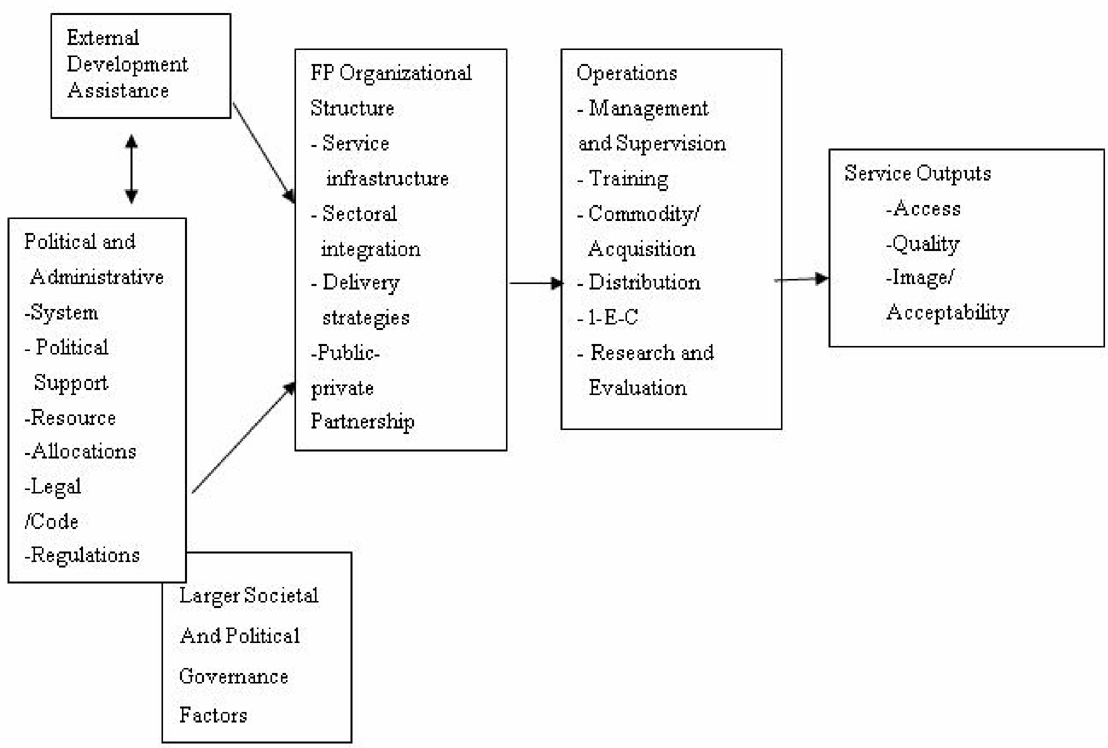


Figure III-3: Conceptual Framework of Family Planning Supply Factors



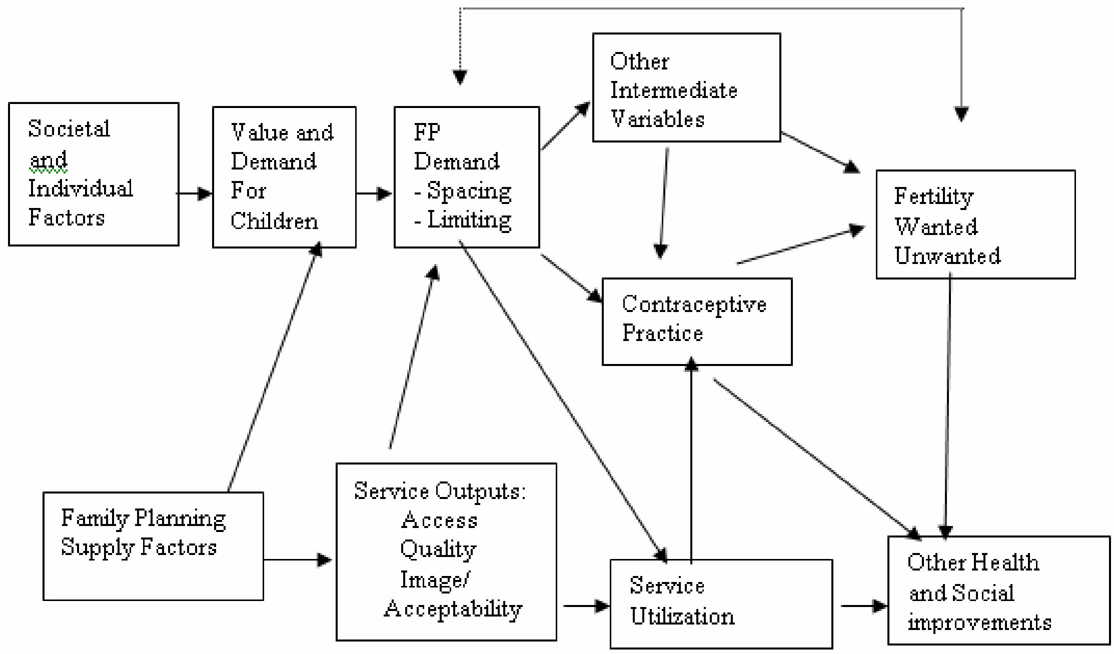
Source: Bertrand J.T.et al, 1996: 18

3-2-Modifying the Model for this Study:

It is important to modify and adopt the general models to apply in special cases of different social settings. In this case, since this research is done at sub national level, it is necessary to exclude variables that belong to the national level or are out of control of the local level. Some of the variables of the model are changed for this reason.

The final model is:

Figure III-4
Conceptual Framework of Family Planning Demand and Program Impact on Fertility



4- Methodology

Since the scope of this research is confined to the local level, multilevel regression methods, especially Basic Cross-Sectional Model is generally the best choice and the data have been gathered at two individual and community levels. Next, the impacts of family planning programs on fertility have been examined at the individual level.

4-1-The Basic Cross-Sectional Multilevel Model

The cross-sectional multilevel model seeks to assess whether there is a statistical relationship between family planning program variables (e.g., presence of a family planning clinic in the community, number of contraceptive methods offered within 30 kilometers of the community) and family planning outcomes, with controlling for socio-economic and other non-program factors. The model uses randomly chosen communities or other aerial units (e.g., municipalities, districts, provinces, etc.) and samples of individual women/couples from each community as units of analysis. A typical model might include three types of variables measured at two levels (i.e., at the individual / household and community levels):

- Factors specific to individual women and households (e.g., age, parity, education, demand for children, household assets, family structure, etc);
- Factors that are specific to communities or other population aggregations, but are common to all households and individuals within the community (e.g., environmental conditions, community infrastructure, labor market conditions, etc);
- And community-level measures of family planning program strength, which are also assumed to be common to all households and individuals in the community (e.g., presence of a fixed clinic providing family planning services in the community, number of family planning methods available at outlets within a specified distance of the community, quality of services).

The basic model may be written as:

- Outcome variable = program factors + individual factors + community factors + interactions among factors + / - Error.

The primary interest in program evaluation purposes lies in the magnitude and statistical significance of the regression parameter(s) of the program variable(s) included in the model and the interactions between program variables and other variables. The regression parameters for the program variables indicate the strength of association between program measures and individual-level outcomes (e.g. contraceptive use, fertility) when the effects of other factors included in the model have been controlled; the interaction terms provide information on whether the program had a larger impact on certain population subgroups than others (Bertrand, J. T. et al, 1996: 54-55).

4-2-Population, Sample Size and Unit of Analysis

Population: statistical population of this research is the ever married female population of East Azerbaijan province at age group (10-49) in the year 2000. The total number of ever married women aged 10-49 was 1073825 in the 1996 census, the estimated number for the year 2000 is 1139719.

Sample: The IDHS - 2000 data have been used at individual level for this study. In its sampling strategy DHS project had 400 clusters in each province, with 10 households in each. Of 400 clusters, 200 have been sampled from each rural and urban area. In East Azerbaijan province sample had the characteristics presented at table 1.

Table 1: Characteristics of East Azerbaijan DHS Sample

Description	Urban	Rural	Total
Accessed households	1990	1999	3989
Population of respondent households	8170	10332	18502
Children aged 0-4 years	559	891	1450
Children aged 5-14	1778	2796	4574
Ever married 10-49 years old women	1546	1698	3244

In this study, ever married 15-49 aged women have been taken as sample size, who did not use non – program contraception supply services (private sector services). So the sample size of this study consists of 1366 and 1650 urban and rural ever married women that didn't use non program contraceptives at the time of survey, respectively.

Sample size: Urban: 1366 Rural: 1650

Unit of Analysis: The data have been gathered at two levels, community level and individual level. Data analysis has been carried out at individual level.

4-3-Research Environment and Data Collection:

The variables are in three parts and consist of the following three parts:

-individual factors at individual level

-community factors at community level

-program factors at community level

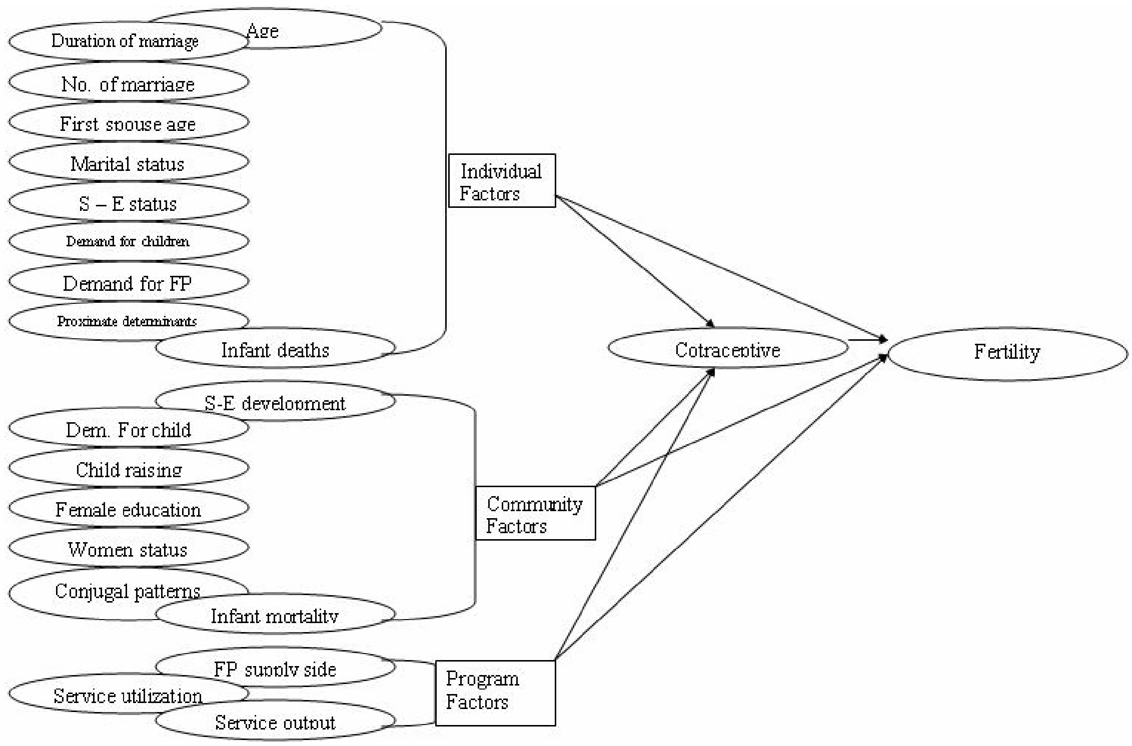
The instruments for data collection are different. At individual level the IDHS – 2000 data have been used. Whereas the community level data have been gather from existing data and utilization of the individual level DHS data. The DHS data have been used to calculate the community level measures. At program level data have been collected from program routine records.

The best places for data collection at community and program level are Central Bureau's of Health and other related organizations at East Azerbaijan Province.

4-4-Statistical Methods and Software

In this research, suitable statistical methods have been utilized to test the variables and relations. In multivariate section IGLS, MCMC and Bootstrap estimators have been utilized to estimate the multivariate multilevel models parameters. Path analysis in this section has been used to analyze the final analytical model. In analysis of data both SPSS release 11.0 and MLwiN release1.10 have been used.

4-5- Analytical Model



5-Findings and Results

Multilevel modelling procedure has been utilized to test the relationship between variables. There are some reasons in using multilevel modeling: a) the data that have been used have several levels (community level, program level, individual level); b) social phenomena are not independent. They are nested in hierarchies, which make them dependent on each other. Using traditional methods such as "Ordinary Least Square" (OLS) ignores "Intra Cluster Correlation"(Proportion of the total variance that is between clusters), and c) utilization of single level variance component model ignores 0.1958 percent of total variance of fertility which is related to intra clusters proportion. The intra cluster correlation is obtained by dividing between clusters variance error (level 2 random parameters) by summation of between cluster variance error and individual level variance error (level 1, random parameters).

$$\rho = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + \sigma_{e0}^2}$$

Where:

ρ is intra cluster correlation;

σ_{u0}^2 is level 2 random parameter;

σ_{e0}^2 is level 1 random parameter

$$\rho = \frac{0.042^2}{0.042^2 + 0.948^2} = 0.001958$$

The application of multilevel modeling with single constant variable to find the intra cluster correlation of CEB gives the following results:

$$y_{ij} \sim \mathrm{N}(XB, \Omega)$$

$$y_{ij} = \beta_{0ij} x_0$$

$$\beta_{0ij} = 0.104(0.025) + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \mathrm{N}(0, \Omega_u) : \Omega_u = \left[0.042(0.013)\right]$$

$$\left[e_{0ij}\right] \sim \mathrm{N}(0, \Omega_e) : \Omega_e = \left[0.948(0.025)\right]$$

*-2*loglikelihood(IGLS)* = 8478.807(3016 of 3016 cases in use)

5-1-Multivariate analysis of CEB

Multivariate variance component analysis of children ever born consists of estimation of fixed and random parts of a multilevel multivariate model. In this model, CEB is response (dependent) variable, whereas all independent variables are entered in this model as explanatory variables (fixed parts). There are also two random parameters in this model: u_{0j} , error term at community level and e_{0ij} , error term at individual level. At first all 29 independent variables were entered to the model, and then non - significant variables were removed. The Walk test has been used to test the null hypotheses of zero value parameters for all fixed and random parts separately. This model is:

$$\text{ceb}_{ij} \sim \text{N}(XB,\ \Omega)$$

$$\begin{aligned}\text{ceb}_{ij} = {} & \beta_{0ij}\text{cons} + \beta_1\text{ceu}_{ij} + \beta_2\text{nomarage}_{ij} + \beta_3\text{demfp}_{ij} + \beta_4\text{marstats}_{ij} + \beta_5\text{chldcst}_j + \beta_6\text{sedevso}_j + \\ & \beta_7\text{conjugal}_j + \beta_8\text{chldlbr}_j + \beta_9\text{womstats}_j + \beta_{10}\text{womedu}_j + \beta_{11}\text{infntmrsoc}_j + \beta_{12}\text{durmar}_{ij} + \beta_{13}\text{durcnt}_{ij} \\ & \beta_{14}\text{seindiv}_{ij} + \beta_{15}\text{infantm}_{ij} + \beta_{16}\text{age}_{ij} + \beta_{17}\text{sposage}_{ij} + \beta_{18}\text{edu}_{ij} + \beta_{19}\text{brestfed}_{ij} + \beta_{20}\text{abort}_{ij} + \\ & \beta_{21}\text{supply}_j + \beta_{22}\text{servutil}_j + \beta_{23}\text{access}_{ij} + \beta_{24}\text{employ}_{ij} + \beta_{25}\text{chldmor}_{ij} + \beta_{26}\text{chdemnd}_{ij} + \beta_{27}\text{qoc}_j + \\ & \beta_{28}\text{agree}_{ij} + \beta_{29}\text{agemar}_{ij}\end{aligned}$$

$$\beta_{0ij} = \beta_0 + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[\sigma^2_{u0}\right]$$

$$\left[e_{0ij}\right] \sim \text{N}(0,\ \Omega_e)\ :\ \Omega_e = \left[\sigma^2_{e0}\right]$$

Parameters of this model have been estimated with utilization of IGLS estimator with convergence tolerance equal to 10E-4. The values of fixed and random parameters, standard error of parameters, Walk test function results (f), chi square (f-k)=0 with 1 degree of freedom (k=0) and also +/- 95% sep. a normal approximation 95% confidence interval for f-k have been presented in Table 2. The +/- 95% confidence interval values give the upper and lower bounds of the function results (f). If the function result has value between lower and upper bounds of the confidence interval, then the null hypothesis of parameter value equal to zero is not rejected at 95% confidence interval. For instance, the f value of β_{26} is *0.355* and also +/- 95% sep. confidence interval is *0.020*. The interpretation of this test is that since the f value is not between the range (*-0.020, 0.020*), so the null hypothesis is rejected by this test. The Walk test results show a rejected null hypothesis of zero parameter for β_1, β_4, β_7, β_{12}, β_{13}, β_{18}, β_{19}, β_{21}, β_{23}, β_{25}, β_{26}, β_{27}, and σ^2_{e0}.

Table 2: The Estimated Values of Parameters and Walk Tests

Parameter	Value	S. E.	f	(f-k)=0 χ^2	+/-95%sep.
β_0	0.046	0.053	0.046	0.748	0.103
β_1	0.076	0.015	0.076	25.873	0.029
β_2	-0.026	0.027	-0.026	0.923	0.054
β_3	0.020	0.014	0.020	1.939	0.028
β_4	-0.084	0.041	-0.084	4.207	0.080
β_5	-0.006	0.006	-0.006	1.025	0.011
β_6	-0.001	0.002	-0.001	0.109	0.004
β_7	-0.022	0.007	-0.022	10.450	0.014
β_8	0.010	0.009	0.010	1.162	0.018
β_9	0.005	0.005	0.005	1.054	0.010
β_{10}	-0.008	0.010	-0.008	0.551	0.020
β_{11}	0.004	0.009	0.004	0.200	0.017
β_{12}	0.167	0.053	0.167	10.027	0.104
β_{13}	0.032	0.006	0.032	33.582	0.011
β_{14}	0.002	0.002	0.002	1.814	0.003
β_{15}	-0.009	0.010	-0.009	0.812	0.019
β_{16}	0.056	0.048	0.056	1.380	0.094
β_{17}	-0.005	0.006	-0.005	0.687	0.011
β_{18}	-0.041	0.006	-0.041	41.492	0.012
β_{19}	0.334	0.014	0.334	588.660	0.027
β_{20}	-0.006	0.005	-0.006	1.257	0.010
β_{21}	0.084	0.031	0.084	7.629	0.060
β_{22}	-0.005	0.008	-0.005	0.361	0.015
β_{23}	-0.080	0.029	-0.080	7.357	0.057
β_{24}	-0.003	0.006	-0.003	0.293	0.011
β_{25}	0.210	0.011	0.210	348.734	0.022
β_{26}	0.355	0.010	0.355	1212.983	0.020
β_{27}	-0.016	0.007	-0.016	5.476	0.014
β_{28}	-0.005	0.007	-0.005	0.411	0.014
β_{29}	-0.009	0.020	-0.009	0.219	0.039
σ^2_{u0}	0.000	0.000	0.000	N. D.[3]	0.000
σ^2_{e0}	0.045	0.001	0.045	980.999	0.003

The model should be run again after exclusion of rejected parameters.

[3] Not Defined

$$\text{ceb}_{ij} \sim \text{N}(XB, \Omega)$$

$$\text{ceb}_{ij} = \beta_{0ij}\text{cons} + 0.092(0.012)\text{ceu}_{ij} + -0.054(0.018)\text{marstats}_{ij} + -0.020(0.006)\text{conjugal}_{j} + 0.202(0.008)\text{durmar}_{ij} + 0.038(0.005)\text{durcnt}_{ij} + -0.036(0.005)\text{edu}_{ij} + 0.335(0.012)\text{brestfed}_{ij} + 0.104(0.025)\text{supply}_{j} + -0.099(0.024)\text{access}_{ij} + 0.201(0.006)\text{chldmor}_{ij} + 0.369(0.009)\text{chdemnd}_{ij} + -0.015(0.006)\text{qoc}_{j}$$

$$\beta_{0ij} = -0.023(0.022) + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \text{N}(0,\ \Omega_u) : \Omega_u = \left[0.000(0.000)\right]$$

$$\left[e_{0ij}\right] \sim \text{N}(0,\ \Omega_e) : \Omega_e = \left[0.047(0.001)\right]$$

*-2*loglikelihood(IGLS)* = -548.219(2456 of 3016 cases in use)

The Walk test results show the confirmation of all parameters and rejection of the null hypothesis for all fixed parts except intercept. Also accurate values of parameters have been estimated by parametric Bootstrap simulation method. Table 3 shows the values of parameters and upper 97.5% and lower 2.5% bounds.

Table 3: Accurate Values of Parameters by Bootstrap Simulation Method

Parameter	Value	2.5% C.I.	97.5% C.I.
Intercept	-0.025 (0.0019)	-0.090	0.039
CEU	0.093 (0.001)	0.079	0.113
Marital status	-0.053 (0.0018)	-0.086	-0.023
Conjugal Patt.	-0.021 (0.0006)	-0.035	-0.010
Duration of mar	0.202 (0.0008)	0.187	0.216
Duration of cnt	0.038 (0.0004)	0.028	0.048
Education	-0.036 (0.0005)	-0.047	-0.026
Breast feeding	0.335 (0.0008)	0.317	0.358
Supply	0.101 (0.0026)	0.054	0.148
Access	-0.096 (0.0095)	-0.142	-0.052
Child mor	0.201 (0.0005)	0.189	0.211
Child demnd	0.369 (0.0008)	0.350	0.382
QOC	-0.016 (0.0006)	-0.028	-0.005
σ^2_{u0}	0.000 (0.0000)	0.000	0.000
σ^2_{e0}	0.047 (0.0001)	0.044	0.050

The table shows that none of the fixed and random parameters except intercept and level two random parts have values between lower and upper bounds of the 95% confidence interval. It confirms non zero values for these parameters. The estimated model explains more than 95 percent of variance in CEB. Only 4.7 percent of the variance relates to unknown random parameters. CEU (contraceptive ever use), marital status, duration of marriage, duration of contraception, education, breastfeeding, child death and demand and value of children, at individual level, and conjugal patterns, at community level, and family planning program supply side, FP accessibility and quality of care in SDPs, also of community level but program factors, are the variables that significantly affect total number of children.

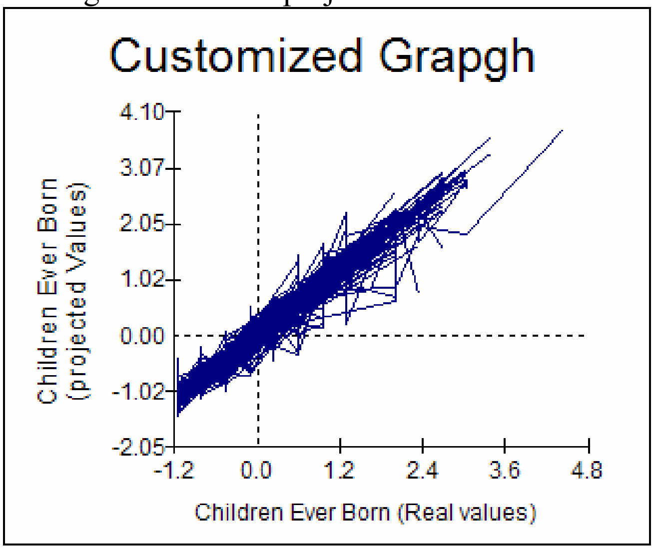
5-2-Goodness of Fit

Two projections have been made to see whether the estimated model predicts exact or nearly close values of response variable. The projected model should be written in this form:

$$\hat{y} = \hat{\beta}_{0ij}\text{cons} + \hat{\beta}_1\text{ceu}_{ij} + \hat{\beta}_2\text{marstats}_{ij} + \hat{\beta}_3\text{conjugal}_j + \hat{\beta}_4\text{durmar}_{ij} + \hat{\beta}_5\text{durcnt}_{ij} + \hat{\beta}_6\text{edu}_{ij}$$
$$+ \hat{\beta}_7\text{brestfed}_{ij} + \hat{\beta}_8\text{supply}_j + \hat{\beta}_9\text{access}_{ij} + \hat{\beta}_{10}\text{chldmor}_{ij} + \hat{\beta}_{11}\text{chdemnd}_{ij} + \hat{\beta}_{12}\text{qoc}_j$$

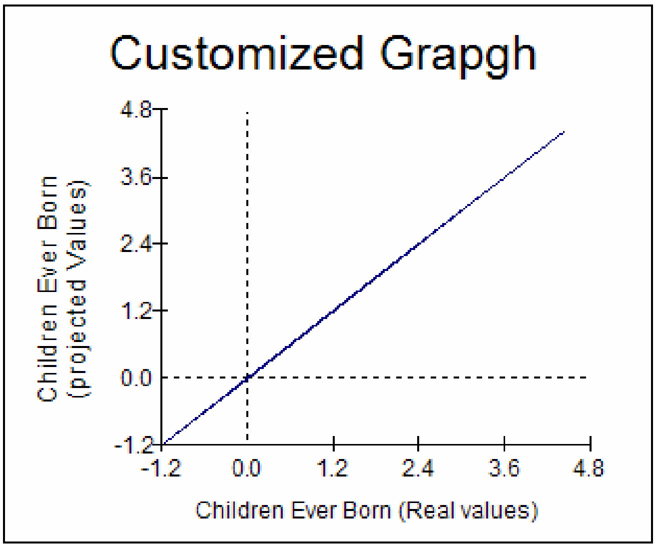
The only difference between two the projections is the random parts. At first, the above model was projected with excluding random parts (subscripts i and j from intercept). The projected values of the dependent variable (CEB) have a high correlation coefficient with real CEB. The correlation value is R = 0.9748. The calculated value of R^2 is 0.9496, which implies the determinant coefficient. It shows nearly 95% percent of variance in CEB is attributed to the fixed parts of the model. It is an excellent value for the model. Figure 6 displays the customized graph of the projected and real values of CEB.

Figure6: real and projected values of CEB



For the second projection the random parts of the model are also included. This time the projected values of CEB are exactly the same values of real CEB. The correlation coefficient value of 1 and also R^2 equal to 1 implies that the projected values are perfectly equal to real values. This determinant coefficient shows perfectly 100% explained variance of CEB by fixed and random parts of the model. Figure 7 shows the customized graph of the projected and real values of CEB.

Figure 7: Real and Projected Values of CEB Including Random Parts



The high values of R^2 for excluded random parts give a very high value of fitness for the estimated model. It should be noted that the important determinant coefficient value is R^2 of excluded random parts, since it gives the determinant coefficient value of explanatory variables and removes unexplained parts of variance.

5-3-Impact of family planning programs

If the non program variables and random parameters are removed from the projection model, the correlation coefficient between projected values and real values of CEB is reduced to -0.1136. The calculated R^2 value of 0.0129 implies that, by controlling other variables, program variables (FPP supply side, accessibility of FP and quality of care in SDPs) could explain nearly 1.3 percent of variance in CEB.

5-4-Path Analysis

The main reason for employment of path analysis in this research is that it gives overall impact (jointly direct and indirect effects) of each variable on the dependent variable. To get the values of P_i and e_i a series of structural equations should be run. The criterion to select the paths of analysis is the model that has been drown from the conceptual framework. The structural equations consist of a) multilevel multiple regression of demand for children as response variable, and societal and individual factors and family planning supply side as explanatory variables, b) multilevel binary logistic regression model of demand for family planning as response variable and demand for children and service outputs as explanatory variables, c) four separate multilevel simple regression models of proximate determinants as response variable and demand for family planning as explanatory variable, d) multilevel multiple regression model of fertility as response variable and proximate determinants and contraceptive practice as explanatory variables, e) Multilevel binary logistic regression in which contraceptive practice is response variable and proximate determinants, demand for FP and service utilization are explanatory variables, f) three single level (community level) simple regression model of service outputs as response variable and FP supply side as independent variable, g) single level (community level) multiple regression model of service utilization as response and service outputs and demand for family planning as explanatory variables, and finally, h) multilevel multiple regression of health improvements as response and fertility, contraceptive practice and service utilization as explanatory variables. The IGLS estimator with convergence tolerance equal to (10E-3) for multiple regression models, and the 2nd order PQL with RIGLS estimator for binary logistic models have been used to estimate the values of fixed and random parameters of the model.

The modified conceptual framework has been used to get the paths of the analysis. The model is too complex to bring all paths in one model, so it is broken into the number of structural equations.

A) Demand for Children

The first structrual equation for path analysis is a multilevel multiple regression of demand for children. The IGLS estimator procedure gives the following values after first iteration.

$$\text{chdemnd}_{ij} \sim \text{N}(XB, \Omega)$$

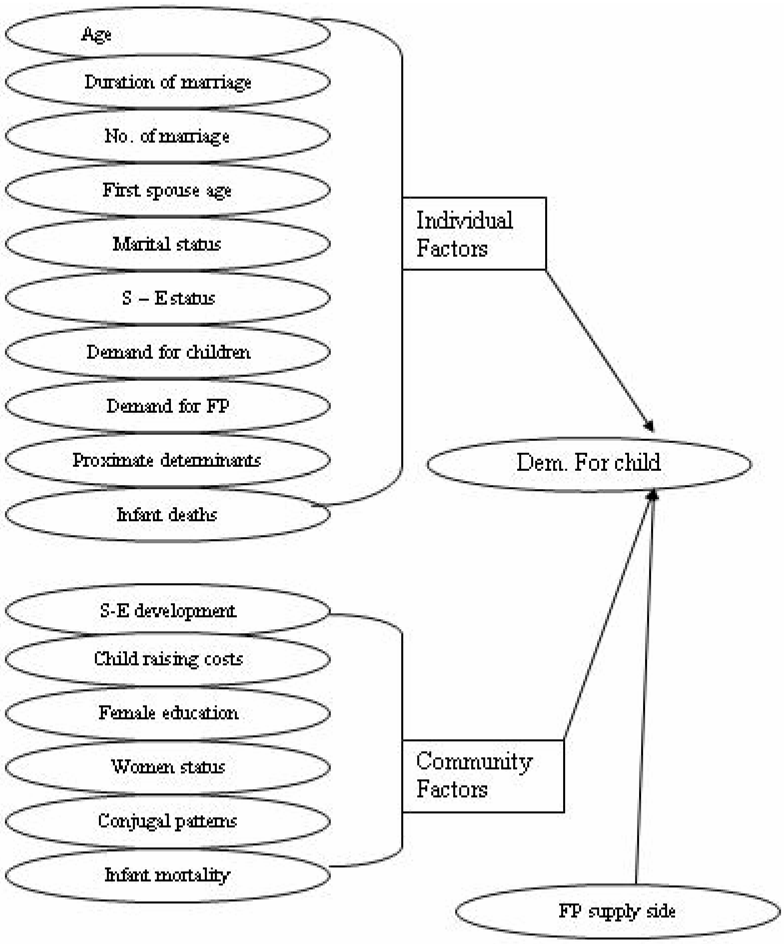
$$\begin{aligned}\text{chdemnd}_{ij} = {} & \beta_{0ij}\text{cons} + -0.265(0.078)\text{nomarage}_{ij} + -0.209(0.057)\text{marstats}_{ij} + -0.001(0.014)\text{chldcst}_{j} + \\ & -0.006(0.005)\text{sedevso}_{j} + -0.036(0.018)\text{conjugal}_{j} + 0.011(0.023)\text{chldlbr}_{j} + \\ & 0.003(0.012)\text{womstats}_{j} + -0.067(0.026)\text{womedu}_{j} + 0.013(0.022)\text{infntmrsoc}_{j} + \\ & 0.613(0.041)\text{durmar}_{ij} + -0.012(0.005)\text{seindiv}_{ij} + 0.005(0.030)\text{infantm}_{ij} + \\ & -0.027(0.039)\text{age}_{ij} + 0.023(0.015)\text{sposage}_{ij} + -0.062(0.018)\text{edu}_{ij} + \\ & 0.016(0.015)\text{employ}_{ij} + 0.056(0.031)\text{chldmor}_{ij} + -0.013(0.003)\text{supply}_{j}\end{aligned}$$

$$\beta_{0ij} = 0.571(0.100) + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \text{N}(0, \Omega_u) : \Omega_u = \left[0.000(0.000)\right]$$

$$\left[e_{0ij}\right] \sim \text{N}(0, \Omega_e) : \Omega_e = \left[0.440(0.013)\right]$$

$$-2{*}loglikelihood(IGLS) = 4964.133 (2462 \text{ of } 3016 \text{ cases in use})$$



B) Demand for family planning

The second structural equation model is multilevel binary logistic model of demand for family planning program. Second order PQL estimator gives the results of the model after 8 times of iterations.

$$\left.\begin{aligned}&\text{demfp}_{ij} \sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij})\\&\text{demfp}_{ij} = \pi_{ij} + e_{0ij}\text{bcons}^*\end{aligned}\right\}$$

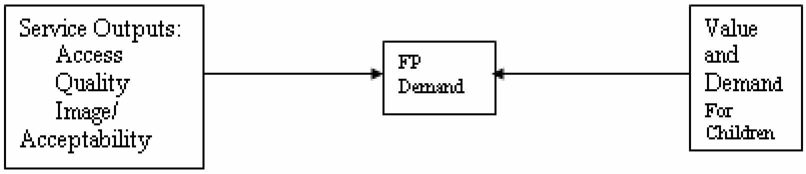
$$\text{logit}(\pi_{ij}) = \beta_{1j}\text{cons} + 0.812(0.066)\text{chdemnd}_{ij} + 0.054(0.028)\text{access}_{ij} + 0.057(0.068)\text{qoc}_j + -0.050(0.067)\text{agree}_{ij}$$

$$\beta_{1j} = 0.917(0.069) + u_{1j}$$

$$\left[u_{1j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[0.133(0.067)\right]$$

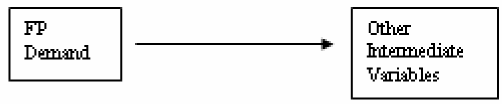
$$\text{bcons}^* = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\left[e_{0ij}\right] \sim (0,\ \Omega_e)\ :\ \Omega_e = \left[1.000(0.000)\right]$$



C) Proximate determinants

Next equations relate to multilevel simple regressions of proximate determinants. Series of these equations have been stated below.



D) Duration of contraception

Number of iteration by IGLS: 9

$$\text{durcnt}_{ij} \sim \text{N}(XB, \Omega)$$

$$\text{durcnt}_{ij} = \beta_{0ij}\text{cons} + 0.686(0.038)\text{demfp}_{ij}$$

$$\beta_{0ij} = -0.647(0.036) + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[0.049(0.013)\right]$$

$$\left[e_{0ij}\right] \sim \text{N}(0,\ \Omega_e)\ :\ \Omega_e = \left[0.821(0.022)\right]$$

$$-2*loglikelihood(IGLS) = 7893.576(2951 \text{ of } 3016 \text{ cases in use})$$

E) Duration of breastfeeding

Number of iterations by IGLS: 4

$$\text{brestfed}_{ij} \sim \text{N}(XB,\ \Omega)$$

$$\text{brestfed}_{ij} = \beta_{0ij}\text{cons} + 0.752(0.037)\text{demfp}_{ij}$$

$$\beta_{0ij} = \text{-}0.379(0.038) + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[0.074(0.015)\right]$$

$$\left[e_{0ij}\right] \sim \text{N}(0,\ \Omega_e)\ :\ \Omega_e = \left[0.803(0.022)\right]$$

*-2*loglikelihood(IGLS)* = 7916.701(2970 of 3016 cases in use)

F) Abortion

Number of iterations: 9

$$\text{abort}_{ij} \sim \text{N}(XB,\ \Omega)$$

$$\text{abort}_{ij} = \beta_{0ij}\text{cons} + 0.139(0.041)\text{demfp}_{ij}$$

$$\beta_{0ij} = \text{-}0.134(0.036) + u_{0j} + e_{0ij}$$

$$\left[u_{0j}\right] \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \left[0.008(0.007)\right]$$

$$\left[e_{0ij}\right] \sim \text{N}(0,\ \Omega_e)\ :\ \Omega_e = \left[0.986(0.026)\right]$$

*-2*loglikelihood(IGLS)* = 8405.559(2970 of 3016 cases in use)

G) Age at Marriage

Iteration number: 5

$$\text{agemar}_{ij} \sim \mathrm{N}(XB, \Omega)$$

$$\text{agemar}_{ij} = \beta_{0ij}\text{cons} + -0.208(0.040)\text{demfp}_{ij}$$

$$\beta_{0ij} = 0.081(0.040) + u_{0j} + e_{0ij}$$

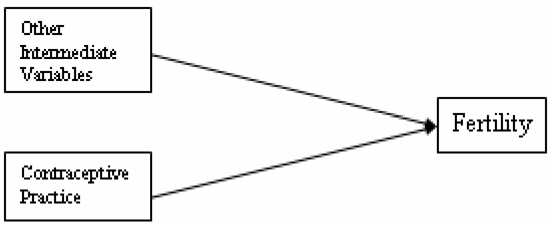
$$\left[u_{0j}\right] \sim \mathrm{N}(0, \Omega_u) : \Omega_u = \left[0.073(0.016)\right]$$

$$\left[e_{0ij}\right] \sim \mathrm{N}(0, \Omega_e) : \Omega_e = \left[0.927(0.025)\right]$$

*-2*loglikelihood(IGLS)* = 8328.340(2970 of 3016 cases in use)

H) Fertility

Another equation from a series of structural equations to do path analysis in this research is the multilevel multiple regression of fertility. The paths and equation (iteration number is 4) have been presented below:



$$\text{ceb}_{ij} \sim \mathrm{N}(XB, \Omega)$$

$$\text{ceb}_{ij} = \beta_{0ij}\text{cons} + 0.903(0.007)\text{brestfed}_{ij} + 0.046(0.007)\text{durcnt}_{ij} + 0.020(0.006)\text{abort}_{ij} + -0.042(0.007)\text{agemar}_{ij} + 0.112(0.017)\text{ceu}_{ij}$$

$$\beta_{0ij} = -0.111(0.016) + u_{0j} + e_{0ij}$$

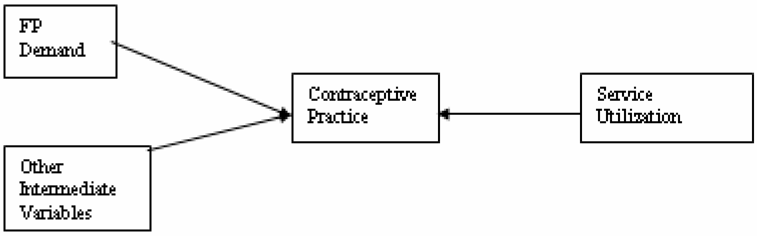
$$\left[u_{0j}\right] \sim \mathrm{N}(0, \Omega_u) : \Omega_u = \left[0.006(0.002)\right]$$

$$\left[e_{0ij}\right] \sim \mathrm{N}(0, \Omega_e) : \Omega_e = \left[0.113(0.003)\right]$$

*-2*loglikelihood(IGLS)* = 2054.329(2997 of 3016 cases in use)

I) Contraceptive practice

Binary logistic regression model for contraceptive practice gives the results after 13.



$$\left.\begin{array}{l} \text{ceu}_{ij} \sim \text{Binomial}(\text{denom}_{ij}, \pi_{ij}) \\ \text{ceu}_{ij} = \pi_{ij} + e_{0ij}\text{bcons}^* \end{array}\right\}$$

$$\text{logit}(\pi_{ij}) = \beta_{1j}\text{cons} + 0.013(0.084)\text{durcnt}_{ij} + 0.941(0.109)\text{brestfed}_{ij} + 0.321(0.091)\text{abort}_{ij} + -0.022(0.065)\text{agemar}_{ij} + 2.947(0.153)\text{demfp}_{ij} + -0.043(0.100)\text{servutil}_j$$

$$\beta_{1j} = 0.429(0.124) + u_{1j}$$

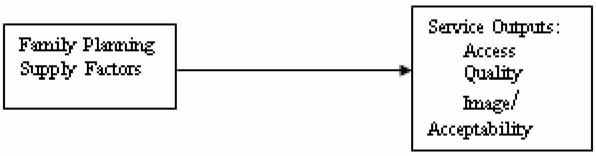
$$\left[u_{1j}\right] \sim \text{N}(0, \Omega_u) : \Omega_u = \left[0.335(0.145)\right]$$

$$\text{bcons}^* = \text{bcons}[\pi_{ij}(1 - \pi_{ij})/\text{denom}_{ij}]^{0.5}$$

$$\left[e_{0ij}\right] \sim (0, \Omega_e) : \Omega_e = \left[1.000(0.000)\right]$$

J) Service outputs

Three separate single level simple regression models have been estimated to find the β values of these equations. The paths drown from the conceptual framework are stated below.



J-1) accessibility

Iteration number: 1

$$\text{access}_{id2id2} \sim \text{N}(XB, \Omega)$$

$$\text{access}_{id2id2} = \beta_{0id2}\text{cons} + 1.032(0.001)\text{supply}_{id2id2}$$

$$\beta_{0id2} = -0.038(0.004) + e_{0id2id2}$$

$$\left[e_{0id2id2}\right] \sim \text{N}(0, \Omega_e) : \Omega_e = \left[0.038(0.001)\right]$$

$$-2{*}loglikelihood(IGLS) = -1185.808(2 \text{ of } 2 \text{ cases in use})$$

J-2) Quality of Care

Iteration number: 1

$$\text{qoc}_{id2id2} \sim \text{N}(XB, \Omega)$$

$$\text{qoc}_{id2id2} = \beta_{0id2}\text{cons} + -0.046(0.002)\text{supply}_{id2id2}$$

$$\beta_{0id2} = 0.000(0.018) + e_{0id2id2}$$

$$\left[e_{0id2id2}\right] \sim \text{N}(0, \Omega_e) : \Omega_e = \left[0.541(0.015)\right]$$

$$-2{*}loglikelihood(IGLS) = 5517.069(2482 \text{ of } 3016 \text{ cases in use})$$

J-3) Image

Iteration number: 1

$$\text{agree}_{id2id2} \sim \text{N}(XB, \Omega)$$

$$\text{agree}_{id2id2} = \beta_{0id2}\text{cons} + 0.013(0.002)\text{supply}_{id2id2}$$

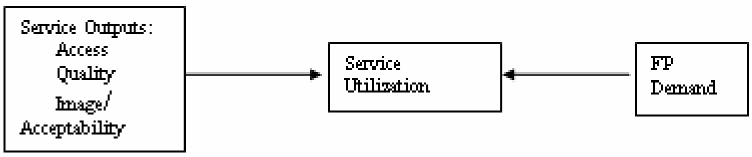
$$\beta_{0id2} = 0.007(0.017) + e_{0id2id2}$$

$$\left[e_{0id2id2}\right] \sim \text{N}(0, \Omega_e) : \Omega_e = \left[0.555(0.015)\right]$$

$$-2{*}loglikelihood(IGLS) = 6045.229(2687 \text{ of } 3016 \text{ cases in use})$$

K) Service utilization

One of the serial equations of path analysis of the study is single level multiple regression model of service utilization. The path ways that have been taken from the conceptual framework is shown below.



Iteration: 1

$$\text{servutil}_{id2id2} \sim \text{N}(XB, \Omega)$$

$$\text{servutil}_{id2id2} = \beta_{0id2}\text{cons} + 0.194(0.002)\text{access}_{id2id2} + -0.163(0.018)\text{qoc}_{id2id2} + -0.221(0.017)\text{agree}_{id2id2} + 0.067(0.029)\text{demfp}_{id2id2}$$

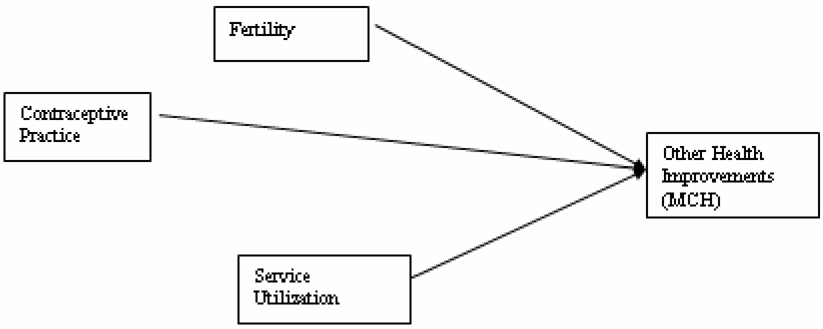
$$\beta_{0id2} = -0.100(0.026) + e_{0id2id2}$$

$$\begin{bmatrix} e_{0id2id2} \end{bmatrix} \sim \text{N}(0,\ \Omega_e)\ :\ \Omega_e = \begin{bmatrix} 0.388(0.012) \end{bmatrix}$$

$-2*loglikelihood(IGLS) = 4206.767(2223 \text{ of } 3016 \text{ cases in use})$

L) Health improvements

Finally the multilevel multiple regression model of health improvements is the last equation in the structure. The path ways have been drown from modified model.



$$\text{helthim}_{ij} \sim \text{N}(XB, \Omega)$$

$$\text{helthim}_{ij} = \beta_{0ij}\text{cons} + 0.867(0.010)\text{ceb}_{ij} + -0.078(0.025)\text{ceu}_{ij} + -0.009(0.015)\text{servutil}_{j}$$

$$\beta_{0ij} = 0.095(0.024) + u_{0j} + e_{0ij}$$

$$\begin{bmatrix} u_{0j} \end{bmatrix} \sim \text{N}(0,\ \Omega_u)\ :\ \Omega_u = \begin{bmatrix} 0.011(0.004) \end{bmatrix}$$

$$\begin{bmatrix} e_{0ij} \end{bmatrix} \sim \text{N}(0,\ \Omega_e)\ :\ \Omega_e = \begin{bmatrix} 0.232(0.006) \end{bmatrix}$$

$-2*loglikelihood(IGLS) = 3826.964(2727 \text{ of } 3016 \text{ cases in use})$

Iteration number: 5

The between variables paths of the model and their β values are presented in Table 4.

Table 4: paths and β values

Path	Origin var.	Destination var.	value β
P_1	Number of marriage	Child demand	-0.265
P_2	Marital status	Child demand	-0.209
P_3	Duration of marriage	Child demand	0.613
P_4	S.E. individual	Child demand	-0.012
P_5	Infant death	Child demand	0.005
P_6	Age	Child demand	-0.027
P_7	Spouse age	Child demand	0.023
P_8	Employment	Child demand	0.016
P_9	Child mortality	Child demand	-0.013
P_{10}	Education	Child demand	-0.062
P_{11}	Child cost	Child demand	-0.001
P_{12}	S.E. Development	Child demand	-0.006
P_{13}	Conjugal patterns	Child demand	-0.036
P_{14}	Child labor	Child demand	0.011
P_{15}	Women status	Child demand	0.003
P_{16}	Women education	Child demand	-0.067
P_{17}	Infant mortality	Child demand	0.013
P_{18}	FP Supply	Child demand	-0.013
P_{19}	Child demand	FP demand	0.812
P_{20}	Access	FP demand	0.054
P_{21}	Quality	FP demand	0.057
P_{22}	Image	FP demand	-0.050
P_{23}	FP demand	Dur. Contracep.	0.686
P_{24}	FP demand	Breastfeeding	0.752
P_{25}	FP demand	Abortion	0.139
P_{26}	FP demand	Age at marriage	-0.208
P_{27}	Duration Contraception	Fertility	0.046
P_{28}	Breastfeeding	Fertility	0.903
P_{29}	Abortion	Fertility	0.020
P_{30}	Age at marriage	Fertility	-0.042
P_{31}	CEU	Fertility	0.112
P_{32}	Duration of Contraception	CEU	0.013

Cont'd

Path	Origin var.	Destination var.	value β
P_{33}	Breastfeeding	CEU	0.941
P_{34}	Abortion	CEU	0.321
P_{35}	Age at marriage	CEU	-0.022
P_{36}	FP demand	CEU	2.947
P_{37}	Service utilization	CEU	-0.043
P_{38}	FPP supply	Access	1.032
P_{39}	FPP supply	Quality of care	-0.046
P_{40}	FPP supply	Image	0.013
P_{41}	Access	Service util.	0.194
P_{42}	Quality of care	Service util.	-0.163
P_{43}	Image	Service util.	-0.221
P_{44}	FP demand	Service util.	0.067
P_{45}	Fertility	MCH	0.867
P_{46}	CEU	MCH	-0.078
P_{47}	Service utilization	MCH	-0.009

The total effect of each variable has been calculated using all necessary paths shown at structural equations. The calculation of the effect of independent variables on the dependent variable is performed by multiplying the path coefficients of the related variables. Table 5gives the overall impact of each variable on CEB.

Table 5: Total Effect of Each Variable on Fertility (CEB) by Path Analysis

Variable	Total Effect	Variable	Total Effect
Number of marriage	-0.2438	**Women education**	-0.06164
Marital status	-0.19228	**Infant mortality**	0.01196
Duration of marriage	0.56396	**supply**	0.005495
S.E. individual	-0.01104	**access**	-0.00662
Infant death	0.0046	**QOC**	-0.00521
Age	-0.02484	**Image**	0.006324
Spouse age	0.02116	**Child demand**	0.92
Employment	0.01472	**FP demand**	-0.105
Child mortality	-0.01196	**Abortion**	0.055952
Education	-0.05704	**Breastfed**	1.008392
Child cost	-0.00092	**Duration of contraception**	0.047456
S.E. Development	-0.00552	**Age at marriage**	-0.04446
Conjugal patterns	-0.03312	**CEU**	0.112
Child labor	0.01012	**service Utilization**	-0.00482
Women status	0.00276		

The results indicate that breastfeeding, demand for children, duration of marriage are most important variables that positively influence fertility.

6- Summary and Conclusion

Multivariate analysis of the factors that affect fertility shows that variables contraceptive ever use, marital status, conjugal patterns, duration of marriage, duration of contraception, education, breastfeeding, FP supply side, accessibility of FPP services, child death, demand for children and quality of care in SDPs with nearly 95% determinant coefficient explain the variance of fertility. 95% determinant coefficient supports conceptual framework with its high and very good value, in which only 5% of the variance remains unexplained. In this model family planning indicators have an important role in determination of variance of fertility. But the role of individual level variables is more important than program variables. In short, despite the significant contribution of family planning program variables in determining fertility, the role of individual variables such as demand for children, breastfeeding, child mortality are more important. Path analysis of the impact of independent variables on fertility shows that individual level variables have total impact equal to 2.05782 on fertility, whereas total impact of community level factors and program factors are -0.07636 and -0.00483 respectively. Findings of path analysis of those factors which affect fertility also confirm that despite important and significant role of FPP factors on determination of fertility, individual distinctiveness and community characteristics plays more important role than family planning program factors.

6-1-Limitations

Like other social researches, this study carries some limitations. First limitation of this study relates to data that have been used. The studies in this area need special data. Two types of problems faced in the course of data collection are: a) most of the data needed for evaluation are not gathered in program routine records; b) even the accessibility of collected data is difficult. Second, people have their own definition of "Evaluation". By evaluation they mean an investigation of management and staff activities. So, they try to prevent doing such studies. But it should be considered that:

Evaluation is making it work

If it works…

Notice and nurture

If it doesn't work…

Notice and change.

6-2-Criticism

6-4-1-Strengths

The multilevel regression approach has a number of strengths:

- Since the approach relates program input measures to outcomes at the community level, it permits the measurement of the impact of the program as it is actually implemented.
- It does not require an experimental design.
- It provides more detailed information on the pathways through which programs influence contraceptive behavior than other approaches.

6-3-Limitations

- The approach is demanding in terms of data.
- The method is sensitive to the use of appropriate statistical models and to the proper treatment of statistical estimation problems.
- The models are sensitive to the timing of program investments in relation to the period of observation in impact assessment (Bertrand, J.T., 1996:62).

6-4-Propositions

This study lies in applied category of research setting. So it is expected to give practical propositions. Since the analysis shows a significant role of family planning programs in determination of the number of children a woman has, so nurturing existing program, and increased supports and efforts will lead to a high contribution of family planning programs to fertility regulations. On the other hand, policy makers should not ignore the role of individual and community level factors on fertility, in which their contributions indeed are higher than that of family planning program factors. Taking into account these factors in decision making and also in the management of family planning programs will help easy and quick success of the programs. High contributions of individual and community level factors on fertility regulations require a multi – dimensional and inter – organizational effort to reach national goals in population related issues. Also, their high contributions to fertility regulations confirm the well – known hot debate of The Bucharest Conference that “Development is the Best Contraceptive”.

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