Quantitative Methods of Measuring the Impact of Family Planning Programs

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I.   Introduction:

Family planning programs are a relatively recent phenomenon. Over the recent years, family planning programs have been initiated in many developing countries with the objective of decreasing the fertility level. In 1951, India adopted the first national program which aimed at lowering birth rates and, hence, the rate of national population growth (United Nations, 1972). Family planning did not, however, gain any appreciable acceptance as a policy instrument until the early 1960's, as a result, among other things, of growing awareness of the dampening effect of the rapid population growth on economic development, and the availability of new contraceptive methods.

The countries of Asia took the lead in the family planning movement and, while some countries of Latin America have introduced programs, only a few African countries have done so.

Measuring the effects of a family planning program on fertility is recognized as a difficult task. If a change in fertility is believed to have occurred during a period of program implementation, the evaluator is expected to determine what part of that change can be attributed to the program. Even if no change in fertility is observed, the evaluator must investigate whether the unchanged fertility reflects the absence of any program influence or whether the constant level of fertility results from the compensating effects of programs and non-programs variables.

The Pop-Line software designed by the United Nations Fund for Population Activities (UNFPA) was used to search under the topic of family planning and evaluation methods. The main purpose of this literature review is to give a brief account of the procedures used in evaluating the impact of family planning program on fertility. In this part, some concepts and related definitions will be reviewed in brief.

I.1 Definitions of Family Planning and Family Planning Programs:

The term family planning has a variety of concepts. For the purpose of this topic, it refers to the deliberate effort of couples or individuals to regulate fertility by delaying or spacing births and/or limiting their numbers.

By family planning programs we mean organized efforts to provide birth control information and services on a voluntary basis to a target population, with a view to lowering fertility and/or improving health. Such programs are

typically governmental in funding and administration and are usually undertaken as part of a wider set of activities aimed at fostering economic and social welfare at both the individual and societal levels.

This view was supported by Berelson (1969), among others, who stated that family planning would proceed more rapidly in the context of modernization, but that well-designed and administered programs would afford at least a start at family planning among some segments of the population.

I.2 Types of Evaluation

The national family planning programs are a wide assortment of activities geared towards an ultimate objective. But achievement of the final goal depends necessarily upon accomplishments at different levels or, in other words, upon attainment of a variety of sub-objectives. Each of the latter goals can be subjected to evaluation; and, as a good administrative practice, this task is done periodically as a guide in operational strategy.

Evaluation has been defined in many ways, but most definitions agree that it involves measuring of the results achieved by a program directed towards some valued objective (Mauldin, 1968). Thus, evaluation is done in terms of both intermediate and ultimate objectives. A brief definition about the two types is as follows:

(a) Intermediate objectives.

A number of intermediate goals can be subjected to evaluation, including efficiency of workers, periodic achievements of workers, and programs logistics.

(b) Long-term or ultimate objectives.

Such objectives may be, among other things, the reduction of infant mortality and maternal mortality and improvement in the general decline of fertility, or achievement of a specified rate of population growth, and well being of mothers and children.

This paper focuses on the methods of evaluating family planning programs in the long-term objectives.

I.3 Main Issues in Measuring the Effect of Family Planning Problems on Fertility:

There are a number of difficult problems relative to the assessment of demographic impact that have not been solved to the satisfaction of interested scholars and administrators of family planning programs. These difficulties are:

1. The complexities of distinguishing direct and indirect program effects.
2. Determining what the secular trend of fertility would have been had the program not been undertaken.
3. Accounting for substitution effects.
4. Working out the future fertility of acceptors as compared with that of the general population.
5. Predicting possible changes in programs that may be hindered by lack of accurate data on fertility levels and on changes in fertility.

II. Literature Review:

By reviewing the methodologies used in measuring the impact of family planning programs in the last four decades, it was found that these methodologies could be classified into the following three main phases:

The first phase: during the period 1960-1979.
The second phase: during the period 1980-1989.
The third phase: during the period 1990- until-now.

This classification may reflect the transitional thinking and development of the methodologies with some of the main population events, concepts, and theories that were revealed during each phase. In each phase, the methodologies used, as well as, a general critical review is summarized.

The first phase: during the period 1960-1979

Many attempts have been introduced to measure the impact of family planning programs on fertility on various occasions. When the effects of a program are evaluated, usually, the interest tends to focus on a program's ultimate contribution to reducing fertility. Concern with this issue has led to the development of a number of evaluation techniques. In fact, the progress in the methodology of evaluating family planning programs was made during the short span of the past few decades. The United Nations took up the task of critically examining the methods that were available for assessing the impact of the family planning programs on fertility, essentially in terms of births averted.

The expert group of demographers of the world recognized that the effects of family planning programs on fertility must be viewed as a complex system of many interconnected parts. They stated that the evaluation of family planning programs should be viewed in the larger context of studying the determinants of fertility, which starts by identifying the boundaries of the system, its component parts and the linking among these components (United Nations, 1978).

An extensive literature on measuring the impact of family planning programs on fertility using both micro and macro analytical approaches was introduced by Wolfers (1969), Potter (1969), Chandrasekaran and Hermalin (1975), and United Nations (1978,1985, and 1989).

The expert group of demographers (United Nations; 1978) have established the base of which method can be applied in specific country circumstances for the best results. This expert group has classified methods of analyzing the impact of family planning programs into seven categories: decomposition, correspondence of timing of programs activity and fertility change, matching studies, experimental and control areas, multiple-regression with real units, births averted among acceptors, and simulation methods. Chandrasekaran and Hermalin volume (1985) and the United Nations' manual IX have used slightly different categories.

This meeting of the expert group was held in Geneva, Switzerland on 20-27 of April 1976, to determine whether and to what degree the family planning programs were fulfilling their purposes. The ultimate objective of this meeting was to ascertain which of the principal methods currently used in evaluating family planning programs on fertility should be applied in a specific country.

The outcome of the efforts of the expert group meeting on methods of measuring the impact of family planning programs on fertility were summarized and published report (United Nations, 1978). The methods of measuring the impact of family planning programs on fertility are well reviewed in this publication. These methods are:

1. Standardization approach;
2. Trend analysis;
3. Experimental designs;
4. Couple-years of protection;
5. Component projection approach;
6. Analysis of the reproductive process;
7. Regression analysis (including path analysis);
8. Simulation models.

In this part, a brief review of the procedures used for evaluating programs impact on fertility is presented.

1. Standardization approach

Freedman and Arjun were the first investigators for this approach (Freedman, and Arjun 1968). Other investigators dealt with this subject as an application, as Reynolds (1973), and Anderson (1975). This approach applied to measure programs' impact on fertility, which requires two steps. The first step consists of measuring fertility at two points in time to determine whether any change has occurred during the period under study. The second step consists of trying to account for the observed change, if any, by standardization for various non-program components which, depending upon the fertility indicator used, may affect observed fertility without reflecting a genuine fertility change.

Standardization is undertaken can be legitimately added (and subtracted) in order to assess the individual effect of each component. However, the fact is that the "true" relationship between the crude birth rate and its components is multiplicative, as is described by the formula:

$$CBR = \frac{W}{P}(\sum_i A_i . M_{pi} . F_{mi}) = \text{crude birth rate};$$

W = number of women or reproductive ages;
P = total population;
i = five-year age groups;
A_i = proportion of women in age group I among all women of reproductive ages;
M_{pi} = proportion of married women of age group I among all women in age group I;
F_{mi} = age-specific marital fertility rate for age group i.

2. Trend analysis

This technique is one of the common statistical methodologies used for a long time.   Demographers have used this technique as a method of evaluation of the family planning programs. Among these demographers who used this technique are Mauldin (1968), Bouge (1970), and Sivin (1971). This methodology attempts to measure the impact of family planning programs on fertility by comparing indicators of actual fertility (observed fertility) over a specific period of time to projected fertility data for the same time period. The projected fertility data are assumed to represent the potential fertility of the population studied, i.e. the fertility for that population had the programs not been undertaken. Actual or observed fertility is the fertility really experienced

by the same population over the same time span. The difference between actual and projected fertility is thus assumed to yield an estimate of the impact of the family planning programs on fertility.

3. Experimental designs

This technique also is very common in the area of applied statistics. Demographers have used the advantage of this technique as one method of measuring the impact of family planning programs on fertility. Among these demographers and some agencies who used this technique were The Population Council in India (1963), Johnson (1973), and Wells (1975). The experimental-design approach aims to compare two groups of population: the first, the "experimental group" is assumed to have undergone a treatment which, in the present case, would be the family planning programs; the other, the "control group", is assumed to have the same characteristic as the experimental group. except that it was not exposed to the treatment. The fertility of each group is recorded at one or several points in time; and, assuming that the two groups are comparable except for the program factor, the evaluator would consider any difference in fertility between the two groups as resulting from the programs.

In practice, researchers resort to various forms of ex post facto matching procedures. The estimates of births averted, X, can be estimated by using the following formula by each cohort:

$$X = A_1 (\frac{M_2}{M_1}) - A_2$$

Where A_1 = fertility rate of acceptors before first acceptance;
A_2 = fertility rate of acceptors after first acceptance;
M_1 = fertility rate of "matches" corresponding to the before fertility rate of acceptors;
M_2 = fertility rate of "matches" corresponding to the after fertility rate of acceptors;

4. Couple-years of protection (CYP)

Been and William (1968) suggested this method as one way to estimate the births averted. Also, Mauldin (1968), and Wishik (1969) developed this method slightly in terms of an index. This index is an estimate of the protection against pregnancy resulting from the differential use of various methods of birth control. It is used to produce a measure of programs

achievement in a period, by assessing the joint impact of methods adopted, taking into account the length of time a couple is likely to be protected by each method. The CYP index can also be used to produce an estimate of prevalence of use during a period by taking into account protection resulting from past distribution as well as protection derived in the period from current distribution. One of the formulas which has been used to estimate (CYP_n) prevalence is:

$$CYP_n = 0.01 C_n + (0.75 I_n + 0.50 I_{n-1} + 0.25 I_{n-2})$$
$$+ (S_n + 0.95 S_{n-1} + 0.90 S_{n-2})$$

Where, C = the number of conventional contraceptive;
I = the number of Intra-uterine devices inserted;
S = sterilization (vasectomies and tubectomies).

The coefficient 0.01 reflects the assumption that 100 units of conventional contraceptives must be distributed to provide one couple with protection for one year.

5. Component projection approach

Lee and Isbister (1966) were the first pioneers to introduce this approach. Later, Mauldin (1968), and Miller et al (1975) applied this approach to some countries data. The concept of this approach is based on data about birth control practice. The number of acceptors of a given method, the duration of use and the effectiveness of the contraception must be taken into account, either explicitly or implicitly. In addition, the fertility of these acceptors, had the family planning programs not been undertaken (potential fertility), must be estimated for the period of time under analysis. These estimates are usually worked out by five-year age groups on annual basis. The number of births averted by couples or women in age group I is thus obtained as the product:

$$Q_{i,t} \cdot g_i$$

Where $Q_{i,t}$ = number of women in the ith age group in year t who were practicing totally effective contraception during the period from t-1 to t;

g_i = potential fertility estimate of the number of women $Q_{i,t}$ in age group i;

i = successive age groups of women of reproductive ages, 15-19,20-24,etc.

6. Analysis of the reproductive process

Potter (1969) introduced this technique to explain the components of the birth interval. Also, this technique was applied by Wolfers (1969), and Tietze and Lewit (1973) to estimate births averted by a segment of contraceptive use. The mean duration of interruption of pregnancy due to the acceptors' effective use of programs' contraceptive is estimated by the life-table technique and compared with the mean duration between births is used as an estimation of the acceptors' potential fertility. If, because of the adoption of the program contraception, the acceptors remain in a non-pregnant state for an average period equivalent to the length of an average birth interval, then one birth has been averted. In addition to the average duration per birth and the length of contraceptive use from the life table, these methods often include adjustments for the proportion of acceptors who are sterile at acceptance and who become sterile at acceptance subsequently, overlap of contraceptive use with postpartum amenorrhoea, occurrence of pregnancy rates while using contraception and a time "penalty" for such pregnancies.

The principle formula of the former scheme is:

$$B = \frac{I}{D}$$

and $I = F(R - A - PW)$

where B = births averted per segment of contraception;

I = average duration that childbearing is interrupted;

D = average duration per birth required in absence of the Contraceptive;

R = mean length of contraceptive segment;

F = proportion of couples non-sterile at time of acceptance;

A = allowance for contraceptive overlap with post-partum anovulations;

P = proportion of segments ending in an accidental pregnancy;

W = penalty per accidental pregnancy.

7. Regression analysis

This technique may be one of the most common statistical techniques that have been widely used. Demographers used this technique in many different demographic applications. One application of this technique is to measure the impact of family planning programs on fertility. Duncan (1966), Freedman (1973), and Hermalin (1975) were used Multiple regression analysis, including path analysis. It can also be used in determining an equation or a system of equations. The dependent variable is fertility indicator and the independent variables are program and non-program factors. Through such a functional model, the evaluator can attempt to calculate quantitative estimates of the weight of the various independent variables. Often a regression analysis of such model will employ an equation of the following type:

$$Y = a + b_1 X_1 + b_2 X_2 + cX_1 X_2 + e$$

This equation assumes that there are independent effects plus an interaction effect captured by the simple multiplicative term.

8. Simulation models

Although these models are, usually, sophisticated and complex so far, some demographers have used this technique in their application in the field of demography, Holmberg (1970), Barrette (1971), and Menken (1975). Simulation models are also used for the study births prevented by the use of birth control methods. These models may have as its objective the study of the effects of family planning practices under various hypothetical conditions regarding, for instance, the type and effectiveness of method used and the reproductive characteristics of the women. Research in this field has investigated births prevented by contraception, by abortion, by sterilization and by contraception supplemented by abortion.

One of these common models is REPISM-B model. This model is a hypothetical cohort of women between the age 15 and 50 years. It is characterized as a static or stationary model. The unit of analysis in REPSIM-B is the individual woman and the unit of time is one month, and all events occurring to a woman are assumed to take place in the middle of the month.

Critical Review:

There are eight methods of measuring the impact of family planning programs on fertility. They have been used in a few countries. They differ widely in their theoretical foundation and specification details, in their level of analytical sophistication in the level of skilled manpower required, in their population coverage, in their required data, and in their potential errors.

Appropriate methods depend upon programs' needs and development or more generally upon the way in which the findings are to be utilized. The difficulty of choosing an evaluation method should be considered. Several criteria can be applied in the selection: the objectives of the evaluation; the particular population for which evaluation is needed; the availability of data; the validity and reliability of the methods; and the cost of the method. In developing countries where resources are limited, and given the fact that there is no unique reliable method of evaluation, the choice will be reduced in most cases to the application of methods for which data are available.

The standardization approach is a useful attempt to measure the real change in fertility by determining changes due to shifts in age structure and marital status. It identifies the change due to fertility behavior but does not separate the effect of family planning program from those of socioeconomic factors. This method should be routinely applied in evaluation if the data are available.

Trend analysis has proved to be useful when there is evidence of an existing trend prior to the beginning of a program and a clear change afterwards. But it requires regular data on fertility for long periods, which may not be available in countries with reliable statistical records.

Multiple regression analysis takes into account non-program and program variables. In theory, it would certainly be the most appropriate method; but in practice, it is difficult to apply because of availability of data and the detailed conceptualization required.

If the evaluation was concerned only with acceptors, the CYP method could be used, but it is a very rough measure. An improvement would be to use reproductive process analysis or the component projection approach.

Experimental design is, in theory, a very powerful scientific tool. In practice, however, the difficulties of applying the method are virtually exhausted. The method as applied to some countries illustrated the problems of interpreting the results and was, thus, found to be of very limited interest.

Simulation models have revealed the impact on the crude birth rates and other demographic measures of an annual stream of acceptors' birth control methods. Simulation should not be used for evaluating family planning programs. Rather, simulation models should be utilized as research tools, for resolving many methodological programs and, in particular, with interpretation of the results.

When the focus of the evaluation is on a longer period, standardization is particularly an appropriate method. Indeed, if the data are available, there also will be no reason not to use it for periods of less than five years. Standardization is a basic method of assessing whether a program might be having any effect. The component method is also highly appropriate for long-term evaluations. Trend analysis is highly appropriate if there is evidence of a trend prior to the beginning of programs. However, various difficulties in its applications arise.

The second phase: during the period 1980-1989.

With few exceptions, however, existing statistical and demographic techniques, which have been adopted, and new methods devised for evaluation purposes do not attempt to quantify the contribution of specific program and non-programs factors to fertility change.

During this phase, family planning surveys known as "Knowledge, Attitudes, and Practices" (KAP) and World Fertility Survey (WFS) were conducted in many developing countries. These surveys focused on fertility and its determinants; hence, contraceptive use, in general, was a central part of the survey. Despite the progress in the past few years both in data collection and in analysis techniques, it is still difficult to establish convincingly that fertility has declined, consequently, on the use of family planning. However this is beginning to be appreciated in a population.

There are two quite distinct reasons for the difficulties. The first is the lack of sufficiently accurate and detailed data. The second is the deficiency of birth registration and, just as crucially, the capacity to estimate the related population at risk.

The part given below describes as simply and concisely as possible the principal current evaluation methods. By reviewing the methods of evaluating

family planning programs on fertility, it is found that, this phase can be reviewed through the following dimensions:

(a)   Introducing new approaches.
(b)   Introducing new measures of fertility.
(c)   Developing some previous methodologies.

(a) The first Dimension: Introducing new approaches.

Hermalin (1985) explored an expansion of multivariate analysis for evaluating family planning programs that utilized data on individuals from surveys as well as characteristics. When a real difference in fertility can arise from individual factors (micro-level behavior) as well as systemic factor (aggregate or macro characteristics), it is desirable to take both sources of variation into account. Multi-level analysis strategy for the analysis outcomes arises from both micro and macro factors.   It is not a technique per se but a framework for analysis within which a variety of techniques may be employed.

Chandaraskaran (1985) tried to explain the changing in developing family planning programs and what they involved in terms of evaluating their achievements. More attention was given to the evaluation of "integrated family planning programs" –an approach that was emphasized at the World Population Conference in 1974. In this approach, national family planning programs aims, in general, to achieve the widespread dissemination of knowledge of effective family planning methods, to increase the motivation of the population to accept and utilize those methods and to provide supplies and servicing facilities so that individuals and couples will be in a position to regulate the number and spacing of their children. Various approaches to evaluation of national family planning programs have also been made that depend upon the point of view from which evaluation is considered.   Three different, though not exclusive approaches have been proposed: the public health; the sociological approach; and the economic approach.

(b) The second dimension: Introducing new measures of fertility.

Smith (1980) illustrated a method for constructing an abridged life table for the interval from marriage to first birth for all ever-married women. A cross tabulation of all ever married women by duration of exposure and termination status is required to construct such a life table.

Rodriguez and Hobcraft (1980) extended Smith's procedure by applying the model to higher order births. They proposed B60's as the key measure. This measure reflects the proportion of women achieving the next birth higher birth order within five years (60 months) of the previous one. The attempt is to find a measure as close as practicable to the parity progression ratio, but the latter can only be calculated precisely for cohorts of completed fertility.

Brass and Juraez (1983) proposed a new technique based on B60's that developed by Rodriguez and Hobcraft to avoid the selectivity as the main problem of birth interval. Applying Rodriguez and Hobcraft's method by using some control variable does not give satisfactory results for some countries as Mexico. Juarez used truncation approach that first suggested by Ryder in 1982 to avoid this problem.

Feeny (1983) presented a model for a cohort version of the parity progression ratios. In this model, expressing (i+1)th births in year (y) terms of (i)th in year, and proceeding years. The parity progression ratios can be expressed as:

$$B(i,t) \, dt = B(i-1,t-a) \cdot E(i-1,a) \, da \qquad (i = 1,2,\ldots,k)$$

Where,
$B(i,t) \, dt$ is the number of births of order i between time t and t+dt;
$E(i-1,a)$ denotes the proportion who have an (their i birth between a and a+da years after their (i-1)at among all women who had an (i-1)at birth.

The technique for doing this task is the life-table analysis of birth intervals. The particular strength of the life table approach is that it adjusts for population at risk. An important measure for this life table technique is called B60's, which expresses the proportion of women in an age cohort of incomplete fertility who have experienced n births at different intervals before five-years of the survey.

Chiang (1984) presented a formula that expressed the relationship between that maximum likelihood of parity progression ratios and parity – specific fertility rates based on the assumption that fertility is dependent on woman's age instead of the previous assumption that fertility and woman's age are independent.

Rashad's work (1987) was based on the cohort version of the parity progression model as presented by Feeney (1983) which expresses (i+1)at births in year y in terms of (i)th birth in year y and preceding years and the parity progression schedules. Thus;

$$B(i,t)dt = B(i-1,t-a).E(i-1,a)da \qquad (i = 1,2,...,k)$$

where, $B(i,t)$ denotes the number of births of order i between time t and t+td;

$E(i-1,a)$ denotes the proportion who have an (i)th birth between a and a+da years after their (i-1)th birth among all women who had an (i-1)at birth. Rashad re-expressed age specific fertility rates using parity progression model.

The work of Bhrolochain (1987) was also an extension of that introduced by Feeny in 1983. For lacking temporal change in fertility, period indices of fertility level (e.g. total fertility rate) are known to have the disadvantage that they are subject to much larger short-term fluctuations than is displayed by the completed fertility of the cohorts passing through the childbearing ages during a given period. The method used by Bhrolochain is essentially a life-table formulation of the period parity progression.

(c) The third dimension: Developing some previous methodology.

Bongaarts and Potter (1983) introduced a new concept of potential fertility in evaluating the impact of family planning programs on fertility. This new concept tries to make a distinction between the gross and net potential fertility as the two major types of potential fertility used in evaluation methodologies. The two different types of potential fertility are defined as follows:

(a) Gross potential fertility is the fertility that would prevail if all use of programs contraception were eliminated, without switching to non-program source of contraception supplies;

(b) Net potential fertility is the fertility that actually would have been observed if there had never been a program.

The estimation of gross potential fertility requires an estimate of the population's natural fertility level. A procedure for deriving the natural fertility level (in absence of induced abortion) is based on the following equation, which summarizes the fertility impact of contraceptive prevalence in a given year:

$$TFR = TNFR (1-1.08.e.u)$$

Where, TFR = total fertility rate;

$TNFR$ = total natural fertility rate;

e = contraceptive use-effectiveness;

u = prevalence of contraception among currently married women.

1.08 = sterilization factor.

In 1985, Bongaarts proposed an aggregate version of a "prevalence" method for estimating the fertility impact of family planning programs. This method permits the estimation of gross potential fertility and gross birth averted by the programs, if prevalence levels of both program and non-program contraception are known. It is the purpose of this methodology to give age-specific and method-specific elaboration of the prevalence model. As in the aggregate model, the following is the final equation for each age group:

$$BANa = (NAFa - PAFa) POPa$$

Where,

   BANa = births averted by non-program contraception by age;

   NAFa = natural age-specific fertility rate;

   PAFa = potential age-specific fertility rate;

   POPa = number of women in age group a.

   (See also, Bongaarts,1990).

Critical Review:

These three general dimensions of reviewing the methods of evaluation of family planning programs during the period 1980-1989 can reveal that, a great attention is paid to improve the dependent variable of fertility in terms of parity progression ratios. This measure reflects the tempo of fertility as the median of birth interval, and the quantum in term of B60's, as well as, the use of national surveys.

Also, there is an improvement in the approach that was introduced as the potential fertility and the multi-level. This is confirmed by fertility as the product of all factors, i.e. demographic, socioeconomic and cultural variables. Etc... At the same time, this product is an integration of the macro and micro level of variables.

But, most of the methods of evaluating the impact of family planning still focus on fertility. While, there are other important aspects that are essential such as mother and child health.

The third phase: during the period from 1990-until now

Cumulated experiences were gained from the last three decades. Family planning received great attention, and this was reflected in increasing the level of contraceptive use in most of the developing countries. Now, after the ICPD1994, there is a remarkable direction to give more attention towards the aspects of the reproductive health and its components. Family planning has become one of the major components for a comprehensive reproductive health.

In the past, efforts to measure the efficacy of family planning programs were derived from a demographic perspective. Likewise, the common themes in designing input and output indicators have had a desire to measure the impact of family planning programs on fertility. This proposed a shift in the objectives of these programs. We review the indicators and evaluation frameworks typically used to measure the efficacy of family planning programs in terms of their current objectives.

The proposed shift in the primary objective of family planning programs implies certain criteria for measuring the efficacy of these programs. The evaluation framework must follow and evaluate the clients' behavior rather than the service delivery point of a given method.

Westoff (1990 and 1991) used the strong statistical links connecting reproductive intentions, contraceptive, and fertility to provide a basis for making short-term forecasts of these parameters. These roughly five-year forecasts are based on regression equations specifying the relationships among the three variables over time. The predicting equations are drawn from data gathered in 137 surveys conducted since the early 1970's in different countries. These quantified relations are used to forecast fertility five years more.

The estimated equation based on 33 countries with successive surveys is:

$$WNM_t = 14.419 + 0.804 (WNM_t + 5) \qquad \text{...............} (1)$$
$$R^2 = 0.92$$

Where WNM_t = percentage of women who will want no more children at time t.

Contraceptive Prevalence Rate (CPR) in the future is estimated using the relationship between CPR and WNN from the work of Westtoff (1990). This

equation was estimated using data from surveys in the same countries and yield R^2 of 0.89. The equation is:

$$CPR_{t+5} = 0.124 + 0.192 \, (WNM_{t+5}) + 0.859 \, (CPR_t) \qquad \ldots \text{(2)}$$

The latest available CPR and the predicted value of WNM obtained from equation (1) are used. Earlier research on the interrelationship or reproductive intentions, contraceptive prevalence, and fertility rate showed a very high correlation with the TFR across time. This relation is modeled in the following equation:

$$TFR_{t+5} = 1.434 - 0.016 \, (CPR_{t+5}) \, 0.728 \, (TFR_t) \qquad \ldots\ldots \text{(3)}$$

Jain and Bruce (1995) proposed a new methodology to assess how well programs help women to achieve their reproductive intentions safely and effectively. This methodology is based on a new vision to promote reproductive health aspects and to include this approach as one element of the population policy. Most population policies, as currently operationalized, depend upon family planning programs as the primary means to reduce fertility. Although levels of contraceptive use and fertility are highly correlated, age at marriage, abortion, and postpartum infecundability are associated with breast-feeding. In addition, a variety of socioeconomic factors powerfully affect individuals' and couples' desire for children and their ability to achieve these desires.

The HARI index is an acronym index for Helping Individuals Achieve their Reproductive Intention. A HARI is a separate reproductive health index that can be defined in terms of 100 minus the percentage of women who experience severe morbidity while trying to avoid an unplanned or unwanted pregnancy. A joint reproductive intention and health index can be defined by a modified HARI index as being equal to 100 minus the percentage of women who have an unplanned or unwanted pregnancy, or experience severe morbidity related to reproduction, during a specified period of observation.

The HARI index will be equal to 100 if the program is completely successful in helping individuals achieve their reproductive intentions in a healthful manner; it will be equal to 0 if the program is a complete failure with respect to both unwanted pregnancy and unnecessary morbidity. It implies, but does not measure directly, the logical intervening steps- choice of technology, adequate information exchange, and so forth.

Latham, Galant, and Portus (1999) used a pilot project as a technique to face the problem of evaluating the demographic, medical, and social effects of family planning. The basic research design includes three phases: First, an initial baseline survey is preformed to investigate fertility, as well as, knowledge of attitudes towards and practice of modern contraception, and other variables which could influence these factors such as age, marital and educational status. Secondly, the administration of the experimental treatment. The third, is conducting later fertility and KAP surveys which permitted the evaluation of the family planning program.

The methodology used for measurement and analysis of the possible effect of the program, through the pregnancy history approach, considers (1) the measurement of the fertility of the community, and (2) the analysis of the cause-effect relationship between the program and the change. The pregnancy history method consists in obtaining the full record of all pregnancies experienced by a cross section of women during all their lives, and in computing, on the basis of these data, age-specific, general, and total fertility rates.

III. Conclusion:

- The issues of the methods of evaluating the impact of family planning programs on fertility have received a great attention during the last three decades. This can be observed from the first task in this topic, which was held under the umbrella of the United Nations in 1978.

- Most of the methodologies that were developed in the first phase seemed so far to be independent methods. Also, these techniques come from the basic statistical work as, multiple regression, trend analysis, and simulation models, ...etc.

- The CYP methodology seems a very rough method. So, it is recommended that this method be excluded from these proposed methodologies because it dose not attempt to estimate births averted in a calendar year. It attempts to estimate the total number of births averted over the years by program acceptances in a year.

- In the second phase, it is observed that heavy work in terms of developing the independent variables was given as parity progression ratios, B60's, and the median length of birth intervals. Also, this phase was characterized by good utilization of the data that came from various surveys.

- In the third phase, a new approach was introduced towards the reproductive health and its components as the ultimate objective for the program. Consequently, family planning component becomes one of the majors of reproductive health framework.

- Selection of the best methodology is based on various criteria. The most important criterion is based on what long-term objective should be evaluated.

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