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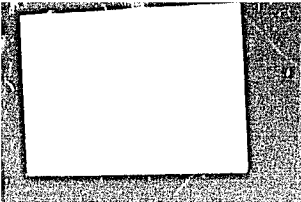
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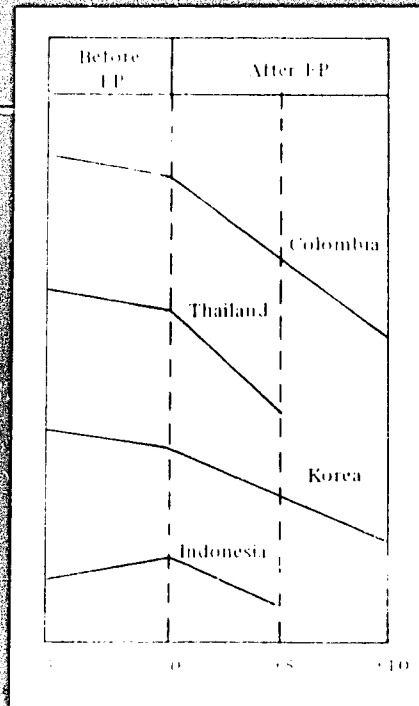
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the impact of family planning programs ON fertility rates

A CASE STUDY OF FOUR NATIONS



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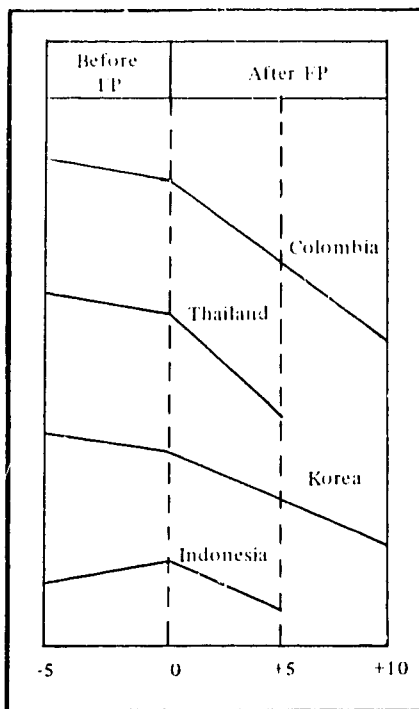
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PREFACE

Documentation that family planning programs are capable of inducing major and rapid decline in fertility still is quite scarce, and widely scattered. This little monograph seeks to make a contribution to the testing of hypotheses concerning the relationship of family planning programs and fertility change by assembling data for four specific countries. The results are still less complete and precise than could be desired. However, the volume does subject the proposition to rigorous test, using methods and techniques which many readers will find as useful as the findings themselves.

The four nations studied were deliberately selected because they are supposed to be "success cases" for family planning. The Community and Family Study Center is continuing its explorations, and now is in the process of applying the same techniques to some examples of "failure" of family planning programs.

It is the hope of all concerned with this project that many more demographers and social researchers will join in this branch of study and that our efforts will be a catalyst.

The Authors
April, 1979

ACKNOWLEDGEMENTS

The results reported in this monograph could not have been compiled and realistically interpreted without the invaluable assistance of numerous organizations and persons. Within Indonesia, data from the BKKBN, the Central Statistical Office, the Demographic Center of the University of Indonesia, and the aid of Haryono Sujono, Jay Parsons, Rohadi, and Aswini made the evaluation possible.

Within Thailand, Scott Edmonds, Richard Cornelius, and the participants in the Demographic Workshop for the Evaluation of Family Planning Program Effectiveness, held in Bangkok, Thailand, on Nov. 28 to Dec. 9, 1977, all contributed to the analysis.

In Columbia, The Working Committee to Study the Impact of Family Planning on the Demographic, Economic, and Social Structure of Colombia, PROFAMILIA (the private family planning organization), and the Population Council played a leading role in sponsoring the impact evaluation project. A comparatively large group of demographers and family planning researchers (listed by name in Chapter Two) not only sponsored this research, but actively participated in it at every step.

The report for Korea was aided by the careful discussion of the participants in the Family Planning Evaluation Workshop held at the East-West Center on June 12 to July 7, 1978.

Within the Community and Family Study Center, a number of graduate students assisted in the tabulation and analysis of the data. We have recognized some of these on the title page. In addition, Mrs. Maggie Gibson bore a major share of the data processing.

The manuscript was edited and prepared for publication by George Rumsey. He was assisted by Jim Adler, Cheryl Crossgrove, Joe Glass, Caren Gottlieb, Judy McCarthy, Anne O'Neill, Doug Pappas, Robin Rosenberg and Corliss Swain. The cover of the book was designed by George McVicker.

Chapter One of this monograph is reprinted in a slightly revised form with the permission of *Demography*, where it was first published (Volume 15, Number 1, 1978, pp. 113-129).

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The Authors

Chapter One

A COMPONENTS METHODOLOGY FOR MEASURING THE IMPACT OF FAMILY PLANNING PROGRAMS ON BIRTH RATES

Jay Teachman, Dennis Hogan, and Donald J. Bogue

I

Introduction

Many family planning programs, under the auspices of both public and private organizations, have been initiated in numerous nations in the past ten years. The variety of social, economic, and health-oriented rationales for these programs have been based upon the assumption that the solution of other problems is facilitated or simplified by a reduction in the rapid rate of population growth. The anticipated indirect effects (through fertility changes) of the family planning programs on infant and maternal mortality, female labor force participation, and so forth vary markedly from country to country and even within nations insofar as strategies and goals of social and economic development differ. However, the direct effect of a family planning program is not nearly so variable: a successful family planning program should lengthen childspacing intervals and reduce completed family size for women in the childbearing ages, resulting in a decline in the target area's rate of natural increase. For this reason, one general strategy for evaluating the success of any family planning program is to measure the area-specific fertility decline since the active implementation of the program (Bogue, 1969).

An interval of several years is necessary before a family planning program can actually result in significant fertility decline. Previous attempts to evaluate the impact of organized programs have focused on many different intermediate variables presumed to be relevant to a program's success or failure. These include changes in knowledge of and attitudes toward contraceptive practices as a result, at least in part, of the communication campaigns con-

ducted by the program. Other studies have counted the number of new acceptors of contraception and then converted these acceptors into estimates of woman-years of contraceptive protection provided by program sources. The number of births averted by such protection provides an estimate of the fertility decline attributable to program efforts.

Such criteria of program success are optimal during the early years of program activity. Many programs have now been operating long enough, however, that it is appropriate to apply a more direct evaluation procedure that attempts to link the amount of contraception provided to a fertility change. Such a procedure need not assume a necessary relationship between a program's contraceptive protection and a fertility decline; fertility declines may also result from increased rates of natural sterility or from decreased rates of sexual exposure. Nor does the procedure assume that all contraception provided by the family planning program is new; rather, some of the contraceptive protection provided by the program is recognized as a substitute for folk contraception or medical contraception otherwise obtained from commercial sources. This chapter outlines a method for linking the amount of contraceptive protection provided by an organized family planning program to changes in fertility. Subsequent chapters will present five examples of this methodology as applied to different national units.

II

Previous Methods

The research issue which this methodology proposes to resolve is, of course, not a new one. At least four relatively distinct approaches have previously been proposed for assessing the impact of a family planning program on levels of fertility. The trend in birth rates procedure (Wolfers, 1968; Freedman et al., 1969; Bogue, 1971) and the multivariate approach (Hermalin, 1968; Schultz, 1971) both compare the rate of fertility change in an area (areas) prior to the initiation of a family planning program with the rate of change after the program is begun. Any acceleration in the rate of decline in fertility coinciding with the onset of program activities is attributed to the program. The control or matching group procedure (Chow, 1968; Chang et al., 1969) is similar to the trends in birth rate procedure, but the expected trend for the target area in the absence of a program is based on the trend observed in a similar area having no program. The births averted procedure (Mauldin, 1968; Potter, 1969; Wolfers, 1969; Lapham, 1970; and Kelly, 1971) converts the number of woman-years of contraception provided by the family planning program into number of births averted, which implies a fertility reduction attributable to the program.

As has been demonstrated elsewhere (Potter and Rao, 1972; Sheps, 1971, 1972), the rate of a fertility decline involves a complex set of interactions among several factors, including the proportion of women of childbearing age who are protected from pregnancy by natural sterility or sexual inactivity. Age-specific marital status, mortality, and migration rates, each of which may vary independently from any organized family planning program, also influence fertility levels. Such variables often differentially affect the fertility of subgroups of the population, further complicating the analysis.

A major problem with previous methods of evaluating program impact is the lack of rigorous attention to the independent role played by such structural factors. The following is a method of explicitly controlling for such structural factors so that an unbiased and reliable estimate of family planning program impact can be made. The procedure builds on existing models for impact evaluation, but differs by providing a formal method for evaluating family planning programs in a variety of settings by utilizing a standard methodology.

III Contraception Required to Account for an Observed Fertility Decline

In order to study the interrelationships between contraception and birth rates (controlling for infertility and changing marriage, migration, and mortality patterns), an empirical link between birth rates and contraceptive behavior must be established. Such a model begins with assumptions regarding the level of natural fertility that characterizes a population in the absence of any contraceptive practices. The number (or proportion) of women who must be protected to avert a given number of births (or to produce a given reduction in the fertility rate) is then calculated. Some of the necessary protection will result from age-specific patterns of exposure to sex and natural sterility, while the remainder result from contraception and abortion.

The application of these protection rates to a population of women survived forward according to an annual schedule of age-specific mortality rates yields the number of woman-years of protection that are necessary to produce a given fertility level. The number of woman-years of protection provided can be decomposed into sources of protection (e.g., nonexposure to sex, abortion, folk contraception, medical contraception, etc.). The number of women who must practice contraception to produce the required woman-years of protection can be calculated, based on information about contraceptive use-effectiveness. Contraceptive continuation rates supply the necessary information for determining the number of new acceptors required each year to maintain the specified number of women practicing contraception at any given point in time.

The volume of calculations required by such a model is obviously quite large. Two packaged computer programs have been designed for calculating the contraceptive protection (number of new acceptors) that must be attained by a family planning program in order to achieve the fertility level reduction set as the program goal. The first, named PROJTAG, was developed by Bogue, Edmonds, and Bogue (1973). TABRAP, the second packaged program for such calculations, is described in Nortman and Bongaarts (1975).

The two computer packages are based on somewhat different algorithms and rely on different simplifying assumptions. The major difference is that the PROJTAG program assumes that the contraceptive mix, the method-specific continuation rates, and the contraceptive failure rates are constant across all age groups. The TABRAP calculations assume that these characteristics vary on an age-specific basis. The TABRAP program thus requires input data for each of these factors by age, whereas the PROJTAG program requires only a single set of parameters characterizing the entire population of reproductive age.

Generally, it is difficult to locate accurate contraceptive continuation and failure rates for all women in a population, much less to obtain such information for women of each age. Given such considerations about data quality and availability, the simplifying assumptions of PROJTAG do not seriously bias the results obtained for the total reproductive population. Accordingly, the impact evaluation methodology proposed here is illustrated with calculations from TABRAP if they possess the requisite data.

PROJTAG is based on a linear fertility-contraceptive function that links the proportion of fecund women who are protected to the level of the current birth rate (Bogue, Edmonds, and Bogue, 1973). This function may be expressed symbolically as follows:

$$\text{Observed Birth Rate} = M - Y(P - K) \quad (1)$$

where

M is the maximum birth rate that the human species is actually capable of attaining under realistic conditions.

P is the percentage of all fecund woman-years of experience that are protected, by all possible sources (adjusted for use-effectiveness of contraception); its range is from 0 to 100.

K is the estimated percentage of fecund women who are protected, by pregnancy and nonexposure, under conditions of maximum fertility.

Y is the slope of the straight line linking **M** and **P** as follows:

$$Y = \frac{M}{100 - K} \quad (2)$$

where 100 is the maximum value of P with M equal to 0, and 34 is the maximum value of P with M equal to 8,384.

The linear equation that estimates the birth rate, given P, is:

$$\text{Observed Birth Rate} = M - Y(P - K) = M - \frac{M(P - K)}{100 - K} \quad (3)$$

Bogue, Edmonds, and Bogue (1973: 25-36) estimate that 34.0 percent of the fecund women are protected in the situation where the Total Fertility Rate reaches its reproductive maximum value of 8,364 (corresponding to a crude birth rate of 60). Almost all of this protection is provided by pregnancy—a sizable proportion of women cannot get pregnant because they are already pregnant! One-hundred percent of the fecund women in a population must be protected to produce a zero fertility rate. The curve connecting these upper and lower limits is assumed to be a straight line (Bogue, Edmonds, and Bogue; 1973: 31). As such, protection of one fertile woman will have the same effect upon the birth rate regardless of where she is located along the continuum.

Substituting these values into equation (3),

$$\text{TFR} = 8,364 - [(P - 34) (8,384/66)] = 12,700 - .127P \quad (4)$$

where P is the percentage of fecund woman-years of experience that are protected from pregnancy.

The PROJTARG program begins with a base of women and separates them into the following categories (on an age-specific basis):

1. Infecund women
2. Fecund women
 - (a) not exposed to sex (protected by abstinence)
 - (b) exposed to sex.

PROJTARG computes the value of P (which results from the value of TFR assumed for a particular year) and applies to it the number of fecund women already computed for that year. It then subtracts the number of women who are not exposed to sex (unmarried or not in a sexual union), and leaves a residual number of women who are being prevented from getting pregnant by contraception and abortion in order for the birth rate to be at its indicated level. (This is termed the family planning “target,” which matches a given combination of birth rates and marital or conjugal status.) The result is the statistic needed to study the interrelationship between changing birth rates and changing levels of contraception. For any value of TFR, it is possible to compute the number of woman-years of protection from pregnancy. Thus, PROJTARG provides a yardstick against which to measure the performance of family planning programs. (Bogue, Edmonds, and Bogue [1973] illustrate the development of the PROJTARG model in terms of the fertility rate

for the total population of reproductive age; the actual computations of the PROJTAG program are done on an age-specific basis, with the value of P for women of a given age calculated on the basis of their fertility rate.)

PROJTARG has the capability of performing the above computations not only for one instant of time, but for each calendar year for a period of up to 30 years. In doing so, it takes into account changes in birth rates, mortality rates, marital (conjugal) status, and net migration - all on an age-specific basis. The values of each of these parameters are specified for a base year and for a terminal year; the computer program performs a linear interpolation independently for each year, and applies it to the female population it has projected for that year. Thus, the model is capable of estimating the amount of contraception required in order to accomplish a predesigned amount of fertility decline, making use of current age statistics, mortality rates, migration patterns, and marital status estimated for each year. As a model, it attempts to replicate as exactly as possible what contraceptive behavior of a population actually has transpired or will transpire under conditions of changing fertility. Nonlinear changes can be represented with PROJTAG by decomposing the change over a long interval into a series of shorter intervals among which linear change is not assumed.

PROJTARG is ordinarily used *prospectively* to predict how much contraception must be experienced by a population to attain a desired level of fertility. PROJTAG can also be applied *retrospectively* to compute how much contraception was actually accomplished in previous years in order to bring about an observed or confirmed decline in fertility. When used in this way it can become a useful tool for family planning program impact evaluation.

PROJTARG provides a more refined estimate of the amount of contraceptive behavior experienced by a population than do the usual sorts of births averted calculations. These refined estimates are obtained at the cost of requiring more raw data input than the other methods reviewed above. At the very least PROJTAG requires fertility, mortality, and conjugal (sexual exposure) rates for base, pivotal, and terminal years. Migration may be optionally included. Natural sterility functions and the population age-sex distribution in the base year must also be provided.

Those familiar with data for developing nations will recognize that these input parameters are rarely known with accuracy. Only by the most fortuitous circumstances will they be known exactly for the base, pivotal, and terminal years. Experience indicates, however, that through the application of standard demographic techniques and the consideration of all the available data, reasonably consistent and accurate estimates of these parameters can usually be obtained for an area. (This argument is analogous to that made in favor of a components method of population projections: by including the best estimate of each component of population change separately into

PROJTARG and reconciling these components to produce the observed change in fertility rates, a more reliable and consistent set of data is obtained.)

If the researcher wishes, a range of parameters (high, medium, and low) can be used in PROJTARG to place a bound on the estimate of the woman-years of contraception experienced by the population. Even though these estimates are never exactly accurate, it is better to utilize a model that at least attempts to allow for known changes in the structural factors influencing fertility in a formal fashion than to ignore such factors or to consider them only in an *ad hoc* fashion as has been the usual practice.

IV

Allocating Sources of Contraceptive Protection

Once PROJTARG has provided estimates of the woman-years of contraception experienced each year by the population, the sources of that protection must be allocated into inside-program and outside-program sources. Medical methods of contraception, surgical sterilization, and abortion are methods of protection that will be available to some extent from both program and private/commercial sources. The practice of folk contraception such as withdrawal, rhythm, coitus, prolonged breast-feeding, and abstinence ordinarily contribute some of the protection provided by the private sector.

If independent estimates of the contraceptive protection provided by each of these five sources are available separately for the inside-program and outside-program sectors, the task is to reconcile the sum of these reported amounts of contraception with the total amount of contraception that PROJTARG indicates actually occurred. There are no sure guidelines for doing this. The researcher will have to examine carefully the sources of this data to determine which figures he wishes to retain and which he wishes to adjust to reach the reconciled total. By varying the assumptions under which these adjustments are made, the researcher can provide high and low boundaries on the estimate of woman-years of protection provided by the inside-program sources.

Unfortunately, there is frequently a lack of good data about the protection provided by folk contraception. In areas where abortion is illegal and where statistics on pregnancy termination are poor at best, the protection provided by the family planning program and by the commercial sale of medical contraceptives and from abortion and folk contraception can be estimated. Woman-years of protection provided by program sources can be calculated with statistics on number of continuing users of program inputs during the year, and by reference to amounts of contraceptive supplies (e.g., cycles of pills) dispensed during the year. Similar statistics on volume of commercial sales of

pills, condoms, etc., can be used to calculate woman-years of protection from that sector (Bogue, Edmonds, and Bogue, 1973). Again, several different estimates can be made to allow for exaggeration in program statistics and to bound the estimated woman-years of protection due to each inside-program source. Several estimating techniques for different data sources are illustrated in the five examples later in this chapter.

Once the proportions of contraceptive protection provided by inside-program and outside-program sources, by method, are determined for the base, pivotal, and terminal years, a final PROJTAG run can be made. This output will provide not only the woman-years of protection from pregnancy required to achieve the observed age-specific fertility rates, but it will also indicate the sources by which this contraceptive protection was obtained each year. In the absence of an active program, some acceptors would have used some other method (e.g., pills from a commercial source, rhythm, douche, abstinence), and thus are not "new" adopters; therefore, the net proportion of total contraceptive protection provided by the organized family planning programs under differing assumptions about substitutability can be made.

V

Five Examples of the Model's Application

The heart of this monograph consists of five examples of the application of the model, each illustrating different problems or obstacles which might face an investigator attempting to do an impact analysis. The model is applied to Colombia, the departamentos of Colombia, Thailand, Indonesia, and Korea. These developing countries have in the recent past been plagued by high rates of population growth. Since 1965, however, each of these countries has experienced measurable and significant declines in fertility, thus slowing the momentum of population growth. Additionally, these five countries have all sponsored vigorous family planning programs since at least before 1970. As will be shown below, the effort of each of these family planning programs has been the major source of contraceptive protection by which observed fertility declines have been achieved.

The chapters on Colombia and Indonesia illustrate the use of the model not only on an aggregate level, but also for subnational units. For Colombia the analysis has been carried out both for the nation as a whole and for the 23 departamentos (states). The presence of data for many smaller areas within Colombia allows an examination of the differential role played by family planning programs in each departamento as well as some inferences (using regression-based strategies) about the relationship between fertility decline and family planning programs net of the effects of various socioeconomic indicators. The Colombian example also presents a detailed discussion of the

use of various demographic techniques to obtain consistent estimates of fertility levels and contraceptive usage.

The Indonesian example, although restricted to about 65 percent of the total population, does cover all areas in which a family planning program existed between 1970 and 1976. Estimates of program impact are provided for the five provinces of Java and for Bali. Although data for six subareas are not sufficient to repeat the regression-based strategy used for the departamentos of Colombia, they are sufficient to show that the national family planning program has had differential impact in these six provinces. What is unique about the Indonesian case is that the impact of the family planning program is *not* judged by comparing contraception provided by the program against required contraception. Since reliable terminal year fertility rates are not available, PROJARG could not be used to estimate a path of required woman-years of protection. Detailed knowledge about family planning acceptors, the structure of use-effectiveness, and other factors affecting exposure to contraception (such as changes in marital status and mortality, the extent of postpartum amenorrhea, etc.) made it possible, however, to estimate fertility reduction attributable to the family planning program. While this is essentially a births averted procedure (see the above discussion of previous methods of impact analysis), the explicit control of various structural parameters which affect fertility change makes the Indonesian example merely a variant of the model used for the other countries. The only major difference is the lack of knowledge concerning the extent that fertility was further reduced in Indonesia beyond that attributed to program contraception.

The chapters on Korea and Thailand refer to the entire nation since adequate data for subnational areal units are not available. Each analysis, though, illustrates the importance of the national family planning program to observed fertility declines and shows that, without the program, fertility levels undoubtedly would have remained much higher. These studies also suggest that the levels of contraception needed to reach observable declines in fertility would have been extremely difficult to obtain without government supported programs.

References

- Bogue, D. 1969. *Principles of Demography*. New York: Wiley.
- _____. 1971. *Demographic Techniques of Fertility Analysis*. RFFPI Manual No. 2. Chicago: Community and Family Study Center, The University of Chicago.
- _____, S. Edmonds, and E. Bogue. 1973. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Stat-*

- us on Birth Rates*. RFFPI Manual No. 6. Chicago: Community and Family Study Center, The University of Chicago.
- Chang, M. C., T. H. Liv, and L. P. Chow. 1969. "Study by Matching of the Demographic Impact of an IUD Program: A Preliminary Report." *Milbank Memorial Fund Quarterly* 47: 137-57.
- Chow, L. P. 1968. "A Study of the Demographic Impact of an IUD Program." *Population Studies* 22: 347-59.
- _____, M. C. Chang, and T. H. Liv. 1969. "Taiwan: Demographic Impact of an IUD Program." *Studies in Family Planning* 45: 1-6.
- Freedman, R., D. N. Namboothiri, A. Adlakha, and K. C. Chan. 1969. "Hong Kong: The Continuing Fertility Decline." *Studies in Family Planning* 44: 8-15.
- Hermalin, A. 1968. "Taiwan: An Areal Analysis of the Effect of Acceptances on Fertility." *Studies in Family Planning* 33: 7-11.
- Kelly, S. J. 1971. "Estimates of Births Averted by Family Planning Programs: A Parity Approach." *Studies in Family Planning* 2: 197-201.
- Lapham, R. 1970. "Family Planning and Fertility in Thailand." *Demography* 7: 241-53.
- Mauldin, W. Parker, 1968. "Births Averted by Family Planning Programs." *Studies in Family Planning* 33.
- Nortman, D., and J. Bongaarts. 1975. "Contraceptive Practice Required to Meet a Prescribed Crude Birth Rate Target: A Proposed Macro-Model (TABRAP) and Hypothetical Illustrations." *Demography* 12: 471-89.
- Potter, R., Jr. 1969. "Estimating Births Averted in a Family Planning Program." Pp. 413-34 in *Fertility and Family Planning: A World View*, edited by S. J. Behrman, L. Corsa, and R. Freedman. Ann Arbor: University of Michigan Press.
- _____, and S. L. N. Rao. 1972. "Future Family Planning Impact: Method and Data Requirements." Unpublished Paper, Second Asian Population Conference, Tokyo, Japan.
- Schultz, T. 1972. "Disequilibrium and Variation in Birth Rates over Space and Time: A Study of Taiwan." Rand Corporation (September).
- Sheps, M. C. 1971. "A Review of Models for Population Change." *Review of the International Statistics Institute (The Hague)* 39: 185-96.
- _____, and J. A. Menken. 1973. *Mathematical Models of Contraception and Birth*. Chicago: The University of Chicago Press.
- Wolfers, D. 1968. "An Evaluation Criterion for a National Family Planning Program." *American Journal of Public Health* 58: 1447-1451.
- _____. 1969. "Some Problems in Calculating Births Averted." In *International Union of the Scientific Study of Population (ed.), International Population Conference Proceedings, Vol. 2*. Liege: IUSSP.

Chapter Two

AN ESTIMATE OF THE DIRECT IMPACT OF FAMILY PLANNING PROGRAMS ON THE BIRTH RATE OF COLOMBIA

Juan Londoño and Donald J. Bogue¹

I

Problem of Study: The Linkage Between Family Planning and Fertility Decline

This report is a collaborative effort to examine some interrelationships between two current population events in Colombia:

- (a) This nation has been the site of a very active and very successful family planning campaign which has been sustained for over a decade (1965 to the present).
- (b) This nation has experienced a decline in fertility since the census of 1964 which, for a nation so poor and underdeveloped, is without precedent in Latin America and nearly unmatched in the world.

These two events took place within the same time span, and the announced objective of the first was to bring about the second; this fact could lead to the uncritical inference that the fall in the birth rate of Colombia was a direct result of the family planning program. However, other social changes were taking place in the same time span, and alternative explanations should be explored before reaching this conclusion. On the other hand, the alternative assertion, that these two events are wholly unrelated to each other, should not be made until empirical evidence to support it is presented.

The conjunction of two such dramatic events that involve substantial national and foreign expenditures and that consume vast quantities of attention and effort by government ministries, universities, family planning organizations, and foreign experts cannot escape attention and interpretation. Claims that have been made about the impact of family planning upon the

birth rate decline of Colombia range from 100 to 0 percent, and in some extreme cases even to a denial that the birth rate has declined. By the end of 1975 it was apparent that a major effort to make a careful evaluation was needed. A working committee comprised of directors and research technicians representing all of the organizations in Colombia which have been involved in family planning and demographic research was formed to undertake such a study. Together, these organizations have sponsored a vast amount of research collecting a wealth of data unusually rich for a developing country. Yet this evidence has never been synthesized; it consists only of annual reports, articles, and monographs. The committee has pooled this evidence and submitted it to careful analysis. Their findings comprise the content of this report.

The findings of the committee - that the decline in Colombian fertility can be substantially attributed to the organized family planning program - are almost certain to stir some controversy and debate. Consequently, this report presents in full the evidence which was used and outlines in detail the analysis that was made. Those who wish to test different hypotheses or attempt other explanations will find useful materials available. The committee appreciates that the problem of this study is a complicated one with controlled experimental research not possible. As such, the report is regarded by the committee as a first effort. It develops a new methodology for evaluation which the committee believes clarifies the problem greatly. It presents a model which is able to account for the relevant facts and is capable of stimulating further research on the problem and of focusing research on key issues. It is submitted by the committee for critical review, both internally and externally, as highly plausible evidence of the possibility that organized and planned family planning programs reduce fertility quickly and comparatively inexpensively, even where illiteracy is high, living standards near the subsistence level, and religious and cultural factors hostile.

II

The Magnitude of Family Planning in Colombia

There are three major programs for family planning in Colombia:²

(1) *The national family planning program* is operated through the Ministry of Health. Under this program, family planning information and service is available at every health center in the nation. Such centers and subcenters began offering family planning in 1965; by the end of 1975, more than one thousand centers were actively serving the public. These centers cover the entire country, both urban and rural. Although the quality of service varies widely from center to center, the overall situation is one in which family planning is reasonably accessible to any citizen who wishes it. Training for

family planning has been given to key personnel in almost all of the health centers. Equipment and supplies for providing family planning service have been installed while information campaigns have been conducted to inform the public of the availability of this service. As a result of these actions, the nation has been moderately well blanketed with family planning service since about 1968.

(2) *The Social Medicine and Population Division of the Association of Medical Faculties of Colombia (ASCOFAME)* has operated a substantial number of postpartum family planning programs within hospitals and clinics where babies are delivered or medical care is given to women with complications resulting from illegal abortions. This organization has been very instrumental in training the personnel of the Ministry of Health clinics and in promoting the establishment of the national family planning program in addition to its own clinical activities. It has sponsored a great deal of research which has led to the expansion of the national program.

(3) *The Asociación Pro-Bienestar de la Familia Colombiana (PROFAMILIA)*, the dominant private family planning organization of Colombia, began offering medical and informational services in 1965. With funds provided primarily from the International Planned Parenthood Federation it has rapidly expanded its services from Bogotá to all of the leading provincial and commercial cities of the country and even to smaller urban locations. Although it has focused upon serving populated centers, knowledge of its services has spread quickly into the hinterland, and many clients have travelled from outlying places to obtain service. As of 1975, PROFAMILIA was operating 44 clinics in 34 cities, covering more than a quarter of the departamentos (states) of the nation. In 1973, PROFAMILIA launched a non-clinical system of distributing oral pills and condoms through community institutions such as coffee-growers associations, labor unions, etc. This organization has received international acclaim for its leadership in the field of family planning and has pioneered the use of mass media for public information, vasectomy services in Latin America, female sterilization service using new techniques, and the provision of nonclinical family planning services.

What have these three organizations accomplished? Beginning from a near-zero point in 1965, these organizations have accumulated an active clientele at an accelerating rate until the point was reached in 1975 when it could be claimed that they provided protection from pregnancy to an estimated 484,000 women for the entire twelve months. In order to measure the contraceptive accomplishments of the family planning organizations, the unit of measure "woman-years of protection" is used. This is defined as twelve woman-months (thirteen menstrual cycles) of pregnancy-free contraception. Twelve women, each contracepting for one month, or one woman contracepting for twelve months both provide one woman-year of protection. Even where the method used is condom or vasectomy, the resulting contraception

Table 2-1. "BEST" ESTIMATE OF WOMAN-YEARS OF PROTECTION FROM PREGNANCY PROVIDED BY ORGANIZED FAMILY PLANNING PROGRAMS IN COLOMBIA: 1965 TO 1975.

[Thousands]

Year	Total-- all programs	Program		
		Public (MOH and ASCOFAME)	Private (PROFAMILIA)	Percent private
Total . . .	2,071.0	1,035.5	1,035.8	50
1965.	0.1	0.0	0.1	--
1966.	3.3	0.5	2.8	--
1967.	18.9	5.4	13.5	71
1968.	47.6	20.9	26.8	56
1969.	95.6	50.1	46.0	48
1970.	158.9	64.8	94.1	59
1971.	224.2	91.4	132.5	48
1972.	294.0	153.9	140.1	46
1973.	341.5	185.7	155.8	46
1974.	402.7	215.0	187.7	47
1975.	484.2	247.8	236.4	49

Procedure for developing Table 1:

Each organization has kept reliable statistics on the number of new acceptors to its program, year by year. Studies of continuation rates by new acceptors have shown that in comparison with other countries, continuation tended to be relatively good, with rates for the IUD being substantially better than for the pill.

The number of new acceptors for IUD and oral pills were converted into estimates of woman-years of contraception, using the following continuation rates. These continuation rates assume an average duration of use of about 30 months for the IUD and about 18 months for the oral pill.

Rate after	Method	
	IUD	Oral pills
0.5 year. . . . .	.85	.85
1.0 year. . . . .	.72	.70
2.0 years . . . . .	.56	.42
3.0 years . . . . .	.42	.25
4.0 years . . . . .	.28	0
5.0 years . . . . .	.12	--
5.0+ years.	0	--

It was assumed that new acceptors were evenly distributed over the twelve months of each year, which translates into the assumption that all of the adopters for a given year adopted on July of that year.

This procedure was carried out separately for private (PROFAMILIA) and the public (Ministry of Health, ASCOFAME) programs.

The estimates for oral pills that resulted from this procedure are quite consistent with the number of cycles known to have been distributed by that organization. This corroboration lends support to the plausibility of the estimates.

Sterilization was assumed to offer 8.0 years of protection.

Condoms and spermicides were estimated on the basis of quantities consumed, with 120 condoms taken as the equivalent of one woman-year of contraception, and six tubes of foam or jelly equivalent to one woman-year of contraception.

is expressed in terms of protection for the woman. This measure is superior to other statistics such as "number of active clients," "new acceptors," or "number of clinic visits," because (as will be shown later) it is directly convertible into measurements of birth-rate decline. Moreover, it is able to combine all methods of contraception (including sterilization, abortion, and the semireliable methods) using a common denominator that signifies the same amount of contraception regardless of the source. Table 2-1 reports the estimated number of woman-years of contraception provided by these programs. (Notes which accompany Table 2-1 describe in detail the procedure by which the table was compiled.) In this table, the clientele of the Ministry of Health and of ASCOFAME have been combined into a single "public" program, and that of PROFAMILIA has been reported as the "private" organized family planning program.

The 484,000 woman-years of protection estimated for 1975 is believed to be an unbiased estimate of the contraceptive service load of these organized programs. The statistics for earlier years are believed to trace out rather accurately the trajectory of growth that the programs have enjoyed. Figure 2-1 is a graph of these growth trends. As a requirement for international fundings as well as its own research needs, each organization keeps an accurate count of new acceptors. (Since 1969 the system has been computerized and managed as a central records system. Several members of the committee believe that the official statistics understate the actual amount of contraceptive service provided—that the rather sophisticated system of records required invites overworked clinic personnel to neglect registering every client, particularly in Ministry of Health clinics where such record keeping is not required for other services.) The estimates of woman-years of protection, made by assuming average continuation rates reported in the notes to Table 2-1, are based upon studies of continuation accepted as valid by both national and international researchers familiar with the studies upon which they are based. In other words, these data are submitted as the collective "best estimate" which the technicians comprised the committee are capable of generating, given the information available.

However, for purposes of conducting the analysis which follows in a manner that will gain the acceptance of those who may be more skeptical, an alternative "conservative" estimate of family planning services provided by the program, Table 2-1A is submitted. For this table it is assumed that there may have been as much as a 20-percent inflation in the estimates of Table 2-1, resulting from overstatement of new adopters, overestimation of the rates of continuation, or underestimation of the number of accidental pregnancies that occurred while using these methods—or some unknown combination of these factors. This alternative "conservative" viewpoint will be followed throughout the entire following analysis. The reader is invited to choose which alternative, or some intermediate interpretation, should be believed as most valid.

Women - Years of
Contraceptive Protection

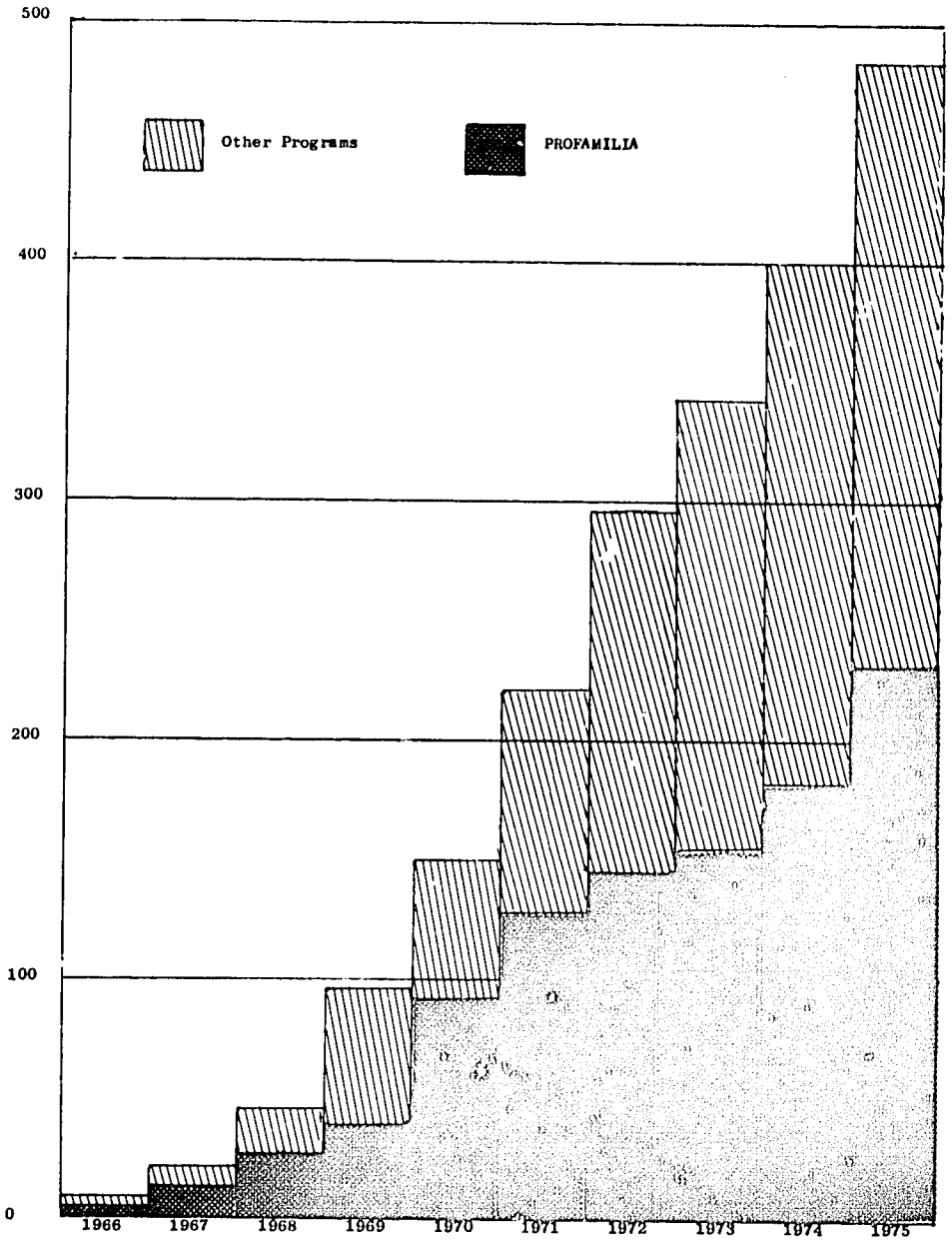


Figure 2-1. GROWTH TRAJECTORY OF ORGANIZED FAMILY PLANNING PROGRAMS IN COLOMBIA.

Table 2-1A. CONSERVATIVE ESTIMATE OF WOMAN-YEARS OF PROTECTION FROM PREGNANCY PROVIDED BY FAMILY PLANNING PROGRAMS IN COLOMBIA: 1965 TO 1975.

[Thousands]

Year	Total-- all programs	Program	
		Public	Private (PROFAMILIA)
1965.	--	--	--
1966.	2,6	0,4	2,2
1967.	15,1	4,3	10,8
1968.	38,1	16,7	21,4
1969.	76,5	40,1	36,8
1970.	127,1	51,8	75,3
1971.	179,4	73,1	106,0
1972.	235,0	108,7	112,8
1973.	273,2	148,6	124,6
1974.	322,2	172,0	150,2
1975.	387,3	198,2	189,1

Table 2-2. WOMAN-YEARS OF PROTECTION FROM PREGNANCY PROVIDED BY EACH METHOD OF CONTRACEPTION: ALL PROGRAMS OF ORGANIZED FAMILY PLANNING IN COLOMBIA: 1965 TO 1975.

[Thousands]

Year	Total (a)	Method of contraception provided			
		Intra-uterine devices	Oral pills	Sterilization	Condoms, spermicidals
1965.	--	--	--	--	--
1966.	3,3	2,9	0,4	--	--
1967.	18,9	16,3	2,5	--	0,1
1968.	47,6	37,1	10,2	0,1	0,2
1969.	95,6	67,6	27,0	0,5	0,5
1970.	158,9	106,1	50,6	1,4	0,8
1971.	224,2	138,0	82,4	2,9	0,9
1972.	294,0	169,3	118,6	5,1	1,0
1973.	341,5	181,9	148,1	8,3	3,2
1974.	402,7	192,8	187,7	14,0	8,2
1975.	484,2	196,1	235,6	24,5	28,0

(a) The figures have been rounded individually. For this reason the total may not exactly equal the sum of reported figures.

Table 2-3. WOMAN-YEARS OF PROTECTION FROM PREGNANCY PROVIDED
BY EACH METHOD OF CONTRACEPTION--PROFAMILIA (PRIVATE)
PROGRAM, COLOMBIA: 1965 TO 1976.

[Thousands]

Year	Total (a)	Method of contraception provided					
		Intra-uterine devices	Oral pills--clinics	Oral pills--community distribution	Condoms and spermicinals--clinics	Condoms--community distribution	Sterilization
1965.	--	--	--	--	--	--	--
1966.	2,7	2,7	--	--	--	--	--
1967.	13,5	13,1	0,2	--	--	--	--
1968.	26,7	25,4	1,1	--	0,1	--	--
1969.	45,5	41,4	3,5	--	0,5	--	0,1
1970.	94,0	85,4	7,8	--	0,8	--	0,1
1971.	132,5	117,7	13,7	--	0,9	--	0,2
1972.	140,1	117,1	21,8	--	1,0	--	0,2
1973.	155,8	118,1	34,8	--	1,6	--	1,2
1974.	187,7	114,5	49,5	12,4	6,4	0,6	4,3
1975.	236,4	103,7	56,2	41,8	22,5	1,6	10,6

(a) The figures have been rounded individually. For this reason the total may not exactly equal the sum of reported figures.

Table 2-4. WOMAN-YEARS OF PROTECTION FROM PREGNANCY PROVIDED BY EACH METHOD OF CONTRACEPTION PUBLIC PROGRAM (MINISTRY OF HEALTH AND ASCOFAME), COLOMBIA: 1965 TO 1975.

[Thousands]

Year	Total (a)	Method of contraception provided		
		Intra-uterine devices	Oral pills	Other methods
1965. . .	--	--	--	--
1966. . .	0.6	0.2	0.4	--
1967. . .	5.4	3.1	2.3	--
1968. . .	20.9	11.7	9.1	0.1
1969. . .	50.1	26.1	23.5	0.5
1970. . .	64.8	20.7	42.8	1.3
1971. . .	91.4	20.3	68.7	2.4
1972. . .	153.9	52.2	96.8	4.9
1973. . .	185.7	63.8	113.3	8.6
1974. . .	215.0	78.2	125.8	11.0
1975. . .	247.8	92.4	137.6	17.8

(a) The figures have been rounded individually. For this reason the total may not exactly equal the sum of reported figures.

Table 2-2 reports the amount of contraception attributable to each of the family planning methods. It was obtained by combining the estimates for the public and private programs, reported in Table 2-3 and Table 2-4. Together, Tables 2-1 through 2-4 give the history of contraceptive service, by method, provided by the public and private organized programs in Colombia during the 1965-75 decade. A "conservative" estimate of the statistics of Tables 2-2, 2-3, and 2-4 can be made simply by multiplying all cells of each table by 0.8.

But exactly what effect, if any, has this large amount of claimed contraception had upon Colombia's birth rate? Has the birth rate fallen since 1965 and if so, by how much? Is there any demonstrable link between observed birth rate changes and the increased use of contraception? These and other questions concerning the impact of family planning programs upon birth rates in Colombia are the subject of this report.

III

Recent Trends in Colombia's Birth Rate

As nearly as demographers are able to estimate, Colombia's crude birth rate stood at about 43.7 births per 1,000 population in 1964 and had been

even higher at earlier dates.³ This level of fertility, applied to the census of 1964 (corrected by the National Department of Statistics for underenumeration and age misstatement) in the form of a population projection (using levels of mortality deemed valid by official demographic statisticians), reproduces the census of 1973 with only a small error. A crude birth rate of 43.7 has therefore been accepted as a valid estimate of fertility levels at a date immediately before the organized family planning programs began.

A census taken in 1973 has produced data which imply that the birth rate had fallen to about 33-34 births per 1,000 population. Thus, a decline of about ten points (22 percent) in the crude birth rate appears to have taken place within a short span of only nine years. There has been a great deal of discussion and research about this phenomenon which came as a surprise to many demographers and even to some of the family planners who had been providing services. The major indicator of this fertility decline is the unprecedented shortage of children under ten years of age, and especially of children in the first few years of life. Four independent estimates, each made by an entirely different set of procedures, agree that there was a substantial fertility decline between 1964 and 1973. Three of the four estimates placed the 1973 crude birth rate at about 33-34 per 1,000; for that reason it has been adopted as the most plausible estimate for that year.

(1) So extraordinary were the results of the 1973 Census that DANE (National Department of Statistics) arranged for Joseph E. Potter, a member of the research staff of the Office of Population Research at Princeton University, to investigate the problem. Working under the supervision of Ansley J. Coale, a report entitled "The Completeness of Enumeration in the 1973 Census of the Population of Colombia" was prepared. Potter's best estimate of the recent trend in fertility is that "... the total fertility rate fell by 0.334 per year, from 6.03 at the year end 1967 to 4.36 at the year end 1972." Using Bogue's equation $CBR = 0.0070 TFR + 0.2453$, this implies a decline in fertility from 44.7 in 1967 to 30.8 in 1972, which is even more of a precipitous decline than has been presumed in the present report.

(2) Myriam Ordonez, head of the Demographic Section, National Office of Statistics, made independent estimates of fertility from the national census, using data tabulated from the question, "What was the birth date of your last-born child?" Using an adjusted count of children born within the twelve months preceding the census, she arrived at a crude birth rate of 33 per 1,000 for the nation. Because these data on births of last child were obtained for a 4 percent sample of the women of reproductive age, the number of cases upon which the statistics are based is quite large. In fact, Ordonez used this information to compute birth rates for every departamento (state) as well as for the nation.

(3) Still another analysis of the 1973 census age data, made independently by Donald J. Bogue and without knowledge of the outcome of the Potter

and Ordonez estimates, arrived at a similar result: a birth rate of 33 per 1,000 for the year 1973.

(4) Despite the fact that the birth registration system of Colombia is moderately deficient, an intensive study by Clement Pierret of the trends in birth registration and the historic patterns and trends of errors in registration over the course of four decades has provided correction and adjustment factors which can be applied to estimate the number of births occurring each year. Using data adjusted by these procedures, Pierret arrives at an estimated crude birth rate of 35 per 1,000 for 1973.

The birth rate did not decline linearly between 1964 and 1973. Instead, there seems to have been a major turning point (when the gentle downward drift turned into a precipitous decline). Potter (1976) places this turning point at about 1967. Estimates prepared by Bogue indicate that it occurred somewhat later, about 1970. For this study it has been assumed that between 1964 and 1970 the pace of fertility decline quickened somewhat, declining from 43.7 to 39.0, and then between 1970 and 1973 suffered a more severe drop, from 39.0 to 33.9.

Table 2-5 presents the trend of fertility which the committee has accepted as its best estimate of actual events. Because the analysis which follows requires more refined measures of fertility, the trends have been expressed in terms of three separate measures:

Table 2-5. ESTIMATED TREND IN FERTILITY
IN COLOMBIA: 1964 TO 1975.

Year	Crude birth rate	General fertility rate (GFR)	Total fertility rate (TFR)	Estimated number of births (000)
1964,	43.7	193.3	6241	772
1965,	42.9	189.5	6127	783
1966,	42.1	185.9	6013	795
1967,	41.5	182.3	5899	806
1968,	40.5	178.7	5785	818
1969,	39.8	175.1	5671	830
1970,	39.0	171.7	5557	843
1971,	37.0	162.2	5264	821
1972,	35.5	152.9	4970	798
1973,	33.9	143.7	4677	774
1974,	32.4	134.6	4383	748
1975,	30.7	125.6	4090	721

Procedure for creating this table:

The values of 1964, 1970, and 1975 were used as pivotal values to make the PROJTARG computations reported in this table. The TFR is converted into age-specific fertility rates using the pattern of ASFR employed in the U.S. Bureau of Census Report, "Projections of the Rural and Urban Populations of Colombia, 1965 to 2000," International Research Document Number 3.

- (a) Crude birth rate (CBR) - number of births per year per 1,000 total population
- (b) General fertility rate (GFR) - number of births per year per 1,000 women 15-49 years of age.
- (c) Total fertility rate (TFR) - number of children 1,000 women would bear in their lifetimes if exposed to the current schedule of age-specific fertility rates.

This table reports the estimated values of all three of these measures for each of the years. Only the values for 1964, 1970, and 1975 were fixed empirically; the intervening values are interpolations. The right-hand column of Table 2-5 reports the number of births for Colombia implied by this set of rates. Estimated birth rates for 1974 and 1975 (which fall after the census date and for which no birth data are available) have been made on the assumption that the decline of 1970-73 continued by the same amount per year. This extrapolation has been assumed in order to explore its implications for family planning (see below). A subsequent analysis will show the increased volume of contraceptive activity in these two years fully justifies the assertion of the committee that the crude birth rate had fallen to 30 per 1,000 by 1973, or even lower.

A drop in fertility of this magnitude is a most unusual demographic occurrence. It stands in sharp contrast to the preceding long period when crude birth rates were on a high plateau between 45 and 48 per 1,000 (for decades if not for centuries). Until very recently, precipitous declines of this type have been rare. The much-discussed demographic transition of Europe, North America, and Australia had an average annual decline of about 1 CBR point each 3 or 4 years. *In Colombia the estimated decline between 1970 and 1975 was an average of about 1.7 crude birth points per year, or a rate six times as fast.* In comparison, the United States experienced a recent decline in fertility from its peak crude birth rate of 26 in 1957 to a value of 15 in 1975, a drop of 11 points in 18 years, or about 0.6 crude birth points per year, which had been thought to be rapid. *Thus, the fertility decline in Colombia has been roughly three times as fast as the recent fertility decline in the United States.*

Because this is an extraordinary occurrence, it merits research exploration. The critical question is, how much of this decline can validly be attributed to the massive family planning movement described above?

IV

The Contraception Required to Account for the Observed Fertility Decline

The decline in fertility, estimated in Table 2-5, could have taken place only as a result of the decreased proportion of women exposed to the risk of

bearing a child. There are only four possible explanations for such a change:

- (a) *Infecundity*—The number of women who have reached advanced ages of reduced fertility has increased (implausible).
- (b) *Abstinence*—The number of women in childbearing ages who are not exposed to sex because they are unmarried or not in a sexual union has increased (plausible).
- (c) *Contraception*—The proportion of women of childbearing ages who are using contraception has increased (plausible).
- (d) *Abortion*—A higher proportion of women who become pregnant resort to abortion (plausible).

The first of these factors, infecundity, probably was declining during these years because of the young age distribution and hence could have had a small tendency toward increasing birth rates. It is quite possible that all three of the other factors were acting simultaneously to reduce fertility—delayed marriage, increased use of contraception, and increased resort to abortion. In order to study the interrelationship between contraception and birth rates (controlling for infertility and changing marriage patterns), some empirical link between birth rates and contraceptive behavior must be established. This is provided by a fertility model called PROJTARG developed by Bogue, Edmonds, and Bogue (1973) and outlined in Chapter One of this monograph.

The application of PROJTARG to the Colombian population yields data reported in Table 2-6. Because PROJTARG is capable only of making linear interpolations, it was applied to the Colombian data in two cycles: first, to the period of gentle decline, 1964-70; and then to the period of rapid decline, 1970-75. The output of the first cycle was used as input to the second cycle. In this manner, the "curve" of fertility decline was more realistically approximated than if a single linear interpolation between 1964 and 1975 had been made. In making these computations, PROJTARG introduces a standard set of estimated parameters for sterility at each age to estimate the number of sterile women. These women were subtracted from the total number of women projected for each age in order to arrive at an estimate of the number of fecund women of reproductive age (by five-year age groups) in the population during each year, 1964-75. Columns 1 and 2 of Table 2-6 report these estimates.

Columns 3 and 4 of Table 2-6 divide the number of fecund women into two groups, exposed and unexposed, in accordance with the definitions given above. In order to do this, a set of parameters that estimate what proportion of women at each age are actually exposed to the risk of becoming pregnant is required. (This may be simply statistics of marital status derived from a recent census or survey, but preferably it consists of marital status data that have been adjusted for estimated sexual activity outside marriage. In Latin America the amount of extramarital sexual activity is much greater than in some Asian countries, and the census methods of recording marital status

Table 2-6. WOMEN OF REPRODUCTIVE AGE CLASSIFIED BY FECUNDITY AND EXPOSURE (MARITAL STATUS) AND ESTIMATED AMOUNT OF PROTECTION FROM PREGNANCY REQUIRED TO ACCOMPLISH FERTILITY DECLINE INDICATED FOR COLOMBIA: 1964 TO 1975.

Year	Women in the child-bearing ages	All fecund women	Unexposed fecund women	Exposed fecund women (married)	Exposed fecund women who were protected	Exposed fecund women who were contra-cepted
1964.	3998	3776	1438	1838	1666	228
1965.	4133	3386	1496	1891	1753	257
1966.	4275	3501	1556	1945	1844	287
1967.	4423	3622	1620	2002	1940	319
1968.	4578	3749	1688	2061	2041	353
1969.	4740	3881	1759	2122	2148	389
1970.	4910	4021	1834	2187	2261	427
1971.	5060	4146	1902	2244	2428	526
1972.	5218	4279	1975	2304	2604	630
1973.	5384	4420	2051	2369	2792	741
1974.	5558	4568	2131	2437	2991	861
1975.	5738	4722	2213	2509	3202	989

Procedure for creating this table:

Using the PROJTAG computer program, insert observed or estimated values for the following:

- (a) population of women, 1964
- (b) estimated age-specific fertility rates for 1964, 1970, and 1975
- (c) adjusted marital status distributions
- (d) survival ratios for 1964 and 1970 reflecting mortality levels in those years.

PROJTARG uses these parameters to project the population forward by single calendar years and generates the data specified in this table.

tend to classify many persons as "single" who are actually in an active sexual relationship.) Table 2-7 outlines a procedure for arriving at an improved estimate of the proportion of women in each age group who are sexually active. The footnotes to Table 2-7 explain how marital status statistics were adjusted to allow for extramarital sexual activity.

With the above estimate of women exposed to the risk of pregnancy established for each year, the PROJTAG model was used to estimate retrospectively the number of fecund women who must have been protected in order for the birth rate decline reported in Table 2-5 to have taken place. Column 5 of Table 2-6 reports the results of such a calculation.

With the number of fecund women already known to be protected from pregnancy because they are sexually inactive (Column 3 of Table 2-6), it is possible to subtract the total number of fecund women who must somehow have been protected from getting pregnant in order to achieve the lower level that has been observed. This is done simply by subtracting the data of Col-

Table 2-7. PROPORTION OF SEXUALLY ACTIVE WOMEN BY AGE GROUPS.

Age group	1964		1973	
	Census (a)	Estimated (b)	Census (a)	Estimated (b)
15-19.	0,1532	0,1955	0,1304	0,1734
20-24.	0,5155	0,5640	0,4712	0,5246
25-29.	0,6919	0,7227	0,6761	0,7086
30-34.	0,7395	0,7655	0,7640	0,7709
35-39.	0,7424	0,7810	0,7551	0,7922
40-44.	0,7075	0,7660	0,7283	0,7831
45-49.	0,6671	0,7337	0,6880	0,7493

(a) Married and in consensual union.
 (b) Married, cohabiting, and single, widowed, and separated women exposed to the risk of pregnancy.

Procedure for developing

The following assumptions were made in constructing this table:

1. married and cohabiting women of reproductive age according to the censuses are sexually active;
2. the fertility of women not reported as married or cohabiting in the National Fertility Survey (1969) is the same as those who are married or cohabiting;
3. the number of women in addition to those who are married or cohabiting needed to obtain the total number of exposed women was calculated on the basis of assumption 2 and they were considered sexually active.

umn 3 from the data of Column 5 of Table 2-6. Column 6 of this table reports these estimates.

The data of Column 6 of Table 2-6 are of crucial importance, for *they represent an estimate of the total fertility control behavior which must have taken place in Colombia in order for birth rates to have declined by the amount estimated in Table 2-5.* Column 6 of Table 2-6 provides exactly the right information. It links fertility control directly to fertility decline by estimating the total volume of fertility control that *must* have taken place in Colombia in order to accomplish the observed fertility decline.

It is essential to note at this point that the estimates of Column 6 in Table 2-6 do not specify the nature of this fertility control. It could have been accomplished by:

- (a) use of modern, more reliable contraceptive methods
- (b) use of less reliable contraceptive methods such as withdrawal, douche, the rhythm method, abstinence within marriage, or use of herbs or other folk methods
- (c) resort to induced abortion to avoid unwanted childbirth
- (d) surgical sterilization either of male or female for family planning or other medical reasons.

Neither do the values estimated in Table 2-6, Column 6, report the *source* of contraceptive service. It could have been obtained from national family

planning programs, from contraceptive services provided by private physicians, from purchase of contraceptive materials directly from pharmacies, from surgical sterilization performed at the time of delivery of a child, from visits to illegal abortionists, or from use of simple pregnancy-averting practices without any modern methods. All of these various sources of service and types of contraceptive practice can claim to have accomplished the observed reduction in fertility. The next section of this report assembles estimates for each of these claims and reconciles them in order to arrive at an estimate of the contribution which each appears to have made to the fertility reduction observed in Colombia between 1964 and 1975.

V

The Sources and Total Volume of Contraception for the Colombian Population, 1964-1975

In order to make use of the results of the PROJARG estimates of contraception presented in Table 2-6, it is necessary to compare them with an estimate of the total birth-prevention behavior that has occurred in the population. This section of the report undertakes such an estimate by making a separate estimate for each of four principal sources:

- (1) the organized family planning program (all public and private programs combined)
- (2) the "outside-program" sources:
 - (a) the commercial sector (services by private physicians, plus sales of oral pills, condoms, spermicidals, etc., through pharmacies)
 - (b) induced abortion—both legal and illegal
 - (c) traditional contraception (rhythm, withdrawal, douche).

The protection claimed to have been provided by each of these sources is the first preliminary estimate of the total volume of contraception that occurred in the population of Colombia, 1974 to 1975. Table 2-8 represents an effort by the committee to estimate the contribution of each source, and Table 2-8A is a "conservative" estimate.

A. *Total contraception.* Since the total amount of contraception that must have taken place for birth rates to decline as they did has already been fixed in Table 2-6, Column 6, these statistics must be accepted as the total of Column 1 in Tables 2-8 and 2-8A. The task of this section of the analysis is to distribute this total among the various sources enumerated above.

Solid evidence with which to make these estimates is scarce, and it has been necessary to use incomplete evidence and estimates pulled from a wide variety of sources and derived by a variety of methods. The major goal is to make the best possible estimate of the claim for each source.

Table 2-8. "BEST ESTIMATE" OF CONTRACEPTIVE PROTECTION ESTIMATED TO HAVE BEEN PROVIDED BY EACH SOURCE, COLOMBIA: 1964 TO 1975.

Year	Fertility control accomplished			Outside programs		
	Total	Provided by family planning programs	Provided by other sources	Commercial sector and private doctors	Abortion	Rhythm, withdrawal, douche and other
1964 . . .	228	--	228	55	44	129
1965 . . .	257	--	257	62	50	145
1966 . . .	287	3	284	68	56	160
1967 . . .	319	19	300	84	61	155
1968 . . .	353	47	306	104	69	133
1969 . . .	389	96	293	113	75	105
1970 . . .	427	159	268	121	74	73
1971 . . .	526	224	302	154	93	55
1972 . . .	630	294	336	197	94	45
1973 . . .	741	341	400	246	108	46
1974 . . .	861	403	458	308	113	37
1975 . . .	989	484	505	354	122	29

Table 2-8A. "CONSERVATIVE ESTIMATE" OF CONTRACEPTIVE PROTECTION ESTIMATED TO HAVE BEEN PROVIDED BY EACH SOURCE, COLOMBIA: 1964 TO 1975.

Year	Fertility control accomplished			Outside programs		
	Total	Provided by family planning programs	Provided by non-program sources	Commercial sector and private doctors	Abortion	Rhythm withdrawal, douche and other
1964. . .	228	--	228	66	44	118
1965. . .	257	--	257	80	50	127
1966. . .	287	3	284	93	56	135
1967. . .	319	15	304	108	62	134
1968. . .	353	38	315	122	70	123
1969. . .	389	77	312	139	76	97
1970. . .	427	127	300	151	76	73
1971. . .	526	179	347	175	95	77
1972. . .	630	235	395	219	105	71
1973. . .	741	273	468	294	110	64
1974. . .	861	322	539	368	114	57
1975. . .	989	387	602	431	123	48

B. *Organized family planning program.* This estimate has already been derived in Tables 2-1 and 2-1A (Column 1), and is simply entered in Column 2 of Tables 2-8 and 2-8A. These statistics are based upon the records of new acceptors as detailed by the respective organized family planning programs.

The procedure of deriving them from assumptions about continuation rates has already been described.

C. *Other sources.* Inasmuch as the total amount of contraception has been fixed in Column 1 of Tables 2-8 and 2-8A, and the volume of services provided by the family planning program has been estimated, the difference (Column 1 minus Column 2) represents the volume of contraception that must have been provided by sources outside the organized family planning programs. This amount is recorded in Column 3 of Tables 2-8 and 2-8A.

D. *Distribution of "outside-program" contraception by source.* Tables 2-8 and 2-8A attempt to distribute the total "outside-program" contraception among three categories. This distribution is based on small studies which represent only specific cities or localities of the country. The objective is only to assign a general magnitude to each and to establish what must have been the general trend. For this reason, the columns referring to abortion, the commercial and private medical sector, and the traditional methods must be taken as a first effort at quantification, to be refined by further, more careful, and more focused study.

E. *Abortion.* Clients coming to family planning clinics report that about one-fifth or more of their recent pregnancies have been terminated by abortion. It has been assumed that this relationship between pregnancy and abortion was characteristic of the total population during the period 1965 to 1970. The growth of abortion attributed in Tables 2-8 and 2-8A parallels the growth in the number of births for these years. It is believed that the family planning programs blunted what would have been a virtual explosion of abortion had there been no program, but that nevertheless abortion has continued to increase slowly from 1970 to 1975. The same estimates for abortion are retained for the "conservative" estimates of Table 2-8A as for the "best" estimates of Table 2-8.

F. *Commercial sector family planning.* The total volume of medically reliable contraception that is dispensed through pharmacies or provided by private physicians and hospitals has been estimated in a combination of the following ways:

- (1) records of imports of contraceptive materials, subtracting those imports known to have been consumed by the organized family planning programs.
- (2) surveys of the sales of contraceptives by the pharmacies and other possible private outlets. Such results have been reported in the Bogotá Survey (Bailey, Measham, and Umaña, 1975; Estrada, 1973; Rivera and Estrada, n.d.).

In their 1975 report on Bogotá, for example, Bailey, Measham, and Umaña report that 51 percent of all initial contraception was obtained through private and commercial sources. In rural areas where both private physicians and pharmacies are much less accessible, one would expect a lower percentage of

contraception through private sources. The "best" estimate of Table 2-8, for example, calls for 45 percent of all "modern" contraception to be provided through commercial channels in 1974. In 1964-66, when organized family planning programs had not exerted any effect as yet, it was assumed that roughly 30 to 35 percent of all contraception (excluding abortion) was provided by commercial outlets and physicians, and that the remaining 60 to 70 percent was being provided by the use of rhythm, withdrawal, and douche. This also is consistent with earlier surveys of the comparative use of modern versus traditional methods (Estrada, 1973; Rivera and Estrada, n.d.; CELADE-CFSC, 1972). Thus, with a crude estimate at the beginning and the end of the decade, it is possible to establish a general trend.

G. *The traditional methods.* Once the general trend of abortion and the commercial sector is established, the residual is the traditional sector of rhythm, withdrawal, and douche. The estimates result in an implied decline of these methods. That this has indeed been the case is supported by empirical evidence (see discussion on substitution below).

The estimates outlined above have been accepted by the working committee as the most plausible figures that can be produced with the evidence available. The claims for the family planning programs are thought to be quite valid (certainly the conservative estimate has this virtue). The distribution of the outside-program sources is of much more dubious precision due to lack of nationwide data for all. For this reason, the three right-hand columns of Tables 2-8 and 2-8A should be accepted only as a first effort intended to sketch a general picture of what might have been the trends in each. The "outside-program" contraception is comprised of three very unlike components, each of which experienced its own unique trend within the 1965-75 decade:

- (a) commercial sources grew almost explosively, beginning nearly simultaneously with the onset of the family planning program
- (b) abortion grew moderately, blunted by the impact of modern contraception
- (c) traditional contraception by rhythm, withdrawal, and douche suffered a dramatic decline under the impact of the organized family planning program and the services provided through commercial and medical facilities.

VI

Some Comments on Substitution of Sources of Family Planning Services

Those who are dubious about the impact of organized family planning programs upon birth rates usually remind the family planners that there is a

strong possibility that if there had been no family planning program the same amount of contraception or birth prevention could have taken place. Protection simply could have been provided from other sources—private physicians, pharmacies, abortions, or more traditional methods such as rhythm, withdrawal, etc. Having presented the foregoing data about Colombia, it is possible to discuss this question in terms of concrete statistics rather than as an abstract possibility. Although there is absolutely no way of knowing for certain what would have been the trend in contraceptive use without an organized family planning program, it is possible to make a more realistic interpretation of the substitution argument.

1. *The organized programs almost certainly made huge inroads into the use of traditional methods, especially the use of the rhythm and withdrawal methods.* Bailey, Measham, and Umaña (1975), in their survey of Bogotá, conclude:

In the past decade, the shift in specific method use has been substantial. Withdrawal and douche were used by over 10 percent of the couples in 1964, but by 1974 less than 1.7 percent were using these methods. Most of the increase in contraceptive use occurred with the most effective methods.

Although this comment was made with respect to contraception in Bogotá, it very probably applies with equal or greater force to other areas. Those couples who already were modern enough to be using some method (although perhaps it is unreliable) probably would be very nearly as inclined as metropolitans to substitute inexpensive and reliable methods that can quickly be provided through the local health centers or in nearby smaller cities. Because the unsophisticated methods impose severe inhibitions on the enjoyment of sex, they tend to be abandoned rather promptly by those who are already motivated to contracept in favor of the more reliable, more pleasant to use, and more satisfying methods. The estimates of Tables 2-8 and 2-8A presume that this has occurred in Colombia. This shift substitution has two corollaries, both implying favorable impact of the family planning program:

- (a) This substitution tends to reduce the number of accidental pregnancies that occur while making sincere efforts to control fertility. This greater rate of success almost certainly tends to lower fertility.
- (b) This substitution tends to keep the already-high illegal abortion rates from soaring to astronomical levels.

If the decline that occurred in birth rates had been accomplished entirely by the traditional methods and abortion, the toll in maternal deaths and impaired health from abortion and the increase in accidental and unwanted births would have grown exponentially. The fact that they remained nearly on a plateau or declined sharply should be accepted as a humane and praiseworthy side effect of the programs. In having this effect, the organized family planning programs were simultaneously reducing fertility by substituting reliable for unreliable methods.

2. *It is doubtful that the organized family planning programs caused a large net reduction in the private sector.* The formation and establishment of organized private family planning programs was premised on the belief that the current system was not functioning adequately. In the case of Colombia, the "present system" in 1964 was private medical practice and sales through pharmacies. To assert that these facilities would have expanded their activities and served the large segment of people estimated above is to go from a highly plausible to a highly implausible explanation:

- (a) Private physicians in Colombia are highly concentrated in larger urban locations, and their clientele is drawn almost entirely from the middle and upper classes. The great mass of poor peasants cannot afford to make use of their services and do not make use of them, even for matters of great medical urgency. Pharmacies, likewise, are distributed in a pattern very similar to that of physicians, and their clientele is heavily concentrated in the upper and upper-middle classes.
- (b) The situation described above is so serious and the access of peasants to minimal health and medical care is so limited that the government provides medical and health care as a public service through its system of clinics and hospitals. Establishing an organized family planning program consisted in part, therefore, of adding it as a service to a clientele known to have been sealed off from medical service via private medical practice.
- (c) There is no "profit" to be gained in providing family planning services to low-income families. In fact, such programs must be subsidized if they are to function. It is necessary to provide the service itself at a very low cost or to make it free; otherwise, the population will not be able to take sufficient money from its household budget to use the service. There is no "motivation," therefore, for physicians or pharmacies to try to generate such a vast amount of family planning service as has been observed.
- (d) Family planning was, and continues to be, a highly political and ethical question in Colombia. Physicians and pharmacists, who must gain their livelihood from providing a broad spectrum of services, would have been disinclined to risk condemnation from influential persons or groups who disapproved of family planning. The PROFAMILIA program consisted, for the most part, of courageously "opening up the market" to family planning among lower-middle and upper-lower class families who could not afford private medical service at the rates being charged. That their clinics grew so rapidly is itself evidence of an unmet need.
- (e) The knowledge level and the awareness level of the general public was very low before the onset of the organized program (CELADE-CFSC, 1972; Heredia, 1972). Sustained communication through radio, group

work, and satisfied clients of the newly established clinics caused family planning to come to the forefront of public attention and concern. Although its public information program for family planning has been somewhat episodic, the total volume of communication has been quite large, has covered an entire decade, and has been of good to superior quality. It is far easier to assume that it heightened the salience and knowledge about family planning and helped to generate the great acceptance that has been observed, than to infer that it was wholly unrelated to the family planning history of the past decade.

In the light of the above points, it is easy to conclude that the private physicians and the pharmacies gained as much clientele from the heightened awareness and public discussion of family planning as they lost to the clinics of PROFAMILIA, ASCOFAME, and the Ministry of Health service centers. This conclusion is implied in the findings of the Bogotá Survey (Bailey, Measham, and Umaña, 1975). After comparing the social and economic characteristics of women using three sources of family planning service—pharmacies and private physicians, PROFAMILIA and ASCOFAME clinics, and Ministry of Health centers—the survey concludes:

. . . each program as well as the other sources of contraception has benefited distinct groups of women. PROFAMILIA and the postpartum program have provided assistance to women of the lower and middle economic strata, the Ministry has served the needs of the lower levels, while the upper-middle class is assisted by sources such as private doctors, private clinics, and drugstores. The comparison also reveals that the Ministry program reaches younger women who are less likely to work and have more children, while those who turn to nonprogram sources are on the average older and have fewer children. The PROFAMILIA and postpartum programs are very similar in that both serve women of an intermediate age group who have more children than women who use other (private) sources.

There is strong evidence, both empirical and inferential, that the organized family planning programs brought family planning services to a lower socioeconomic strata (lower-middle class and lower class) which otherwise would have had no service. In Colombia, these strata comprise more than 70 percent of the total population. (In the Census of 1973, the proportion of families with income below \$1,000 per year was 76 percent.)

It is plausible to assume, therefore, that the family planning practice of private medical doctors and the sale of contraceptives through pharmacies has been lessened very little, if at all, by the organized family planning programs. It is as easy to argue the reverse, that they have enjoyed a net gain as a result of it.

3. *Reconciliation of claims.* For the purposes of discussion, as much as one half of all contraception attributed to the family planning program can be as-

sumed to be a substitution for abortion, traditional contraception, and commercial sector contraception, combined. (Commercial sector contraception also was replacing folk contraception and abortion.) This premise allows a tentative inference to be made about the impact of family planning in reducing the birth rate. The reasoning is as follows:

(a) In Table 2-8, the total volume of contraception required during the years 1970 to 1975 to overcome increasing population size and reduce the birth rate (summing for all years, 1970 to 1975) is 4,174,000. Since the number of fecund, exposed women increased by 20 percent during this span of time (Column 3, Table 2-5), simply to hold the birth rate constant at the 1970 level would have required a 20-percent increase over the 427,000 woman-years specified by PROJTARG as required in 1970. This leads to an estimate of 2,818,200 woman-years of contraception required during 1970 to 1975 merely to hold birth rates constant. The difference between 4,174,000 and 2,818,200 equals the number of *additional* woman-years of protection required to bring down the birth rate by the amount estimated, which is 1,355,800.

(b) During these six years, the family planning programs claimed a total of 1,905,000 woman-years of contraception. If one-half of this was unsubstituted contraception, the program can be said to have contributed a total of 953,000 woman-years of protection that otherwise would not have been provided by any other source.

(c) The 953,000 unique woman-years represent 70.3 percent of the additional protection needed to reduce the birth rate.

(d) If the above computations are made, using the conservative data of Table 2-8A, the percentage of decline in fertility attributable to the organized family planning programs is 56 percent.

(e) On the assumption that the 50 percent substitution proportion cited above (that one-half of all clients were persons who otherwise would not have contracepted for lack of knowledge, motivation, and services) is a conservative one, the committee concludes that according to its best estimate, 70 percent of the fertility reduction that took place in Colombia during the period 1970 to 1975 can be attributed to the organized family planning programs. Even under the conservative estimate this proportion is 56 percent.

Unless one is willing to make extreme assumptions about the volume of commercial and traditional contraception that would have taken place had there been no family planning program, the commercial sector, abortion, and the traditional methods very probably would have been able only to increase at about the pace needed to hold the birth rate constant because of the rapidly increasing number of women of reproductive age.

Those who have alternative explanations and hypotheses may make crude empirical tests of them by constructing hypothetical distributions of the sources of contraception (rearrangements of the data of Column 1 of Table

2-8). They will find it is extremely difficult to construct a believable model which attributes zero impact to the organized family planning programs.

VII

Conclusion

The committee concludes that on the basis of the data presently available, analyzed through available models, the net impact of the organized family planning programs in Colombia during the decade 1965-75 was to:

1. assist the commercial sector in the reduction of use of unreliable methods of contraception
2. blunt an epidemic rise in abortion which otherwise would have occurred
3. have beneficial effects upon public opinion and knowledge, so that the commercial and private medical sectors gained as many new clients as they might have lost to the organized programs
4. bring family planning service to lower socioeconomic strata which could not afford family planning as it is distributed through commercial and private medical channels
5. bring family planning services to outlying populations and to districts within cities which otherwise have no family planning service facilities
6. provide an unduplicated margin of additional contraception that has accounted for over 100 percent of the estimated decline in fertility; if the organized family planning programs were suddenly to be brought to a halt today, there would almost certainly be a dramatic rise in fertility.

Notes

¹ The Working Committee to Study the Impact of Family Planning on the Demographic, Economic, and Social Structure of Colombia was composed of the following persons:

Members of the Committee: Juan B. Londoño, Coordinator; Luis Daza, Chief, Maternal and Child Program, Ministry of Health; Myriam Ordoñez, Chief, Demographic Division, DANE; Miguel Trias, Chief, Urban Clinic and Community Network, Profamilia; Guillermo Lopez, Executive Director, Corporacion Centro Regional de Poblacion (CCRP); German Riaño, Chief, Maternal and Child Program, Colombian Association of Medical Schools (ASCO-FAME); Gonzalo Echeverry, Chief, Rural Community Network, Profamilia; Enrique Cabrera, Chief Statistics Department, Profamilia; Clement Pierret, Investigator, Demography Department, DANE; Alcides Estrada, Chief, Evaluation Area, CCRP; Rodolfo Heredia, Chief, Socioeconomic Area, CCRP; Luis

Hernando Ochoa, Investigator, CCRP; Edgar Baldion, Research Associate, CCRP.

International Officials, William Bair, AID/Bogotá; Jerald Bailey, Population Council; Donald Bogue, Community and Family Study Center, University of Chicago; William Visser, United Nations Fund for Population Activities; Luis Sobrevilla, Population Council; Alberto Rizo, Pathfinder Fund.

²For a detailed statement of family planning services in Colombia, see *Country Profiles: Colombia*.

³Estimates by Collver (1965) indicate that during the period 1900 to 1960 the crude birth rate fluctuated between 43 and 45 per 1,000. Lopez Toro (1968) obtained estimates somewhat higher; he estimated 46.5 for the intercensal period 1938-61 and 47.2 for the interval between 1951-64. Data from the CELADE-CFSC (1972) report on the urban fertility survey of 1964 indicated a crude birth rate for Bogotá of 41, with the presumption that rates would be higher in the rural and smaller cities. Lee Jay Cho (1964) estimated a crude birth rate of 42 for the nation as of 1960. Utilizing data from the national fertility survey, Elkins (1973) estimated a crude birth rate of 45 per thousand for the nation as a whole, as of about 1964. The U.S. Bureau of Census (1975) in making its projections of fertility assumed a level for 1965 that implies a crude birth rate of 48. However, when reverse survival methods are applied to the adjusted age distribution, a birth rate of only 40 is obtained for 1973.

References

- Bailey, Jerald, Carol Measham, and María Umaña. 1975. "Bogotá 1964-1974, Clinics, Attitudes, Contraceptive Practices and Fertility." New York: Population Council.
- Bogue, D., S. Edmonds, and E. Bogue. 1973. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Status on Birth Rates*. RFFPI Manual No. 6, Chicago: Community and Family Study Center, The University of Chicago.
- CELADE and CFSC. 1972. *Fertility and Family Planning in Metropolitan Latin America*. Chicago: Community and Family Study Center, The University of Chicago.
- Cho, Lee Jay. 1964. "Estimated Refined Measures of Fertility for all Major Countries of the World," *Demography* 1:359-365.
- Collver, Andrew O. 1965. *Birth Rates in Latin America: New Estimates of Historical Trends and Fluctuations*. Research Series, No. 7. Berkeley: University of California, Institute of International Studies.

- Departamento Administrativo Nacional de Estadística, 1975. XIV Censo Nacional de Población y Vivienda, Muestra de Avance (Agosto) [*National Census of Population and Housing, Advancement Sample*].
- _____. 1976. "Evaluación del Subregistro de las Estadísticas Oficiales de Nacimientos y Defunciones" ["Evaluation of the Underenumeration of the Official Birth and Death Statistics"].
- Elkins, Henry G. 1973. "Cambio de Fecundidad." Capítulo 2. *La Fecundidad En Colombia: Encuesta Nacional de Fecundidad*, Rodolfo Heredia B. y Elena Prada S., edit. Publicación Número 5, Encuesta Nacional de Fecundidad ["Fertility Change." Chapter 2. *Fertility in Colombia: National Fertility Survey*].
- Estrada, Alcides E. 1973. "Uso de Métodos Anticonceptivos por las Mujeres de la Encuesta Nacional de Fecundidad." Capítulo IV. *Características Socio-demográficas de las Mujeres Colombianas, Encuesta Nacional de Fecundidad: Parte Urbana* ["Use of Contraceptive Methods by Women in the National Fertility Survey." Chapter IV. *Socio-demographic Characteristics of Colombian Women, National Fertility Survey: Urban Part*].
- _____. 1975. "Analysis Family Planning Programs in Colombia," paper presented at seminar on "Impact of Population Programs and Policies in Colombia," carried out by COLCIENCIAS in collaboration with the Smithsonian Institute (December 1 and 2).
- Heredia, Rodolfo. 1972. "Ideales, Motivos y Actitudes Hacia el Número de Hijos y el Uso de Anticonceptivos." Capítulo III. *Características Socio-demográficas de las Mujeres Colombianas, Encuesta Nacional de Fecundidad: Parte Rural* ["Ideals, Motives and Attitudes Towards the Number of Children and Contraceptive Use." Chapter III. *Sociodemographic Characteristics of the Colombian Women, National Fertility Survey: Rural Part*].
- _____. 1975. Efectos Directos de Los Programas de Planificación Familiar en Colombia," C.C.R.P., 1 ["Direct Effects of Family Planning Programs in Colombia"].
- Jaramillo G., Mario. 1975. "Reducción de la Fecundidad en Antioquia y Medellín," mimeographed paper ["Fertility Reduction in Antioquia and Medellín"].
- López Toro, Alvaro. 1968. "Análisis Demográfico de los Censos Colombianos: 1951 y 1964." Centro de Estudios sobre Desarrollo Económico (CEDE). Edición Universidad de los Andes, Bogotá, D.E. ["Demographic Analysis in the Colombian Censuses: 1951 and 1964"].
- Measham, Anthony. 1974. "The Role of the Family in Postpartum Family Planning Acceptance." *International Journal of Gynecology and Obstetrics*, Vol. 12, No. 2.
- _____. "Self Prescription of Oral Contraceptives in Bogotá, Colombia," mimeographed paper.

- _____, and Enrique Martínez. 1975. "The Influence of Institutional and Convenience Factors on Postpartum Family Planning Acceptance in Medellín, Colombia." *Contraception* (February).
- Potter, Joseph. 1976. "The Completeness of Enumeration in the 1973 Census of the Population of Colombia." Office of Population Research, Princeton University.
- Rivera C., Jorge, y Alcides E. Estrada. n.d. "Conocimiento y Uso de Métodos de Planificación Familiar." Capítulo V. *Características Socio-demográficas de las Mujeres Colombianas, Encuesta Nacional de Fecundidad: Parte Rural* ["Knowledge and Use of Family Planning Methods." Chapter V. *Socio-demographic Characteristics of Colombian Women, National Fertility Survey: Rural Part*].
- U.S. Bureau of Census. 1975. "Projections of the Rural and Urban Populations of Colombia: 1965 to 2000." International Research Document Number 3 (December).

Chapter Three

THE IMPACT OF FAMILY PLANNING UPON FERTILITY WITHIN THE DEPARTAMENTOS OF COLOMBIA

Juan Londoño and Donald J. Bogue

I

Introduction

In Chapter Two, it was demonstrated that birth rates have declined precipitously in Colombia in recent years, from about 44 per 1,000 in 1964 to 33 in 1973, and even further to about 30 by 1975. It was asserted that on a net overall basis about 70 percent of this decline could be attributed to the programs of family planning that had been carried out by the public agencies (Ministry of Health and University Schools of Medicine) and by private organizations (primarily PROFAMILIA, the national affiliate of International Planned Parenthood Federation). Although this analysis seems to be plausible, it will not be considered sufficient proof by many. For this reason, the present chapter attempts to carry the analysis further by directing it into a different realm that will subject these findings to a much more rigorous test. This consists of repeating the analysis on a departamento-by-departamento (state-by-state) basis.

The reason for this procedure is to attempt to establish causation by linking fertility decline to family planning in both place and time. In some departamentos of Colombia, the volume of family planning activity conducted was very great. In other departamentos less family planning was done by either public or private agencies before 1975. If the claims of Chapter Two are valid, one should expect to find large declines in fertility in exactly those departamentos where the family planning program was relatively most active, and to find the smallest declines in fertility in exactly those departamentos where the family planning program was least active. Did this in fact

occur? How close is the correlation between fertility decline and family planning efforts? Does a departamento-by-departamento analysis support or cast doubt upon the findings of Chapter Two? These are the problems of research discussed here.

The analysis is complicated by the fact that all of the data involved are much less precise for individual departamentos than for the nation as a whole. The estimates made for the nation were determined on the basis of estimates grounded on data known to contain some error. For this reason, it is necessary to caution the reader against accepting the results as final refined estimates. The preliminary precautions must be reemphasized for this chapter. All of the errors and biases that were inherent in the original procedure of Chapter Two persist here, but they are augmented by errors and biases in departamento-by-departamento differences in registration, enumeration, and data collection.

Despite these limitations, the findings clearly support the contention that the largest single factor in explaining departamento-to-departamento differences in birth rate declines was the amount of contraceptive adoption that occurred in the official family planning programs. This remains true even when controls are imposed for all of the plausible alternative socioeconomic explanations.

Organization of the analysis. The organization of the analysis in this chapter is similar to that of Chapter Two.

- (a) The first step is to measure the level of fertility in each departamento and the change in fertility that took place between 1964 and 1975.
- (b) The second step is to measure the volume of contraception in each departamento between 1964 and 1975.
- (c) The third step is to perform a PROJTARG analysis for each departamento, imposing controls over migration, differentials and changes in marital status, and changing age composition. The objective of this step is to estimate the amount of contraception required to account for the decline in the birth rate and to relate this to the amount of contraception that was actually performed by participants in the family planning programs.
- (d) The fourth step is to correlate the contraceptive activity in each departamento with the fertility level and changes in fertility estimated in step one, to see how well the hypothesis of family planning impact withstands analysis.

II

Fertility Rates for Departamentos: 1975

Fertility rates for the departamentos in 1975 are based on information contained in the 1973 census and the 1976 National Fertility Survey.

- (a) In the 1973 census, women were asked the date of birth of their last

live born child. The births were then tabulated by the mother's age for those events that occurred in the year prior to the census date. Both the number of births and the number of women were corrected for underenumeration.

- (b) These corrected figures served as the basis for calculating age-specific fertility rates, the total fertility rate, and the general fertility rate. The crude birth rate was estimated by applying the Bogue-Palmore regression equation (Bogue, Edmonds, and Bogue, 1973: 7). Estimates were calculated for each departamento. However, since the 1973 census was only a 4 percent sample, the number of women and events in some departamentos when broken down by age was quite small. As a consequence, the results for Bolivar and Sucre, Caidas, Risaralda, Quindio, and Magdalena and Cesar are pooled, thereby creating 18 sets instead of 23.
- (c) To find age-specific fertility rates for the departamentos in 1975, the ratio of the 1973 total fertility rate calculated from the census data to the 1976 total fertility rate calculated from the 1976 National Fertility Survey was applied to the 1973 age-specific rates. The 1975 general fertility rate comes directly from the 1976 National Fertility Survey, and the 1976 crude birth rate is estimated by applying the Bogue-Palmore regression equations.

The results of this procedure are given in Table 3-1.

The variation in fertility among the departamentos is substantial, though not as great as might have been expected. The lowest fertility is found in Bogotá, where the crude birth rate in 1975 was estimated to be 19.3 per 1,000. The highest fertility was found in Chocó, Córdoba, and Magdalena, where the crude birth rate was estimated to be around 40 per 1,000. Generally, the departamentos where the largest cities are located (Antioquia, Valle, Atlántico, Caldas) have the lowest fertility rates, while the rural departamentos have higher rates. It is important to note that in 1975 no departamento had a birth rate in the "high explosive" range—a crude birth rate level above 45 per 1,000. In fact, only three departamentos had a crude birth rate above 40; all of the remainder were in the more moderate fertility range of the 30s, and 8 were in the 20s. Thus, the lower fertility described in Chapter Two appeared to be widely diffused throughout the nation rather than concentrated in a few metropolitan areas.

III

Fertility Rates for Departamentos, 1964, and Incensal Change in Fertility Rates, 1964-1975

A schedule of fertility rates for 1964 was estimated for each departamento. By subtracting the fertility rate for 1975 (established in the preceding section)

Table 3-1. FERTILITY RATES FOR THE DEPARTAMENTOS OF COLOMBIA: 1975.

Departamento	Crude birth rate	General fertility rate	Total fertility rate	Age specific fertility rates						
				15-19	20-24	25-29	30-34	35-39	40-44	45-49
Colombia (a)	30.7	125.6	4095	172	194	192	162	122	59	18
Bogotá	19.3	83.0	2595	43	135	131	100	68	32	11
Antioquia	25.0	104.5	3580	48	146	170	155	118	62	17
Atlántico	25.0	106.7	3505	51	167	185	137	88	58	15
Bolívar (b)	35.8	154.1	5170	71	246	239	196	178	82	22
Boyacá	36.5	151.4	5415	56	222	269	225	182	113	16
Caldas (c)	27.4	115.3	3930	63	168	181	164	131	62	17
Cauca	34.8	148.3	5065	71	212	249	203	162	85	31
Córdoba	41.3	178.0	5975	79	284	263	261	170	100	38
Cundinamarca	25.8	106.7	3710	45	172	173	158	116	58	20
Chocó	41.9	180.2	6085	80	289	168	266	173	102	39
Huila	33.7	139.3	5000	64	209	272	189	157	85	24
Magdalena (d)	40.5	176.2	5818	108	243	261	244	189	82	17
Meta	35.2	159.8	4930	102	252	206	175	123	92	36
Nariño	37.0	159.2	5340	74	224	263	211	173	90	33
Norte de Santander	29.0	121.7	4195	53	175	213	187	128	67	16
Santander	27.8	116.8	3990	48	179	190	160	147	57	17
Tolima	30.4	131.3	4305	84	216	193	156	135	52	25
Valle	25.1	107.7	3505	60	179	162	129	108	47	16

(a) See Chapter I.

(b) Bolívar and Sucre.

(c) Caldas, Risaralda, and Quindío.

(d) Magdalena and Cesar.

Table 3-2. FERTILITY RATES FOR THE DEPARTAMENTOS OF COLOMBIA: 1964.

Departamento	Crude birth rate	General fertility rate	Total fertility rate	Age specific fertility rates						
				15-19	20-24	25-29	30-34	35-39	40-44	45-49
Colombia ^(a)	43.7	193.3	6241	117	262	303	263	205	89	20
Bogotá	32.2	142.9	4475	85	200	215	188	133	63	11
Antioquia	44.4	194.8	6365	119	266	307	267	207	90	17
Atlántico	39.9	175.3	5685	106	238	274	239	185	80	15
Bolívar	48.0	210.8	6900	133	278	333	286	232	96	22
Boyacá	46.1	200.7	6685	125	280	323	281	218	94	16
Caldas	43.1	189.7	6175	115	258	298	259	201	91	31
Cauca	45.5	203.2	6510	120	269	311	270	210	91	31
Córdoba	50.1	221.6	7195	137	287	343	295	240	99	38
Cundinamarca	46.9	204.4	6790	131	274	328	282	229	94	20
Chocó	53.8	238.6	7715	147	308	369	317	257	106	39
Huila	48.1	211.0	6935	129	289	333	290	225	97	24
Magdalena	51.9	228.9	7455	142	296	354	305	248	102	44
Meta	55.8	251.0	7915	151	317	379	326	265	109	36
Nariño	39.9	173.9	5710	105	235	271	236	182	79	33
Norte de Santander	45.3	198.7	6515	121	273	315	274	212	92	16
Santander	45.1	196.6	6515	121	278	315	274	212	92	16
Tolima	46.5	203.5	6690	124	231	321	279	217	74	25
Valle	39.2	173.4	5545	103	231	269	232	180	78	16

(a) See notes to Table 3-1.

from the estimates for 1964, it was possible to derive estimates of the change in fertility that occurred in each departamento between 1964 and 1975. The estimates for 1964 are considerably less precise and consistent than those for 1975, with the result that the measures of fertility change may have a wide margin of error. Nevertheless, it is believed that the 1964 estimates and the measures of change, though approximate, are sufficiently valid for use in the subsequent analysis of the impact of family planning on birth rates and birth rate changes.

The urban-rural patterns of age-specific fertility rates found by Elkins (1973: 31) in the 1969 National Fertility Survey were adjusted to fit the number of births estimated for each departamento in 1964 from the 1964 census. The pattern of urban fertility was applied to Bogotá while the rural pattern was used for Bolívar, Córdoba, Chocó, Cundinamarca, Magdalena, and Meta. For the remaining departamentos, the combined pattern of fertility for the nation as a whole was applied. This procedure allowed for the calculation of age-specific fertility rates, the total fertility rate, and the general fertility rate. The crude birth rate was once again estimated from the Bogue-Palmore regression equations.

The results of this procedure are shown in Table 3-2. A close examination of these figures shows that the birth rates in 1964 were much less variable across departamentos and were quite high. Only in Bogotá was there evidence of consistent fertility regulation. A crude birth rate of nearly 56 was obtained for Meta, a value close to the maximum biological limit. Contrasting with the data of Table 3-1, no departamento had fertility levels in the 20s and only four had levels in the 30s.

Table 3-3 shows the estimates of fertility decline for each departamento between 1964 and 1975. It is obvious that each state has experienced a significant decline in fertility with the largest declines occurring in Cundinamarca, Antioquia, Bogotá, the Santanders, Atlántico, and Meta. In Cundinamarca, Meta, and Antioquia, the average completed family size dropped by nearly 3 children for the period. Only one departamento, Nariño, failed to obtain a decline of at least one child.

IV

Family Planning Accomplishments in Each Departamento

Using a procedure almost identical to that employed for the nation in Chapter Two, an estimate was made of the number of woman years of protection from pregnancy that was achieved in each departamento by all of the family planning programs combined. The reported number of new adopters was converted to estimates of continuing contraceptors, using continuation rates separately for IUD and pills. The resulting estimates are reported

Table 3-3. CHANGE IN FERTILITY RATES FOR DEPARTAMENTOS
OF COLOMBIA: 1964 TO 1975.

Departamento	Crude birth rate			General fertility rate			Total fertility rate		
	1964	1975	Percent change	1964	1975	Percent change	1964	1975	Absolute change
Colombia ^(a)	43.7	30.7	29.7	193.3	125.6	35.0	6241	4095	-2,146
Bogotá	32.2	19.3	40.1	142.9	830.0	41.9	4475	2595	-1,880
Antioquia	44.4	25.0	43.7	194.8	104.5	46.3	6365	3580	-2,785
Atlántico	39.9	25.0	37.3	175.3	106.7	39.1	5685	3505	-2,180
Bolívar	48.0	35.8	25.4	210.8	154.1	26.9	6900	5170	-1,730
Boyacá	46.1	36.5	20.8	200.7	151.4	24.6	6685	5415	-1,270
Caldas	43.1	27.4	36.4	189.7	115.3	39.2	6175	3930	-2,245
Cauca	45.5	34.8	23.5	200.2	148.3	25.9	6510	5065	-1,445
Córdoba	50.1	41.3	17.6	221.6	178.0	19.7	7195	5975	-1,220
Cundinamarca	46.9	25.8	45.0	204.4	106.7	47.8	6790	3710	-3,080
Chocó	53.8	41.9	22.1	238.6	180.2	24.5	7715	6085	-1,630
Huila	48.1	33.7	29.9	211.0	139.3	34.0	6935	5000	-1,935
Magdalena	51.9	40.5	22.0	228.9	176.2	23.0	7455	5818	-1,637
Meta	55.8	35.2	36.9	251.0	159.8	36.3	7915	4930	-2,985
Nariño	39.9	37.0	7.3	173.9	159.2	8.4	5710	5340	-0,370
Norte de Santander	45.3	29.0	36.0	198.7	121.7	38.8	6515	4195	-2,320
Santander	45.1	27.8	38.4	196.6	116.8	40.6	6515	3990	-2,525
Tolima	46.5	30.4	34.6	203.5	131.3	35.5	6690	4305	-2,385
Valle	39.2	25.1	36.0	173.4	107.7	37.9	5545	3505	-2,040

(a) See notes to Table 3-1.

Table 3-4. WOMAN-YEARS PROTECTION PROVIDED BY ALL FAMILY
PLANNING PROGRAMS BY DEPARTAMENTO:
1969 TO 1975.

Departamento	Woman-years of protection							
	Total 1969-1975	1969	1970	1971	1972	1973	1974	1975
Total	1976019	95647	157539	221338	290170	337012	397022	477461
Colombia (a)	2001100	95600	158900	224200	294000	341500	402700	484200
Bogotá	474939	31403	43010	54648	65761	79083	91043	109981
Antioquia	313014	16437	24710	34969	45465	52566	60965	77902
Atlántico	102038	4162	8280	11006	15426	18772	20941	22551
Bolívar	118615	6454	9776	13042	18167	21901	23643	25632
Boyacá	32263	1185	1641	2461	4003	5966	7608	9399
Caldas	213005	8314	17802	26627	33692	38634	41040	47096
Cauca	37111	1294	1867	3175	5230	7005	8030	10510
Córdoba	61388	2115	3637	5648	7620	10297	13799	18272
Cundinamarca	37663	898	2570	4621	5641	6675	7917	9671
Chocó	--	--	--	--	--	--	--	--
Huila	43116	1212	3921	5295	6861	7776	8386	9665
Magdalena	51690	1277	2608	3917	6315	8881	12487	16455
Meta	26815	1860	2305	2962	3840	4219	5142	6487
Nariño	51570	2331	3927	5405	8049	9117	10291	12450
Norte de Santander	48109	2220	3897	5173	6796	8049	9575	12299
Santander	96211	5669	7927	9411	12978	16197	20223	23805
Tolima	66707	3019	5318	7346	9459	11151	13462	16952
Valle	201565	5797	14343	25082	34866	30773	42370	48334

(a) See notes to Table 3-1.

in Table 3-4. (Notes accompanying Table 2-1 in Chapter Two describe the procedure in more detail.) These estimates are based on the following assumptions.

- (a) The statistics on number of new acceptors were kept with equal accuracy in each departamento.
- (b) The clients lived in the same departamento in which the clinic they attended was located.
- (c) The continuation rates used for each method are the same in all departamentos.

Informal evidence suggests that data in more rural departamentos are of poorer quality and that continuation rates are lower than in the more urbanized departamentos. Thus, there is a good possibility that the family planning accomplishments in the rural areas are substantially overestimated while those of the more cosmopolitan departamentos are more accurately estimated.

Table 3-4 shows that there has been great variation among the departamentos in the volume of family planning services provided. This, of course, is due to two factors:

- (a) the population size of each departamento—the more women of reproductive age a departamento contains, the greater should be the number of contraceptors
- (b) the level of activity of the family planning program—in some departamentos the family planning programs may have been more active than in others.

It is the second of these factors, of course, that is of primary concern in this report. In order to study it, however, it is necessary to control the effect of the first factor—population size. This is accomplished in the next section by computing contraceptors during each year.

V

PROJTARG Estimates of the Population in Need of Contraception in Each Departamento

The principal objective of this analysis is to compute a “rate of contraceptive use” that characterizes each departamento and to see if this is correlated with the change in fertility which has been measured. Such a rate of contraceptive use must have a numerator and a denominator. The numerator for this rate has been provided by the estimates of the preceding section; the task of this portion of the analysis is to provide an appropriate denominator and to compute the rate.

The level of contraceptive use. There are a number of denominators that could serve as an appropriate base for computing the level of contraceptive

use. Using the computer program PROJTARG, all of these possible bases were computed for each departamento by year from 1964 to 1975, as reported in the following set of tables:

Table 3-5A. Number of Women Age 15 to 49 (Women of Reproductive Age)

Table 3-5B. Number of Married Women Aged 15 to 49 (Women of Reproductive Age Who Are Eligible to Bear Children)

Table 3-5C. Number of Fecund Married Women (Women of Reproductive Age)

Table 3-5D. Number of Fecund Non-Pregnant Women.

As is readily apparent, these four tables are progressively more refined. The last table specifies exactly the population to be contracepted if birth rates are to be reduced. It is therefore used to obtain the denominator which will be used to establish the rate of contraceptive use. The other tables are included for reference and possible use by researchers in other contexts.

The procedure followed for calculating these various estimates of the female population of each departamento is identical to that described in Chapter Two for the entire nation. However, this procedure was made somewhat more complex at the departamento level by three factors:

- (a) *Migration and mortality.* Based on the adjusted census figures for 1964 and 1973, the female population by five-year age groups was estimated by interpolation for 1969 and by extrapolation for 1974. These values were then used to calculate the ratio of survivors between 1964 to 1969 and 1969 to 1974. In this fashion it was possible to replicate exactly the female population in each departamento in 1973 without calculating the yearly flow of migrants usually required by PROJTARG.
- (b) *Women sexually active.* The proportions of married women and women living with men from the 1964 and 1975 censuses were adjusted for each departamento utilizing information from the 1969 *National Fertility Survey* in order to account for widows and separated and divorced women who were sexually active.
- (c) *Utilization of PROJTARG.* Since PROJTARG assumes a linear change in fertility, the model was applied to two periods of time, 1964 to 1970 and 1970 to 1975, so that the apparent acceleration of fertility decline after 1970 could be taken into account. The results from the first cycle were used as inputs to the second cycle.

The rate of family planning service in each departamento. The PROJTARG estimates provide the denominators necessary to establish measures of contraceptive service in each departamento, adjusted for population size. Table 3-6 reports these data. The numerator for this rate was computed by summing the contraceptive services provided in each departamento for the six years 1969, 1970, 1971, 1972, 1973, and 1974 from Table 3-4. It is these contraceptive

Table 3-5A. ESTIMATED NUMBER OF WOMEN OF REPRODUCTIVE AGE (15 TO 49) EACH YEAR BY DEPARTAMENTO: 1964 TO 1975.

Departamento	Estimated number of women of reproductive age											
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total . . .	3974519	4098994	4232081	4373953	4524851	4733778	4812965	4949095	5092915	5244329	5403427	5570842
Colombia (a)	3998000	4133000	4275000	4423000	4578000	4740000	4910000	5060000	5218000	5384000	5558000	5738000
Bogotá . . .	470901	503802	529602	578584	621013	667152	701884	738961	778554	820841	866000	914197
Antioquia . .	571069	590723	611519	633365	656549	680741	700731	721636	743493	766346	790250	815250
Atlántico . .	180142	188225	196847	206028	215782	226116	234431	243210	252480	262273	272621	283556
Bolívar . . .	226559	233428	240664	248285	256186	264443	271383	278625	286181	294065	302291	310869
Boyacá . . .	233684	234374	235214	236192	239295	238512	239133	239920	240860	241940	242146	244465
Caldas . . .	334254	340245	346513	353006	359666	366433	372470	378749	385860	391998	398959	406128
Cauca	138264	140702	143278	145985	148819	151772	154226	156803	159507	162338	165288	168375
Córdoba . . .	125995	130040	134313	138827	143590	148604	152719	156999	161450	166081	190899	175911
Cundina- marca	237974	239504	241197	243028	244974	249012	248444	250030	251772	253675	255740	257964
Chocó	39824	40733	41722	42793	43944	45174	46152	47201	48320	49508	50765	52088
Huila	89692	91410	93208	95087	97051	99098	101147	104302	107827	111274	114402	117112
Magdalena . .	168226	173814	179664	185808	192235	198936	204577	210455	216574	222939	229555	236423
Meta	34342	36751	39392	42281	45430	48850	51430	54170	57071	60132	63354	66743
Nariño	168668	171967	175421	179053	182881	186922	190194	193582	197104	200781	204628	208658
Norte de Santander . .	120777	125185	129867	134835	140098	145657	150151	154883	159864	165102	170603	176368
Santander . .	228113	232188	236487	241019	245793	250809	254808	258986	263361	267954	272784	277863
Tolima	184363	187070	189905	192859	195926	199096	201784	204577	207478	210487	213604	216826
Valle	421672	438893	457268	476838	497619	519601	537301	556015	575767	596576	618448	641375

(a) See notes to Table 3-1.

Table 3-5B. ESTIMATED NUMBER OF MARRIED WOMEN OF REPRODUCTIVE AGE (15 TO 49) EACH YEAR BY DEPARTAMENTO: 1964 TO 1975.

Departamento	Estimated number of women of reproductive age											
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total . .	2342721	2403864	2468304	2536517	2603718	2684802	2749882	2817330	2888024	2961816	3038688	3118757
Colombia ^(a) . .	2349000	2419000	2493000	2569000	2649000	2731000	2817000	2892000	2971000	3053000	3140000	3231000
Bogotá . . .	253253	270358	288841	308227	330449	353847	371220	389608	409101	429777	451718	475011
Antioquia . .	322975	331178	339793	348832	358304	368214	376505	385116	394077	403398	413095	423182
Atlántico . .	104257	108266	112521	117037	121827	126904	130510	134287	138243	142384	146721	151262
Bolívar . . .	147945	151725	155670	159780	164058	168502	172803	177270	181910	186732	191744	196958
Boyacá . . .	138989	139453	139938	140450	140995	141576	141843	142131	142448	142798	143187	143260
Caldas . . .	194057	195987	197997	200082	202288	204419	206585	208803	211067	213374	215723	218110
Cauca	82070	83487	84943	86445	87997	89602	91060	92552	94082	95656	97278	98952
Córdoba . . .	84636	86210	87851	89543	91300	93126	96049	99070	102199	105443	108809	112305
Cundinamarca . .	144161	144682	145254	145879	146559	147291	147885	148515	149191	149917	150698	151539
Chocó	26085	26556	27051	27579	28144	28752	29345	29956	30588	31246	31934	32656
Huila	53653	54751	55892	57078	58311	59591	60946	62433	65602	68015	70186	72038
Magdalena . .	109042	112422	115969	119688	123584	127358	131948	135361	138901	142573	146380	150326
Meta	24422	25983	27691	29559	31600	33826	35421	37222	39142	41183	43346	45632
Nariño	88944	90591	92280	94021	95826	97703	99393	101110	102869	104680	106552	108493
Norte de Santander	70797	72973	75254	77650	80167	82813	85074	87420	89859	92400	95051	97818
Santander . .	132919	135161	137491	139916	142441	145073	147336	149675	152096	154607	157214	159923
Tolima	114644	116068	117544	119074	120657	122292	123808	125368	126970	128617	130309	132048
Valle	250072	257996	266324	275077	284271	293913	302151	310733	319681	329013	338739	348870

(a) See notes to Table 3-1.

Table 3-5C. ESTIMATED NUMBER OF FECUND MARRIED WOMEN OF REPRODUCTIVE AGE (15 TO 49) EACH YEAR BY DEPARTAMENTO: 1964 TO 1975.

Departamento	Estimated number of fecund married women of reproductive age											
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total	1828709	1878466	1926190	1976205	2029717	2086703	2135626	2185638	2247990	2292913	2350655	2411498
Colombia (a)	1838000	1891000	1945000	2002000	2061000	2122000	2187000	2244000	2304000	2369000	2437000	2509000
Bogotá	200617	213787	227957	243331	259726	277574	291323	305863	331272	337627	355014	373526
Antioquia	250437	256417	262718	269365	276383	283792	299897	296250	302887	309831	317109	324750
Atlántico	81655	84750	86052	91576	95337	99350	102057	104908	107912	111078	114214	117930
Bolívar	117562	120385	123343	126439	129679	133067	136380	139840	143452	147229	151181	155322
Boyacá	105620	105725	105858	106028	106246	106520	106527	106558	106623	106733	106900	107131
Caldas	152073	153245	154471	155761	157084	158465	159820	161216	162651	164130	165656	167234
Cauca	63873	64814	65775	66768	67800	68877	69870	70884	71926	73005	74127	75298
Córdoba	68097	69224	70398	71627	72918	74277	76482	78772	81157	83644	86239	88948
Cundinamarca	109778	109967	110196	110474	110805	111193	111514	111862	112249	112682	113171	113724
Chocó	20356	20715	21099	21514	21966	22459	22866	23292	23742	24221	24734	25285
Huila	42027	42857	43717	44608	45534	46499	47752	48790	49757	50664	51535	52400
Magdalena	82051	89640	92320	95139	98101	101210	104660	107253	109954	112766	115692	118739
Meta	19916	21148	22506	24004	25654	27471	28726	30171	31723	33383	35152	37032
Nariño	67183	68405	69663	70964	72315	73722	75001	76313	77663	79056	80496	81989
Norte de Santander	55400	56982	58948	60407	62269	64242	65911	67650	69463	71377	73380	75488
Santander	102993	104603	106273	108011	109825	111723	113430	115185	116996	118870	120818	122849
Tolima	90168	91115	92108	93150	94245	95398	96452	97543	98676	99854	101083	102368
Valle	198863	204683	210765	217139	222830	230864	236958	243289	249883	256763	263952	271473

(a) See notes to Table 3-1.

Table 3-5D. ESTIMATED NUMBER OF FECUND, NONPREGNANT WOMEN OF REPRODUCTIVE AGE (15 TO 49) EACH YEAR BY DEPARTAMENTO: 1964 TO 1975.

Departamento	Estimated number of fecund, nonpregnant women of reproductive age											
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total	1421526	1479164	1541420	1608390	1600094	1756487	1813239	1882790	1940281	2009945	2083932	2162330
Colombia (a)	1438000	1496000	1556000	1620000	1688000	1759000	1834000	1902000	1975000	2051000	2131000	2131000
Bogotá	191475	205855	221626	238945	257955	278772	294147	310702	328512	347672	368272	390390
Antioquia	217296	227644	238667	250364	262721	275712	286289	297411	309086	321354	334255	347824
Atlántico	66913	70568	74494	78695	83172	87921	92160	96672	101475	106590	112042	117850
Bolíver	68820	71667	74705	77925	81312	84853	81249	89774	92433	95234	98179	101271
Boyacá	81171	81480	81918	82466	83111	83832	84212	84729	85366	86109	86940	87845
Caldas	123079	126614	130324	134167	138105	142096	145434	148951	152641	156501	160530	164723
Cauca	48828	49'92	50849	51992	53211	54498	55416	56420	57508	58680	59929	61249
Córdoba	56318	38186	40817	43317	45989	48829	49979	59198	52485	53841	55266	56758
Cundinamarca	80816	81812	82914	84097	85340	86624	87430	88345	89363	90486	91713	93038
Chocó	11982	12376	12823	13319	13852	14422	14760	15118	15645	16145	16685	17256
Huila	31257	31844	32463	33117	33806	34529	35229	35877	36513	37141	37767	38398
Magdalena	52201	54219	56367	58632	61003	63469	64661	66924	69297	71780	74372	77072
Meta	8622	9382	10223	11147	12155	13246	14140	14992	15883	16812	17778	18787
Nariño	69314	70810	72414	74135	75982	77959	79375	80878	82469	84156	85944	87836
Norte de Santander	43185	45210	47394	49743	52257	54934	56952	59116	61427	63886	66493	69241
Santander	81556	83328	85226	89255	89416	91707	93355	95096	96941	98903	100998	103232
Tolima	59886	61042	62268	63560	64911	66317	67350	68442	69596	70812	72091	73430
Valle	148807	157035	165931	175516	185796	196762	205121	214082	223647	233823	244610	255994

(a) See notes to Table 3-1.

services that would be most influential in determining the birth rate as of 1975. This sum is reported in column 2 of Table 3-6. The denominator for this rate was computed by summing the number of fecund, married, nonpregnant women for the years 1969, 1970, 1971, 1972, 1973, and 1974 from Table 3-5. These women were eligible to practice contraception during the years referred to by the estimates of family planning service. This sum is reported in column 1 of Table 3-6. The rate of family planning service is obtained by dividing the data of column 2 by the data of column 1, departamento by departamento, and multiplying the quotient by 100. This measure states what percentage of woman-years of genuine exposure to the risk of pregnancy was protected by contraceptive services provided by the family planning programs. Thus, it is as precise a measure of the level of activity and of the success of family planning work in each departamento as is possible to compute with available information.

Table 3-6. INDEX OF ORGANIZED FAMILY PLANNING PROTECTION

Departamento	Construction of index of family planning protection		
	Number of fecund married nonpregnant women	Women years of protection from pregnant source	Index of protection
Total	11487	1497	13.0
<u>Columbia</u> (a)	9206	1517	13.0
Bogotá	1728	365	18.9
Antioquia	1824	235	12.9
Atlántico	597	79	13.2
Bolívar	542	93	17.2
Boyacá	511	23	4.5
Caldas	906	166	18.3
Cauca	342	27	7.9
Córdoba	320	43	13.5
Cundinamarca	534	28	5.2
Chocó	93	n.d.	n.d.
Huila	217	33	15.2
Magdalena	410	35	8.5
Meta	93	20	21.5
Nariño	491	39	8.0
Norte de			
Santander	363	36	9.9
Santander	577	72	12.5
Tolima	415	50	12.1
Valle	1318	153	11.6

(a) See notes to Table 3-1.

Table 3-7. REQUIRED WOMAN-YEARS OF PROTECTION TO REACH OBSERVED
BIRTH RATE DECLINES BY DEPARTAMENTO: 1964 TO 1975.

Departamento	Required woman-years of protection											
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Total	245663	278852	313488	349964	388677	431069	514907	603034	695666	793599	892074	1006795
Bogotá. (a)	62459	69239	76651	84768	93688	103533	118737	135264	153226	172804	194140	217435
Antioquia	16018	19472	23152	27108	31395	36072	50235	65236	81155	98061	116032	135158
Atlántico	15150	16647	18268	20035	21970	24097	28078	32355	36943	41870	47164	52858
Bolívar	16299	18222	20238	22367	24627	27030	30530	34199	38051	42101	46367	50867
Boyacá	7298	8184	9023	9829	10619	11406	13548	15649	17727	19798	21882	23994
Caldas	18288	19811	21369	22988	24691	26496	32380	38427	44646	51055	57670	64510
Cauca	6104	7154	8205	9270	10360	11484	12973	14479	16009	17573	19180	20840
Córdoba	8942	9065	9171	9267	9361	9461	11086	12774	14541	16395	18345	20397
Cundinamarca	7878	9913	11946	13997	16084	18224	23915	29641	35426	41288	47246	53323
Chocó	712	858	995	1130	1269	1422	1966	2514	3070	3652	4259	4902
Huila	2010	3014	4052	5126	6239	7397	8935	10439	11958	13493	15054	16653
Magdalena	5325	6832	8425	1126	11951	13916	16942	19106	21387	23794	26337	29028
Meta	2130	2504	2929	3419	3987	4648	5929	7450	9140	11015	13085	15364
Narino	5813	6151	6474	6784	7080	7361	7902	8436	8970	9504	10041	10582
Norte de Santander	4827	5554	6314	7119	7979	8908	11606	14452	17462	29655	24054	27682
Santander	8321	10192	12104	14065	16083	18171	23348	28688	34192	39871	45741	51820
Tolima	11124	13345	15619	17957	20369	22865	25971	29154	32417	35769	39219	42777
Valle	47065	49851	52751	55795	59023	62479	71555	81144	91306	102106	113613	125901

(a) See notes to Table 3-1.

As might be expected, there is great variation from departamento to departamento. The highest levels of activity are reported for Bogotá, Meta, and Caldas departamentos, which were the objectives of special campaigns. High service rates are also reported for Bolívar and Huila. In all of these departamentos, more than 15 percent of the woman-years of risk were covered by family planning services.

However, the family planning program was at least moderately active in all departamentos except two. In Chocó and Boyacá departamentos, only 4 percent or less of the woman-years of exposure were covered by family planning. In Cundinamarca departamento, the level of service was only slightly higher—5 percent. In other words, 16 of the 18 departamentos' public and private family planning programs combined to provide a level of service that covered 5 percent or more of the woman-years of risk of conception. In 11 of these 18 departamentos the coverage was in excess of 10 percent.

In general, therefore, it can be said that the family planning program blanketed almost the entire nation with moderately active service, and that in about one-half of the departamentos it was quite intense.

VI

Relationship of Family Planning Service Rate to Decline in Birth Rates

The rather lengthy series of computations described above leads to the important question, "Is there any relationship between the level of family planning services provided in the various departamentos and the declines in fertility that were measured?" Column 4 of Table 3-6 reports the total fertility rate as of 1975, while column 5 of this table reports the decline in fertility during the 1964-75 period, measured in terms of TFR. Figures 3-1 and 3-2 show the rate of contraceptive service plotted against both of these measures of fertility.

There is a clear and quite consistent relationship between the fertility rate in 1975 and the level of family planning service, Figure 3-1. This implies that the more intensive the inputs of family planning, holding constant population size, the lower the birth rate tended to be in 1975. Points that fall below the line identify places which accomplished a low fertility rate with *less* help from family planning programs than one would expect from the trend. The outstanding deviations are the five departamentos containing large metropolitan centers—Bogotá, Atlántico, Valle, Antioquia, and Cundinamarca. In these places family planning services could be obtained from several sources other than the family planning program.

Deviations *above* the trend line in Figure 3-1 tend to identify departamentos where comparatively large inputs of family planning tended to be associated

Total Fertility
Rate 1975

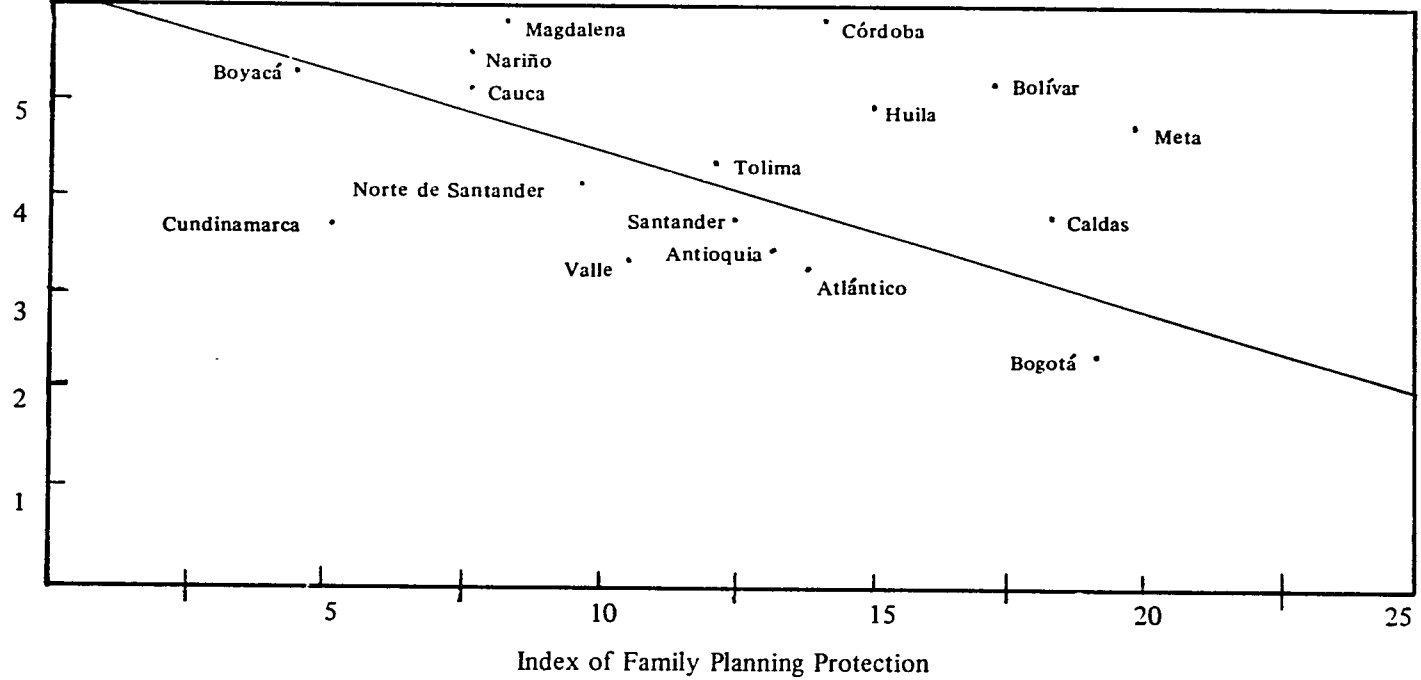


Figure 3-1. TOTAL FERTILITY RATE 1975 BY INDEX OF FAMILY PLANNING PROTECTION.

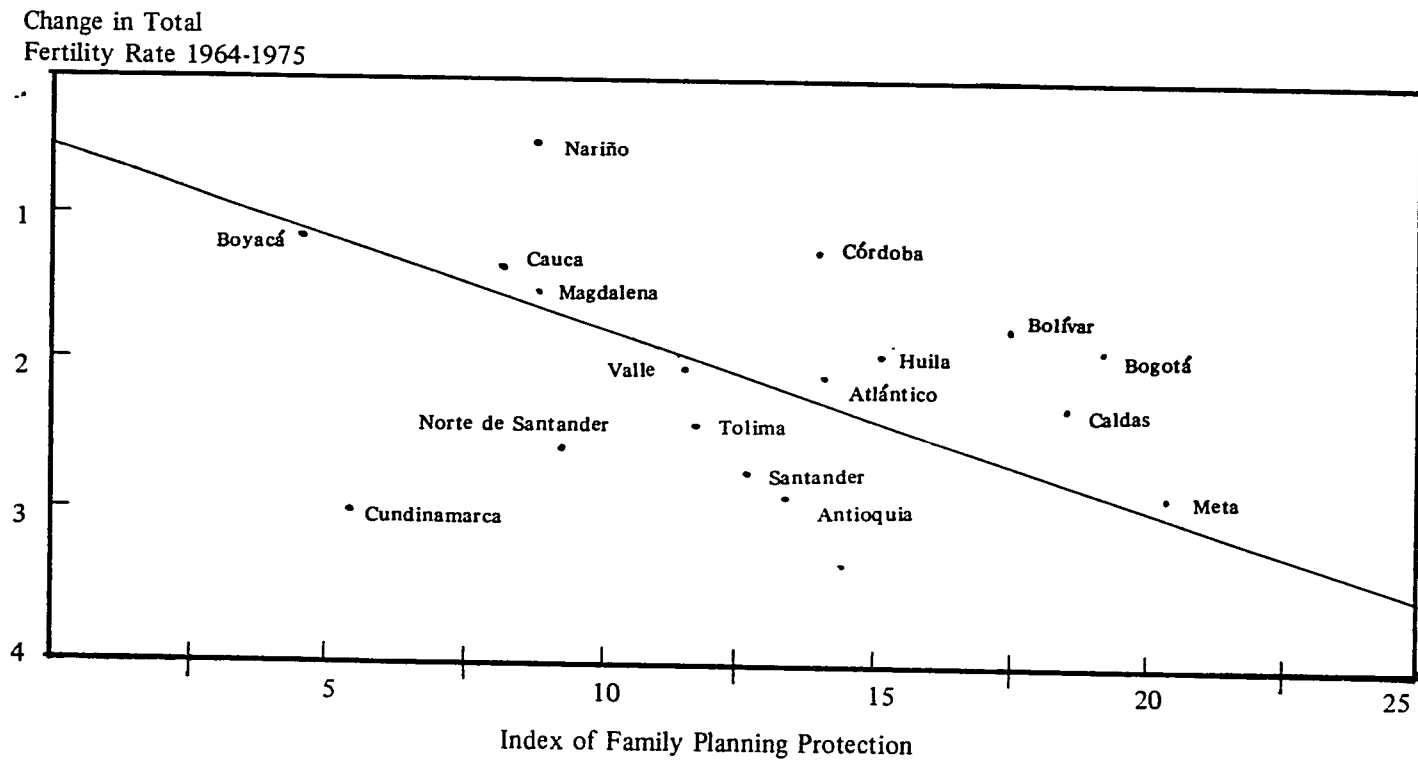


Figure 3-2. CHANGE IN TOTAL FERTILITY RATE 1964 TO 1975 BY INDEX OF FAMILY PLANNING PROTECTION.

with persistent high fertility. Six departamentos are outstanding here—Córdoba, Bolívar, Meta, Caldas, Magdalena, and Huila. If the statistics can be trusted, it appears that although large inputs were made in these six departamentos (in comparison to their size), birth rates remained high at the end of the period. (A partial explanation for this will be given in the discussion of Figure 3-2.) With the exception of these six departamentos, it appears that there is a rather consistent relationship—the greater the input of family planning services, the lower the birth rate tended to be in 1975.

As comforting and reassuring to family planners as the statistics of Figure 3-1 may be, they contain a hidden, possible disturbing, factor—the level of fertility in 1964. In some of the departamentos, the birth rates in 1974 were much higher than in others. For example, Bogota was below average in 1964, and its position in 1975 may simply reflect a continuation of this state. Meta, it will be recalled, had the almost impossibly high crude birth rate of 56 per 1,000. A more precise measurement, therefore, is to plot *change* in fertility services. The scattergram of Figure 3-2 provides this information. Although the relationship noted above still persists, it has some apparent extraordinary deviations from the trend. A part of the scatter of the plot may be due to error in measuring the level of fertility in 1964 (in order to get a measure of fertility change). However, this plot is the best possible estimate of the impact of the official family planning programs upon the birth rates of the various departamentos of Colombia.

In general, points falling *below* the line in Figure 3-2 identify departamentos where the fall in birth rates has been *greater* than the level of family planning service would suggest. Within this category are metropolitan departamentos, with their greater variety of family planning services. Cundinamarca, Tolima, Santander, and Norte de Santander are also included in this category.

Points falling *above* the trend line in Figure 3-2 identify departamentos where the decline in the birth rate is less than one would have expected on the basis of the family planning service rate that has been claimed. These are departamentos that claim to have had an active family planning program, but where the apparent results were less than average. Into this category are the departamentos like Nariño and Córdoba. In these departamentos, the statistics on the number of new adopters may have been exaggerated, the rates of continuation may have been lower than average for the nation, or the birth rate in 1964 may have been lower (or the birth rate in 1975 higher) than estimated by demographic procedures. These are the only possibilities, and hence these departamentos warrant special separate investigation. In these departamentos, very significant inputs of family planning services appear to have been made with comparatively little visible impact upon birth rates. One would have expected declines in the amounts reported to have resulted from increased use of abortion, traditional methods, and commercial facilities. The

family planning programs in these departamentos should be carefully reviewed, with an eye to their complete overhaul.

VII

PROJTARG Estimates of Family Planning Targets

The calculation by PROJTARG of the family planning "targets" for the years 1964 to 1975 is as important as the estimates of the female population in need of contraception. These estimates specify the number of woman-years of contraception required in each departamento in order for the birth rates to change as they did given the other factors of population size, marital status, net migration, mortality. This parallels the similar computations made in Chapter Two for the nation. *These estimates imply that somehow, by some means, the contraceptive protection specified by the estimates was actually accomplished.* This could have been achieved by attending one of the family planning service centers, by visiting a private physician, or by using nonmedical methods such as condoms, spermicidals, rhythm, withdrawal, etc. It could also have been accomplished by increased practice of abortion. Where birth rate declines were large, the results indicated that a comparatively larger share of the fecund exposed population was protected by contraception. Conversely, where declines in birth rates were smaller, the size of the target was smaller in comparison with the number of fecund exposed women.

One objective of this research is to find what proportion of the target was provided family planning services by the program in each departamento. Were there departamentos where large family planning targets were met without help from the family planning programs? Were there departamentos where there were large inputs of family planning with comparatively small targets? This line of analysis is valuable for purposes of identifying departamentos where the family planning programs appear to have been highly effective and where they have been least effective.

Table 3-7 provides estimates of the family planning target for each departamento for each year, 1964 to 1975. These estimates were made using the birth rates for 1964 and 1975 which have been established in Section II. It also made allowance for sexual activity outside marriage, migration, and differential mortality between departamentos. Thus, it is the most precise estimate that it is possible to make of the actual volume of contraception practiced in each departamento, while controlling for these other factors.

In order to measure the role of the family planning programs in accomplishing these targets, a "percent of target provided by family planning" statistic was computed. The numerator of this rate is the family planning service, as estimated in column 1 of Table 3-6. The denominator of this rate is the sum of the family planning target statistics for 1969, 1970, 1971, 1972,

1973, and 1974. These are recorded in column 1 of Table 3-8. The percent of family planning target provided by family planning programs is computed by dividing the data of column 2 by those of column 1 and multiplying by 100. This is done departemento by departemento and recorded in column 3 of Table 3-8.

If the family planning program had spread its energies equally over the nation, in proportion to the female population of reproductive potential, the data of column 3 of Table 3-8 would be identical in all departamentos. This is not the case. The percentages range from a high of 75 percent in Nariño departemento to a low of 14 percent in Cundinamarca departemento. For about one-half of the departamentos, the contribution of family planning to the attainment of the target is 40 percent or more. In only three departamentos is it less than 25 percent—Boyacá and Cundinamarca. Thus, the family planning program significantly contributed to the attainment of the target needed to accomplish fertility decline in almost every departemento. The general finding of Chapter Two, that the family planning program was providing a very substantial share of the contraceptive service for the nation, is true for all but a few of the departamentos.

Is the percentage of the family planning target provided by the family planning program related to the decline in the birth rate? Figure 3-3 is a scattergram of the data of column 3 of Table 3-8 plotted against the decline in the birth rate (column 5 of Table 3-7). If one ignored Nariño and Cundinamarca (the outliers in Figure 3-2), the relationship is a moderately consistent one, despite the fact that one could have expected a complete absence of relationship. Where programs met a larger share of the target, the decline in fertility tended to be greater. In other words, where the decline in fertility was largest, the family planning program was more active and helpful in quickening fertility decline. This in turn created (ex post facto) larger annual family planning targets. Thus, there is general but very convincing evidence that the interdepartemento variation in fertility decline is linked to the interdepartemento intensity of family planning effort.

The points *below* the trend line in Figure 3-3 identify those departamentos which met their targets with comparatively less help from the family planning program, while those points above the line identify those departamentos which were most *dependent* upon the family planning program for whatever progress they made in fertility reduction. The most rural and "backward" departamentos fall within this second category, while the more urbanized and cosmopolitan departamentos tend to fall within the first. Thus, one of the services which the family planning programs clearly played was to pioneer in bringing family planning to the less economically and socially developed departamentos of the nation.

Change in Total Fertility
Rate 1964-1975

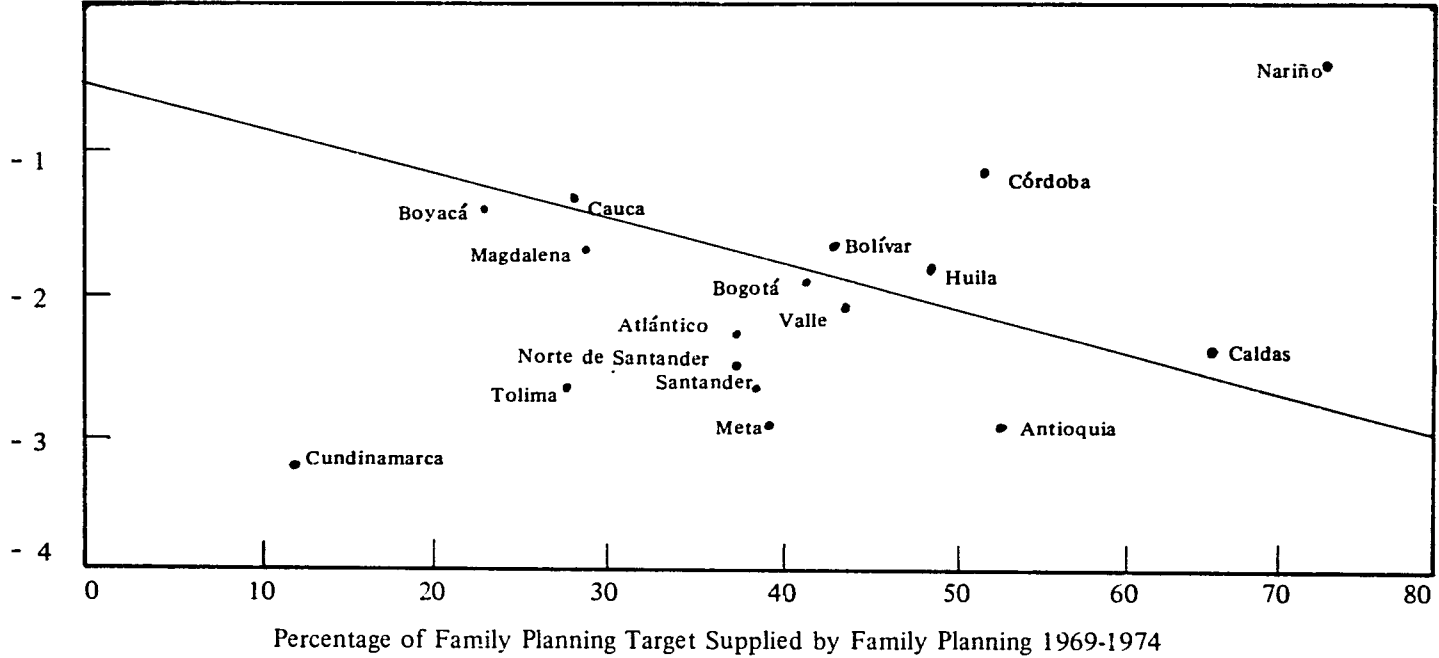


Figure 3-3. CHANGE IN TOTAL FERTILITY RATE 1964 TO 1975 BY PERCENTAGE OF FAMILY PLANNING TARGET SUPPLIED BY FAMILY PLANNING 1969 TO 1974.

Table 3-8. PERCENTAGE OF REQUIRED PROTECTION
PROVIDED BY FAMILY PLANNING
BY DEPARTAMENTO.

Departamento	Required protection	Provided protection	Percentage of provided to required protection
Total	3778	1497	39.6
Bogotá (a)	878	365	41.6
Antioquia	447	235	52.6
Atlántico	211	79	37.4
Bolívar	218	93	42.7
Boyacá	100	23	23.0
Caldas	251	166	66.1
Cauca	92	27	29.3
Córdoba	83	43	51.8
Cundinamarca	196	28	14.3
Chocó	17	-- (b)	n.d.
Huila	67	33	49.3
Magdalena	121	35	28.9
Meta	51	20	39.2
Nariño	52	39	75.0
Norte de Santander	97	36	37.1
Santander	190	72	37.9
Tolima	185	50	27.0
Valle	522	153	42.7

(a) See notes to Table 3-1.

(b) No data.

VII Conclusion

The information presented above lends considerable support to the contention made in Chapter One that the organized family planning programs of Colombia have played the major role in recent fertility declines. Simply, fertility declines are concentrated in those departamentos with more active family planning programs. Although there are some deviations from a linear relationship that deserve further investigation, this association is quite consistent even when using slightly different measurement techniques.

There is little doubt, therefore, that in the face of increased numbers of women exposed to the risk of pregnancy, family planning programs have supplied enough contraception in Colombia to slow the pace of growth caused by high fertility. Furthermore, these gains were achieved in a country which can most definitely be characterized as less developed. Poverty, illiteracy, and rural background, therefore, need not present an insurmountable barrier to the achievement of a more rational fertility behavior.

References

- Bogue, D., S. Edmonds, and E. Bogue. 1973. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Status on Birth Rates*. RFFPI Manual No. 6. Chicago: Community and Family Study Center, The University of Chicago.
- Elkins, Henry G. 1973. "Cambio de Fecundidad," Capítulo 2, *La Fecundidad en Colombia: Encuesta Nacional de Fecundidad*, Rodolfo Heredia B. y Elena Pradø S., edit. Publicación Número 5, Encuesta Nacional de Fecundidad ["Fertility Change," Chapter 2, *Fertility in Colombia: National Fertility Survey*].

Chapter Four

AN EVALUATION OF THE DEMOGRAPHIC IMPACT OF THE NATIONAL FAMILY PLANNING PROGRAM OF THAILAND

Dennis Hogan

I

Introduction

The population growth rate of Thailand in 1964 was approximately 3.1 percent annually, among the highest in the world. This high rate of growth is a modern phenomenon. Thailand experienced a relatively slow rate of population growth throughout the first half of the twentieth century, a crude death rate of about 30 per 1,000 counterbalancing a crude birth rate of about 45. Following World War II, Thailand experienced a rapid decline in levels of mortality, the crude death rate dropping to below 20 by the mid-1950s and to a level of about 12 by the mid-1960s. Throughout the period of mortality improvement the crude birth rate remained constant at around 45. The 1947 population of about 17 million persons had increased to about 26 million by 1960 and to about 36 million by 1970. With a rate of natural increase of 3.1 percent annually, the doubling time for the Thai population was about 22 years (Population Council, 1971, 1972; Thomlinson, 1971).

Until 1965 the Thai government population policies concentrated on public health measures to reduce the death rate; regarding fertility, the government policy was historically pronatalist. In 1959 a report released by World Bank economic advisors warned that the rapid population increase in Thailand would result in "many alarming problems, such as shortage of schools and public services as well as a shortage of living accommodations" (Thomlinson, 1971: 102). During the 1960s the government began to reassess its population policies. In 1968 a pilot family planning program was begun by the Thai Ministry of Public Health. This program was incorporated into ex-

isting health services. The early focus was on the training of physicians, nurse-midwives, auxiliary midwives, and male health workers in population and family planning. In 1970 the auxiliary midwives were authorized by the government to distribute oral contraceptives to any woman who had no apparent health problems after answering a checklist of questions regarding health history and current medical conditions. The use of such paramedics for the distribution of oral contraceptives is an unusual feature among worldwide family planning programs (Population Council, 1971). Oral contraceptives are also available without prescription in pharmacies throughout the nation (Riley and Santhat, 1974).

In March, 1970, the Thai Cabinet accepted the recommendations of the National Economic Development Board concerning the formal adoption of a national family planning program (NFPP): "The Thai Government has the policy to support voluntary family planning in order to resolve various problems concerned with the very high rate of population growth, which constitutes an important obstacle to the economic and social development of the nation" (Population Council, 1972). Full-scale family planning activities were begun under the auspices of the Ministry of Public Health with the following objectives (Thai-American Evaluation Team, 1975):

1. to reduce the annual rate of population increase from more than 3 percent to about 2.5 percent by the end of 1976
2. to provide family planning information to women of the childbearing ages (especially to those living in remote rural areas) to motivate them to accept family planning and to make family planning services available throughout the nation
3. to integrate fully family planning services with maternal and child health services in order to increase the efficiency of each.

II

Trends in Contraceptive Practice and Period Fertility Rates

Considerable demographic research done over this period provides baseline and trend demographic data on fertility desires, family planning adoption, and fertility performance. The two rounds of the *National Longitudinal Study* (Knodel and Prachuabmoh, 1973; Knodel and Pitaktepsombati, 1975) indicate that women, whether urban or rural residents, bear substantially more children than they reported desirable.

Rural women aged 40 to 44 have an average of 5.63 children, although their stated desire is only 4.29; for provincial urban women, the actual number is 5.21 and the ideal is 4.42; and for Bangkok-Thonburi residents the comparable figures are 4.95 and 4.04 (Knodel and Prachuabmoh, 1973: 29).

Between the first (1969-70) and the second (1972-73) rounds of the *Longitudinal Study*, the percent of all currently married women aged 15 to 44 able to mention spontaneously at least one method of family planning increased from 54 percent to 71 percent. By 1975 only 3.5 percent of ever-married women aged 15 to 49 had not heard of any method of contraception; 92 percent of the women had heard about the pill, 86 percent about the IUD, 70 percent about the contraceptive injection, 87 percent about female sterilization, and 70 percent had heard of the vasectomy (*Survey of Fertility in Thailand*).

Increased knowledge about family planning and more favorable attitudes resulted in higher rates of family planning use over the interval. The percentage of women reporting they had ever practiced contraception grew from 20.1 in 1968-69 to 35.2 in 1971-72, immediately following the implementation of the National Family Planning Program. By mid-1975, about 45 percent of ever-married women aged 15 to 49 reported that they used some method of contraception.

Among currently married women aged 15 to 44, about 14 percent were currently practicing contraception in 1968-69, compared with 26 percent in 1971-72. Among currently married women aged 15 to 49 in 1975, about 37 percent were practicing contraception. Among urban women the figures for the three dates are 33, 45, and 49 percent, respectively; this compares with 11, 23, and 35 percent of the rural women using contraceptives in each year (*Survey of Fertility in Thailand*). Increases in contraceptive use since the initiation of the national family planning program have thus been concentrated among rural women. This reflects the emphasis of the NFPP on the delivery of contraceptive services to women in the rural areas through the use of paramedics and mobile medical teams.

Not surprisingly, these increases in the use of contraception from all sources have resulted in measurable declines in period fertility rates. The 1960 Census shows a total fertility rate of 6,416. The *Survey of Fertility in Thailand* estimates the 1965-69 TFR as 6,250, the same level reported for 1964-65 by the *Survey of Population Change*. The *National Longitudinal Study* reports a TFR of 6,100 in 1968-69 and 5,350 in 1971-72. The 1970 Census indicates a decline in the TFR to 5,600. Since 1970 the downward trend in fertility has continued. The 1974-75 *Survey of Population Change* estimates the TFR as 5,100. This contrasts with the World Fertility Survey estimate of 4,850 for 1970-74 and 4,300 for 1973-74 (NESDB, 1975; *Survey of Fertility in Thailand*, 1977; NFPP, 1977).

The evidence is thus clear-cut that there have been substantial declines in fertility in Thailand between 1960 and 1975. The downward trend in fertility is confirmed by two successive censuses, by a series of nationwide fertility surveys, and by the *Surveys of Population Change* which match vital registration system data with data from special surveys to obtain estimates of the true levels of fertility.

While there is no doubt that fertility has declined, the level of fertility by 1975 is less precisely determined. An estimated total fertility rate in 1975 of 4,880 is about the same level as that calculated by the *Survey of Fertility in Thailand* (World Fertility Survey) for the entire 1970-74 period (TFR = 4,850). It is about three-quarters of the way between the 1973-74 estimate from the *Survey of Fertility in Thailand* (TFR = 4,300) and the 1974-75 estimate from the *Survey of Population Change* (TFR = 5,100). A TFR of 4,880 in 1975 corresponds to a crude birth rate of about 34.

III

Possible Sources of Fertility Decline

This section attempts to estimate the degree to which the observed declines in actual fertility in Thailand can be attributed to the national family planning program. Fertility declines must result from a decreased proportion of women exposed to the risk of a birth (see Section One). There are four possible ways for reduced exposure to occur:

1. *Infecundity*—The proportion of women who have reached the advanced ages of reduced fertility has increased.
2. *Abstinence*—The proportion of women in the childbearing ages who are not exposed to sex because they are unmarried or not in a sexual union has increased.
3. *Contraception*—The proportion of women in childbearing ages who are using contraception has increased.
4. *Abortion*—The proportion of pregnant women who resort to abortion has increased.

The age distribution of Thailand's population has grown progressively younger over the interval due to the dual factors of higher fertility and rapidly declining mortality. An increased proportion of women in the childbearing ages are thus concentrated in the younger, more fertile ages, which may have tended slightly to increase the birth rates. It is possible that all three of the other factors were acting simultaneously to reduce fertility—delayed marriage, increased use of contraception, and increased resort to abortion.

In order to study the interrelationship between contraception and birth rates (controlling for infertility and changing marriage patterns), an empirical link between birth rates and contraceptive behavior must be established. This is provided by the demographic model described in Chapter One of this volume.

In this chapter, PROJTAG is used retrospectively to compute how much contraception was actually accomplished in previous years in order to bring about an observed or confirmed decline in fertility. The base population used is for 1964 before the family planning program got underway. The year 1971

is used as a turning point since it was at about this time that the family planning program began its most active phase. The year 1975, when the total fertility rate had fallen to 4,880 (from 6,304 in 1964), is the last year for which statistics on the level of fertility are available, so it is chosen as the terminal year.

Contribution of the NFPP

The first step of this analysis is to estimate the total number of woman-years of protection (contraception) required to produce the observed fertility rate in each of these three years (1964, 1971, and 1975). In order to do this, the PROJTARG program was supplied with the age-specific fertility rates, the age-size distribution of the female population, and the proportion of the female population living in conjugal union at each age. These data (and their sources) for each year are shown in Table 4-1. The PROJTARG calculation based on these parameters indicates that the total contraceptive practice in the population provided 521,800 woman-years of protection in 1964, 1,130,300 woman-years of protection in 1971, and 1,637,000 in 1975.

The next step is to estimate the contributions of the NFPP, the commercial sector, abortion, and folk contraception to the woman-years of contraceptive practice in each year. These figures must be reconciled with the total level of contraceptive practice in that year, as indicated by the preliminary PROJTARG estimates. The NFPP has maintained a complete record of new family planning acceptors and the number of current contraceptive users for each year since the initiation of the program. The number of new acceptors of contraception from all NFPP sources for each year from 1964 to 1975 is shown in Table 4-2.

The third step in the analysis is to calculate the woman-years of protection provided by the national family planning program. The Thai-American Evaluation Team (1975: Table 3) estimates that the NFPP provided 311,867 woman-years of protection in 1971 as a result of new users recruited in that year and continuing users recruited in previous years. The procedures of the Thai-American Evaluation Team can be followed in calculating the number of continuing users in 1975 from previous years with the addition of the woman-years of protection provided to new acceptors during 1975. This yields an estimate of 1,008,797 woman-years of protection provided by the NFPP during 1975.

In 1964 the NFPP supplied no contraceptive protection to the Thai population, since it had not yet begun its program. By 1971 the NFPP supplied approximately 27.6 percent of the total contraceptive protection experienced by the Thai population ($.276 = 311,867/1,130,331$). The NFPP provided 61.6 percent of the total woman-years of contraception experienced by the Thai women in 1975 ($.616 = 1,008,797/1,637,045$).

Table 4-1. INPUT PARAMETERS FOR ESTIMATING THE REQUIRED WOMAN-YEARS OF CONTRACEPTIVE PROTECTION: 1964, 1971, AND 1975.^(a)

Year and parameter	Age of women						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
<u>1964</u>							
Population size	1,554,100	1,285,280	1,073,660	904,300	795,560	6,7,240	545,980
Proportions in conjugal union . . . . .	.1450	.5690	.7930	.8580	.8650	.8330	.7840
Fertility rate . . . . .	.0664	.2589	.3026	.2731	.2224	.1123	.0251
<u>1971</u>							
Population size	1,998,600	1,688,270	1,276,590	1,031,350	958,240	823,010	679,320
Proportions in conjugal union . . . . .	.1800	.5800	.7910	.8580	.8670	.8470	.8040
Fertility rate . . . . .	.0714	.2329	.2864	.1862	.1709	.1275	.0168
<u>1975</u>							
Population size	2,252,600	1,918,550	1,392,500	1,103,950	1,051,200	923,450	783,800
Proportions in conjugal union . . . . .	.2000	.5860	.7890	.8580	.8690	.8550	.8160
Fertility rate . . . . .	.0638	.2081	.2559	.1664	.1528	.1139	.0150

(a) The population size and proportions in conjugal union parameters are obtained for 1964 by linear interpolation between the 1960 and 1970 Population Census figures. The 1971 and 1975 values are estimated by extrapolating the annual change between 1960 and 1970 to 1971 and 1975 using the 1970 Census figures as a base. The adjusted Census midyear population counts are from Arnold and Phansirama (1975). The proportions currently married in 1960 and 1970 are taken from the two National Population Censuses as published by the National Statistical Office.

The fertility rates for 1964 are taken directly from those estimated for 1964-65 in the Survey of Demographic Change of the National Statistical Office. The 1971 fertility rates are interpolated from the two panels of the Longitudinal Study of the Institute for Population Studies. The estimates of fertility rates by age group are made from the marital fertility rate as described in Table 5 of the Report of the Thai-American Evaluation Team. Preliminary tabulations from the Survey of Fertility in Thailand, the most recent Survey of Population Change, and calculations by Pordthaisong (1977) indicate a 1975 Total Fertility Rate of 4880. This TFR was distributed into estimated age-specific fertility rates for 1975 using the 1971 age pattern of fertility performance (since the age pattern of fertility in 1975 was unavailable at the time of this analysis).

Table 4.2. NUMBER OF NEW ACCEPTORS OF FAMILY PLANNING FOR EACH METHOD OF CONTRACEPTION: NATIONAL FAMILY PLANNING PROGRAM IN THAILAND, 1964 TO 1975.^(a)

Year	Total	Method of contraception provided			
		Pill	DMPA	IUD	Sterilization
1964 . . .	0	0	0	0	0
1965-67 . .	129,593	8,689	0	86,180	34,723
1968 . . .	57,300	10,000	0	35,300	12,000
1969 . . .	130,219	60,459	0	54,496	15,264
1970 . . .	228,578	132,387	3,139	74,404	18,648
1971 . . .	407,835	294,607	3,648	86,034	23,546
1972 . . .	456,694	327,582	6,316	90,128	32,668
1973 . . .	422,176	268,674	10,447	93,449	49,606
1974 . . .	487,699	305,244	19,014	89,739	73,702
1975 . . .	535,023	345,117	24,559	75,163	90,184

(a) Taken from official NFPP statistics (Thai-American Evaluation Team, 1975; Population Council, 1971, 1972, 1974; and unpublished NFPP tabulations). In cases where the number of acceptors by method and year differed slightly, the Thai-American Team figures were used.

The fourth step is to distribute these total woman-years of protection according to the method of contraception. Women protected from pregnancy by contraceptive sterilization (of self or husband) are first removed from the count of protected women. (Throughout this analysis male and female sterilization are combined because the necessary statistics on acceptors do not separate the two. Most sterilizations in Thailand are of females. The *Survey of Fertility in Thailand* reports that of all couples protected by sterilizations about three-quarters are protected by the sterilization of the wife.)

The remaining woman-years of contraception are distributed as follows. Each new pill adopter is assumed to represent 1.58 woman-years of protection, each IUD acceptor about 2.10 years, and each contraceptive injection (DMPA) adopter about 4.50 years. These figures are based on contraceptive continuation and failure rate studies that have been done for Thai women (NFPP, 1976; McDaniel and Pardthaisong, 1974; Thai-American Evaluation Team, 1975). These average duration of use figures were multiplied by the number of new acceptors of each method in 1971 and 1975 to obtain the relative proportion of protection provided by each source of contraception. While not exact, these estimates are probably not substantially biased in any direction. (Each method had relatively equal numbers of holdovers from previous periods since the mix of family planning services offered by the NFPP, excluding sterilizations, did not change greatly over the period.) At any rate, the *total* contraceptive protection provided by the NFPP remains correctly estimated under these procedures.

Contribution of the private/commercial sector

The next step is to partition the sources of contraceptive protection outside of the NFPP. Data compiled by Price Waterhouse and the United States Agency for International Development/Bangkok indicate that in 1964 commercial sales of oral contraceptives in Thailand totaled 431,800 cycles. By 1971 this figure had increased to 3.8 million cycles of oral pills. After 1971 commercial sales stabilized, totalling 3.4 million cycles in 1974 and about 3.6 million cycles in 1975. Assuming that 13 cycles of pills provide one year of contraceptive protection, the commercial sale of pills supplied about 33,200 woman-years of protection in 1964, 292,300 woman-years of protection in 1971, and the woman-years of protection equalled 279,500 in 1975.

Data on commercial sales of the condom were also collected, though not reported here. The use of the condom in Thailand has historically been for disease prevention rather than for family planning. Since many prostitutes will be protected from pregnancy by oral contraceptives or injections, counting the condoms sold as family planning protection would overestimate the contribution of the commercial sector and underestimate the contribution of the folk sector. Only one percent of the women practicing contraception in 1975 reported the condom as the method used (*Survey of Fertility in Thailand*).

Measuring the level of abortion in Thailand is more problematic. Abortion is legal in Thailand in cases where the health of the mother is endangered and under other selected circumstances, but it is not legally permitted as a method of family planning. Research that has been done on the level of illegal abortions is limited. The available evidence suggests that the rate of induced abortions in Thailand in 1972-73 was probably around 5 per 100 births (USAID/Bangkok). The *Northern Thailand Fertility Study* (1977) estimates that the abortion rate is fewer than 5 per 100 births in Chiang Rai changwat where the practice of contraception and the adoption of a low fertility regime are relatively recent, but is perhaps as high as 10 to 13 births per 100 in Chiang Mai changwat, which has a longer history of fertility control. Cook and Leoprapi (1974) suggest that the abortion rate may be as low as 5 or as high as 15 per 100 births.

The lower estimate of the abortion rate (5 per 100 births) is used as the approximate rate of abortion in 1964, 1971, and 1975. Based on the number of births in these years and assuming that each abortion provides one woman-year of protection (Bogue, Edmonds, Bogue, 1973: 80), 63,600 woman-years of protection in 1964, 69,000 in 1971, and 70,400 in 1975 are attributable to abortion. If these procedures do underestimate the contribution of abortion to the reduction of births, they overestimate the contribution of the folk contraception sector by the same amount.

Some contraceptive sterilizations were also provided outside of the government programs, but there is no direct data on the exact numbers. Survey data are available on the number of women in the childbearing ages who report

themselves or their husbands as sterilized. By decrementing this by the number of women who were sterilized by the NFPP, it is theoretically possible to identify the proportion of women sterilized by the private sector. Unfortunately, this cannot be done because the Thai survey data apparently overreported the level of sterilization to an undetermined extent (Knodel and Prachuabmoh, 1974: 431).

Therefore, as a rough approximation, no contraceptive sterilizations in 1964 are counted. In 1971 about 2.0 percent of the women were sterilized nationally. The NFPP had sterilized about 1.7 percent by 1971, leaving a remainder of 13,746 women sterilized by the private sector. Maintaining the same relative proportions for the sterilizations provided inside and outside of the NFPP, in 1975 an estimated 43,700 women were protected by a contraceptive sterilization performed outside of the NFPP. If any bias is inherent in these estimates, it is to undercount the contraceptive protection provided by sterilizations performed by the private sector and to overcount that provided by folk contraception. This procedure does not affect the level of protection due to the NFPP.

Finally, no direct measures are available of the protection provided by the practice of folk contraception such as rhythm, prolonged breast-feeding, or postpartum abstinence. Consequently, the amount of folk contraception is computed as a residual. PROJARG indicates the total level of contraception practiced in Thailand in a given year; by reckoning the proportions of that protection due to the activities of the NFPP, the commercial sector, and illegal abortion, the remainder may be treated as the amount of protection provided by folk contraceptive protection. This declines to 39.2 percent by 1971, and 14.5 percent by 1975. The *Survey of Fertility in Thailand* reports that about 9 percent of currently married women practicing some form of contraception are using folk methods. Since additional women are probably protected by the breast-feeding of their last child, an estimate of 14.5 percent of the total contraceptive protection provided by some form of folk contraception seems reasonable. In a population that is rapidly adopting modern methods of contraception, a drop in the levels of folk contraception is expected.

IV

Allocating Sources of the Fertility Decline

Once all necessary information for PROJARG has been calculated for 1964 to 1975, the model can be run in two steps. First, the model is fit for the 1964 to 1971 period. The output from this first cycle is then used as input for a second cycle to fit the experience of the 1971 to 1975 period. This procedure allows a turning point to occur in 1971 so that the experience of the entire 1964 to 1975 period need not be viewed as a linear trend. The experiences

Table 4-3. WOMEN PROTECTED FROM THE RISK OF CHILDBEARING BY SOURCE: THAILAND, 1964-75.^(a)

Year	Number of women						
	In child-bearing ages	Fecund	Unexposed fecund	Exposed fecund	Fecund, protected by nonexposure and contraception	Protected by nonexposure, sterility, and pregnancy	Fecund, who need not be protected
1964...	6806.1	5542.2	2269.6	3273.4	2791.3	4722.9	2751.2
1965...	7016.2	5717.2	2336.2	3381.0	2933.5	4839.5	2783.6
1966...	7236.9	5900.5	2406.1	3494.4	3083.6	4961.9	2816.9
1967...	7468.1	6092.7	2479.0	3613.7	3241.8	5089.6	2850.9
1968...	7709.8	6293.7	2554.5	3739.2	3408.5	5222.2	2885.2
1969...	7961.7	6503.4	2632.2	3871.2	3583.8	5359.1	2919.6
1970...	8223.6	6721.8	2712.0	4009.8	3767.9	5499.7	2953.9
1971...	8495.3	6948.7	2793.3	4155.4	3961.0	5643.4	2987.7
1972...	8776.4	7183.8	2875.9	4307.8	4177.2	5780.8	3006.6
1973...	9066.7	7426.8	2959.4	4467.3	4403.4	5919.6	3023.3
1974...	9365.9	7677.3	3043.4	4633.9	4639.8	6059.4	3037.5
1975...	9673.8	7934.8	3127.4	4807.4	4886.2	6199.9	3048.7

Year	Number of women					
	Exposed fecund who were contracepted	Contracepted inside F.P. program (best estimate)	Contracepted outside F.P. program	Contracepted inside F.P. program (conservative estimate)	Percent of contraceptive protection by F.P. program (best estimate)	Percent of contraceptive protection by F.P. program (conservative estimate)
1964...	521.8	0.0	521.8	0.0	0.0	0.0
1965...	597.3	23.6	573.8	18.9	3.9	3.1
1966...	677.5	53.4	624.1	42.7	7.9	6.3
1967...	762.9	90.2	672.6	72.2	11.8	9.4
1968...	854.0	134.7	719.3	107.8	15.8	5.8
1969...	951.5	187.6	764.0	150.1	19.7	9.0
1970...	1055.9	249.8	806.1	137.0	23.7	19.0
1971...	1167.8	322.3	845.5	257.8	27.6	22.1
1972...	1301.3	469.8	831.5	375.8	36.1	28.9
1973...	1440.0	644.0	800.0	515.2	44.7	35.8
1974...	1596.4	847.7	748.7	678.2	53.1	42.5
1975...	1758.8	1083.4	675.4	866.7	61.6	49.3

(a) All values are in thousands of woman-years.

from 1964 to 1971 and from 1971 to 1975 are treated as changing in a linear fashion under this procedure. The turning point is 1971 because that year is the first in which the NFPP was fully active. (Because the life table mortality values input do not exactly reproduce the population size used in the preliminary runs, the woman-years of contraception in 1971 and 1975 vary slightly from earlier estimates. The proportion of the protection provided is exactly as calculated, however, and it is here that the primary interest lies.)

The total number of women in the childbearing ages increased monotonically from 1964 to 1975 (Table 4-3, column 1). The number of fecund women (Table 4-3, column 2) likewise increased. The decline in the fertility rate cannot be a result of increased proportions naturally sterile since the proportion fecund increased from 81.4 percent in 1964 to 82.0 percent in 1975. Similarly, the fertility rate decline cannot be attributed to reduced sexual exposure among fecund women since the proportion of women who were fecund and sexually active (Table 4-3, column 4) increased from 48.1 percent of the total in 1964 to 49.7 percent in 1975.

The increased protection from the risk of pregnancy necessarily resulted from increased contraception or abortion (Table 4-3, column 8). While only 15.9 percent of the sexually active, fecund women were protected by contraception or abortion in 1964, this increased to 28.1 percent in 1971 and 36.6 percent in 1975. In 1964 all of the contraceptive protection was provided outside of NFPP sources (contraception and abortion). By 1971 this had declined to 72.4 percent, and by 1975 outside of program sources accounted for only 38.4 percent of the contraceptive protection experienced by the fertile, sexually active female population. Conversely, the NFPP provided none of the contraceptive protection in 1964, 27.6 percent in 1971, and 61.6 percent in 1975.

Thus, the growth in contraceptive protection experienced by the population over this period can be largely attributed to an increase in protection from pregnancy offered by the NFPP. Woman-years of protection supplied by outside of program sources reached a peak of 845,500 in 1971 and declined thereafter. At least part of the growth in the contraceptive protection offered by the NFPP appears to be due to the substitution of NFPP services for outside commercial or folk sources. Even if the best estimate of the contraceptive protection provided by the NFPP is one-quarter too high (Table 4-3, columns 11 and 13), about 22 percent of the contraceptive protection experienced by women in 1971 was due to the NFPP. Fully half of the contraceptive protection enjoyed by these women in 1975 must be attributed to the National Family Planning Program, even under this conservative estimation procedure.

The percentage of annual woman-years of protection provided by each within program and outside of program source is shown in Table 4-4. Commercial sales of the oral pill increased rapidly from 1964 to 1971. After 1971 the level of protection provided by commercial sales of the pill levelled off at about 300,000 woman-years of protection annually. In 1971 this was about

Table 4-4. PERCENT OF TOTAL CONTRACEPTIVE PROTECTION PROVIDED BY EACH SOURCE OF PROTECTION: THAILAND, 1964 TO 1975.

Year	Inside NFPP sources					Outside NFPP sources				
	Total inside	Oral pill	DMPA	IUCD	Sterilization	Total outside	Abortion	Sterilization	Medical	Folk
1964 . .	0.0	0.0	0.0	0.0	0.0	100.0	12.2	0.0	6.3	81.4
1965 . .	3.9	2.0	0.0	0.7	1.3	96.1	11.2	0.2	10.2	74.5
1966 . .	7.9	3.9	0.1	1.6	2.3	92.1	10.2	0.4	13.6	67.8
1967 . .	11.8	5.9	0.2	2.2	3.5	88.2	9.3	0.7	16.7	61.5
1968 . .	15.8	7.8	0.2	3.0	4.7	84.2	8.4	0.8	19.5	55.5
1969 . .	19.7	9.8	0.3	3.8	5.8	80.3	7.6	1.0	21.9	49.8
1970 . .	23.7	11.8	0.4	4.5	7.0	76.3	6.8	1.1	24.0	44.3
1971 . .	27.6	13.7	0.4	5.3	8.2	72.4	6.1	1.2	25.8	39.2
1972 . .	36.1	17.8	1.3	6.4	10.6	63.9	5.6	1.9	24.2	32.0
1973 . .	44.7	21.7	2.5	7.3	13.1	55.3	5.3	2.4	22.2	25.4
1974 . .	53.1	25.6	4.0	8.0	15.5	46.9	4.8	2.7	19.8	19.6
1975 . .	61.6	29.3	5.9	8.4	17.9	38.4	4.1	2.7	17.1	14.5

one-quarter of the total protection experienced by these women, but by 1975 the relative importance of commercial sales of the pill had declined to about 17 percent. Contraceptive sterilizations in the commercial sector only accounted for about 3 percent of the woman-years of protection in 1975.

The relative importance of abortion and folk contraception declined steadily over the period, with abortion providing 12 percent and folk contraception 81 percent of the total protection in 1964, but only 4 percent and 14 percent respectively by 1975. By 1969 commercial sales of the oral contraceptive and a growth in the pilot project activities of the government program had reduced the role played by folk contraception to less than 50 percent of the total contraceptive protection.

The annual woman-years of protection provided by the National Family Planning Program increased annually for each method of contraception from 1964 to 1975. The oral pill was by far the most important source of contraceptive protection provided by the NFPP, accounting for 29 percent of protection from all sources and for about half of the protection from the NFPP. The IUD was the least quickly growing element of the program. The contraceptive injection assumed an increasingly important role in the program, though by 1975 that role still remained relatively small.

Contraceptive sterilization had become a major source of protection against pregnancy by 1975. Male and female sterilizations are estimated to account for about one-fifth of the total contraceptive protection provided by all sources and for almost one-third of the protection provided by the NFPP. These estimates are close to those of the *Survey of Fertility in Thailand* (Table 4-4), which reports that about one-quarter of the contraceptive protection enjoyed by women then practicing family planning was due to sterilization of either the husband or wife. The convenience and safety of both male and female sterilization as methods of contraception are likely to mean that this method will play an increasingly important role in providing contraceptive protection in the future.

Thus, the decline in the fertility rates of Thai women from 1964 to 1975 necessarily resulted from an increase in the contraceptive protection experienced by those women. Over this period, natural sterility among sexually active women declined due to the younger age distribution of married women. The proportions of fecund women protected from the risk of pregnancy by sexual inactivity also declined. The best estimate is that the woman-years of protection provided by abortion remained roughly constant over the period. Increased contraception is the only possible explanation for the fertility decline. This increased contraception almost certainly did not result from a high incidence of folk contraception, which most likely declined over the period. Rather, the increased contraception resulted from increasing numbers of women obtaining medical methods of contraception or surgical sterilizations. The commercial sale of oral contraceptives accounted for a portion of this increase,

but the protection offered by that service levelled off in about 1973. Sterilization outside of the NFPP continued to increase over the period, but remained too few in number to account for more than a small portion of the total increase in contraception. The evidence indicates that between 1974 and 1975 the total contraceptive protection enjoyed by Thai women increased by 1,237,000 woman-years. The NFPP provided no services in 1964; by 1975 the NFPP accounted for 1,083,400 woman-years of protection, or 87.6 percent of the total increase in contraceptive protection.

V

Births Averted by Contraceptive Protection

The results of contraceptive protection provided by program and nonprogram sources can perhaps be better understood when those results are expressed in terms of number of births averted. PROJTAG calculates this value by applying an estimated age-specific fertility rate for unprotected women to the woman-years of contraception figures already calculated. Table 4-5 reproduces the number of births, the total fertility rate, and the crude birth rate calculated for each year, along with the number of births averted by inside and outside program sources of contraception from 1964 to 1975.

In 1964 a total of 241,000 births were averted as a result of nonprogram sources of contraceptive protection (commercial sales, abortion, and the practice of folk contraception). This implies a crude birth rate reduction of 8.1 points below the potential natural fertility level of 50.7 that would have occurred in 1964 in the absence of all contraceptive protection. The fertility reduction due to the private sector declines steadily following the introduction of NFPP services on a nationwide basis. The contribution of the nonprogram sources of protection remains important throughout the period, however, with about a 7.4 point reduction in the natural fertility level CBR resulting in 1975.

The births averted by the national family planning program increased slowly during the experimental stages of the program. In 1971, the year the nationwide program was implemented, NFPP protection reduced the crude birth rate by 4 points. By 1974 program protection accounted for more births averted than did the private sector, producing a 9.6 point reduction in the CBR. By 1975 NFPP protection caused a 12 point reduction below the natural fertility level CBR, compared with the 7.4 point reduction due to the private sector.

By 1975 the age structure of the female population and the age-specific rates of marriage were such that natural fertility levels would have produced a crude birth rate of 53 in the absence of any contraceptive practice. The commercially obtained sources of contraception, the practice of folk methods of contraception, and abortion reduced the birth rate by about 7 points. Pro-

Table 4-5. ESTIMATED NUMBER OF BIRTHS, BIRTHS AVERTED, AND FERTILITY RATES
BY SOURCE OF PROTECTION: THAILAND, 1964 TO 1975.

Year	Births			Total fertility rate	Crude birth rate				
	Number actually occurring (000)	Averted due to NFPP contra-ception (000)	Averted by outside program sources of contra-ception (000)		Total	Expected		Reduction	
						In the absence of all contra-ceptive protection	In the absence of NFPP protection	Due to outside program sources	Due to NFPP
1964 . .	1271	0	241	6304	42.6	50.7	42.6	8.1	0.0
1965 . .	1287	11	265	6184	41.8	50.7	42.1	8.6	0.3
1966 . .	1303	25	289	6063	41.0	50.8	41.7	9.1	0.7
1967 . .	1317	42	311	5942	40.1	50.9	41.4	9.5	1.3
1968 . .	1333	63	332	5822	39.3	51.0	41.2	9.8	1.9
1969 . .	1349	87	353	5702	38.5	51.1	41.0	10.1	2.5
1970 . .	1365	115	373	5581	37.8	51.2	40.9	10.3	3.1
1971 . .	1380	150	391	5461	37.1	51.6	41.1	10.5	4.0
1972 . .	1389	217	384	5315	36.2	51.9	41.9	10.0	5.7
1973 . .	1397	298	370	5170	35.4	52.3	42.9	9.4	7.5
1974 . .	1403	392	346	5025	34.5	52.6	44.1	8.5	9.6
1975 . .	1409	501	312	4880	33.6	53.0	45.6	7.4	12.0

tection provided by the national family planning program reduced the 1975 crude birth rate by another 12 points. In other words, the NFPP accounts for about 60 percent of the total reduction in the level of fertility that would have prevailed in the absence of any contraceptive practice. With a 1975 crude birth rate of 34 and a crude death rate of 9, Thailand had a 2.5 percent rate of natural increase. The NFPP thus achieved the announced goal of the program by reducing the rate of natural increase from over 3 percent to 2.5 percent annually by 1975.

VI

The Net Impact of the NFPP

Calculated in this manner the NFPP has had a very pronounced effect on the crude birth rate in Thailand, reducing the annual rate of natural increase in 1975 by perhaps as much as 1.2 points. Such a procedure assumes, however, that none of the protection provided by the NFPP would have been provided by other sources had the government programs not existed. This assumption is obviously incorrect—earlier discussion indicates that commercial sales of contraceptives levelled off and the practice of folk contraception declined after 1971 because some women were substituting the protection provided by the NFPP for the contraceptive protection offered by these other sources. The issue thus becomes the extent to which the contraception provided by the NFPP is a substitute for contraceptive practices that would be utilized in the absence of the national program.

It is important to recognize that this is a sociological and not a demographic issue. Demographically speaking, the activities of the NFPP did, *ceteris paribus*, reduce the birth rate by 12 points. The sociological issue is in regard to the *ceteris paribus* assumption—the question of what would have happened to contraceptive practice in the absence of an active national family planning program. Such a question is inherently unanswerable given the lack of any quasi-experimental Thai control group not exposed to the NFPP, although some guesses can be proffered as to likely trends or the levels of contraceptive substitution inherent in the NFPP. In this way some judgment may be made of the true impact of the NFPP on the birth rate of Thailand.

As a first approximation, assume that in the absence of the NFPP the commercial factor and the use of folk contraception would have increased at the same rate between 1971 and 1975 as it did between 1964 and 1971. Between 1964 and 1971 the private/commercial sector woman-years of contraception increased from 521,800 to 845,500 for an average annual rate of increase of about 8.9 percent (using 1964 as the base). To maintain an average annual rate of 8.9 percent between 1964 and 1975 the woman-years of contraceptive protection from outside of program sources would have totalled 1,032,600 in

1975 (instead of the observed 675,400). This would imply 476,900 births averted. All sources of protection in 1975 prevented 813,000 births. The net number of births averted attributable to the NFPP is then about 336,100, equivalent to a birth rate decline of 8 points. Thus, even if the commercial and private sector contribution to contraceptive practice had continued to grow at the same annual rate from 1971 to 1975 as it did before the introduction of the NFPP, the NFPP can be credited with reducing the CBR about 8 points below the otherwise expected level of 41.6. The contraceptive practice expected in the private sector would only have been sufficient to maintain fertility levels at their 1964 levels since increased numbers of women had to be protected. In other words, this first procedure suggests that about 89 percent of the decline in the crude birth rate of Thailand between 1964 and 1974 was due solely to the NFPP.

A variation of this procedure is to look at the increase in contraceptive protection that must have occurred between 1964 and 1975 to produce a fertility rate in 1975 that was at the same level as that of 1964. In 1975, the CBR of 33.6 was a result of 1,409,000 births to 3,048,700 unprotected women. A CBR of 42.6 would imply 1,786,000 births to 3,864,000 unprotected women. Thus, 943,000 women must receive contraceptive protection in 1975 to maintain the crude birth rate at 42.6 (the 1964 level). PROJARG calculates that 1,758,800 women were contracepted in 1975, producing the observed CBR of 33.6. Thus, 815,800 woman-years of protection in 1975 served to reduce the CBR to 9 points below the 1964 level ($815,800 = 1,758,800 - 943,000$).

The NFPP in 1975 provided 1,083,400 woman-years of protection. If half of this contraceptive service is a substitute for contraception that would be otherwise obtained, the NFPP provided a net increment in contraceptive practice in 1975 of 541,700 woman-years. Under these calculations about 66 percent of the birth rate decline over the interval should be attributed to the net effects of the NFPP. Even if the conservative estimate of the amount of family planning protection provided by the NFPP (Table 4-3, column 11) is used, and half of this amount is a substitute for protection that would otherwise have been obtained from other sources, 53 percent of the drop in the crude birth rate of 1975 below the 1964 levels is due to the NFPP.

Table 4-6 indicates the percentage of the total birth rate drop that is attributable to the national family planning program under varying assumptions regarding the percentage of the NFPP acceptors who would have been protected by other sources had the public program not been available. The percentage that most accurately depicts the situation in Thailand regarding the substitutability of commercial and private sector sources for the services of the NFPP cannot be precisely ascertained, as indicated earlier. However, under any reasonable assumptions regarding the degree of substitutability, the NFPP must be credited with half or more of the drop in the crude birth rate.

Table 4-6. PERCENTAGE OF THE CRUDE BIRTH RATE DECLINE IN 1975 FROM 1964 LEVELS THAT CAN BE ATTRIBUTED TO THE THAILAND NATIONAL FAMILY PLANNING PROGRAM UNDER DIFFERING ASSUMPTIONS REGARDING THE SUBSTITUTABILITY OF PRIVATE FOR PUBLIC SECTOR SOURCES OF CONTRACEPTION.

Percentage of NFPP effort that is substitute for private sector	Net woman-years of contraception due to NFPP	Percent of crude birth rate decline due to NFPP
0.	1,083,400	132.8
15	920,890	112.9
33	725,878	89.0
50	541,700	66.4
67	357,522	43.8
85	162,510	19.9
100.	0	0.0

The estimates of the first procedure are the most reasonable. If the commercial and private sector sources of protection from births had grown at the 1964-71 rates during the period of the active phase of the NFPP (1971-75), the NFPP activities would account for about 90 percent of the decline in the crude birth rate of Thailand.

VII

Trends in the Absence of the NFPP

There are many reasons to believe that the NFPP did not simply replace or substitute for contraceptive protection from the private sector that would otherwise have been utilized. First, the efforts of the NFPP particularly focussed on remote or inaccessible rural areas otherwise unlikely to have had access to oral contraceptives through commercial sources. The NFPP use of paramedics and midwife nurses for the distribution of oral contraceptives is particularly noteworthy in this regard. Second, the cost of oral contraceptives from the commercial sector in 1975 was about 12 *baht* (\$0.60) per one-month cycle (Riley and Sermsri, 1974: 47-51). An unskilled worker in Thailand earns approximately 10 to 15 *baht* per day. The NFPP stations supplied contraceptives at an official charge of 5 *baht* (\$0.25) per cycle (Thai-American Evaluation Team, 1975:23). Even the 5 *baht* charge of the NFPP might be sufficiently large to prevent a number of very poor people from purchasing the oral pills (Riley and Sermsri, 1974: 47); certainly the 12 *baht* charge of the commercial sector prohibited a large number of the NFPP users from purchasing the oral contraceptives in the absence of the NFPP.

Perhaps the best reason for understanding why the NFPP program cannot simply be a substitute for privately available sources is to envision what the private sector supply of contraception would have been in 1975 to maintain a CBR of 33.6 without a government family planning program. To maintain fertility at the 1975 levels, 1,758,800 woman-years of protection must come from the private sector. The empirically observed contribution of the private sector peaked at 845,500 woman-years in 1971. Because of the expense involved and the inaccessibility of suitable clinic facilities to much of the rural population, it is extremely unlikely that privately obtained sterilizations could meet more than a tiny portion of this increased demand. The commercial sales of contraceptive pills would doubtless have been considerably higher. Suppose that the commercial sale of pills would have been 10 million cycles in 1975 (about 3 times the peak sales of 1971). This would account for about 769,260 woman-years of protection.

The remaining 989,600 woman-years of protection would have to be provided by either folk contraception or abortion. Recall that folk contraception during the 1960s peaked at about 473,400 woman-years of protection. Unlike the pill, with its high rates of use-effectiveness, methods of folk contraception (withdrawal, rhythm, abstinence, douche, and prolonged breast-feeding) are rather ineffective. It is unlikely that an increase in the practice of folk contraception could thus account for much of the increased supply from the private sector. For the sake of argument, assume that folk contraception would have been practiced by the women actually protected by the NFPP in 1975 who do not show up in this hypothetical discussion as pill users (614,700 women). Further assume that the practice of folk contraception for an entire year by two women equals about one woman-year of protection. (This is the value suggested for the rhythm method in Bogue et al., 1973: 81.) A total of 562,000 woman-years of protection from folk contraception would have been expected in 1975 ($561,900 = 614,700/2, 254,600$).

The practice of contraception from private/commercial sources and the private purchase of sterilizations would thus produce a total of 1,378,400 woman-years of protection ($1,378,400 = 769,200 + 561,900 + 47,300$). In order to maintain the CBR in 1975 at 33.6, an additional 380,400 woman-years of protection must be obtained ($380,400 = 1,758,800 - 1,378,400$). The only source left open is abortion. This hypothetical exercise suggests that the number of abortions in 1975 would have had to be 380,300 instead of the 72,900 actually estimated, if the CBR was to be maintained at 33.6. Such a veritable explosion in the rate of abortions implies that about 27 abortions would have been performed for every 100 live births. Even if the highest abortion estimates of Cook and Leoprapai (1974) are accepted, this would still indicate a doubling of the rate of abortion.

Of course, this discussion has been hypothetical, and the numbers are often simply reasonable guesses. Nonetheless, it is clear that the national family plan-

ning program in Thailand must be regarded as having had a substantial impact on the decline in the crude birth rate. Had the NFPP not existed, the observed decline in fertility by 1975 could have resulted if: (1) over 769,000 of the 4,807,000 couples in the nation purchased oral contraceptives at a cost of 12 *baht* or more per month; (2) about 1,120,000 couples practiced folk methods of contraception; or (3) approximately 380,000 couples resorted to abortion to avert a birth. From any public welfare viewpoint, a population policy resting on these figures would be disastrous. The NFPP *must* be regarded as being responsible for a substantial portion of the fertility decline observed between 1964 and 1975. Thailand simply could not have reduced its rate of natural increase so quickly in the absence of the public family planning program.

VIII

Summary and Conclusions

In conclusion, this chapter is an exercise in demographic modelling aimed at providing an answer to the question of the impact of Thailand's national family planning program on the fertility rate decline between 1964 and 1975. None of the data here can be regarded as exact. The Census population distribution, the life table (mortality) values, the trends in proportion sexually active at each age, the age-specific fertility rates, the contraceptive protection provided by each source and the use-effectiveness measures are all estimates. They are the best estimates available for Thailand, but it is possible that better data exist. If such is the case, or if critics of this report wish to suggest different assumptions regarding the parameters of the model or the calculation procedures outlined here, the PROJTAG model provides a formal method for judging relevance of such criticisms for the conclusions drawn.

Given these caveats the decline in the fertility rate of Thai women between 1964 and 1975 can in large measure be demonstrably attributed to the efforts of the national family planning program. Because the age distribution of child-bearing women and of sexual activity shifted downward over the interval, more contraceptive protection was necessary in 1975 than in 1964 to maintain fertility rates at their 1964 levels. Sufficient contraception to do this and to reduce the crude birth rate by about 9 points to 33.4 was obtained by these women. The national family planning program was the major source of this increased contraceptive protection. Even if the commercial sector of contraception had continued to grow at its pre-1971 rate after the initiation of the NFPP, the results would have been barely more than sufficient to hold the CBR at the 1964 levels. The best estimate is that the activities of the NFPP account for about 90 percent of the observed decline in the crude birth rate. Even if only half of the NFPP contraception is "new" contraception which would not have been avoidable in the absence of a public program and the

NFPP statistics on number of new acceptors exaggerate the true number by one-quarter, one-half of the birth rate decline is still conclusively due to the NFPP.

In the absence of a national program the level of fertility in Thailand almost certainly would have been much higher in 1975 than was observed. To maintain a CBR of 34 in 1975 without the NFPP, the commercial sector would have had to triple its peak yearly sale of oral contraceptives, at great cost to those for whom such contraceptives were commercially available and at great inconvenience to those for whom the supplies were not accessible. The number of couples practicing haphazard methods of folk contraception would have risen dramatically in the absence of superior NFPP methods of medical contraception. Finally, there would have had to be an increase in the rate of abortions to 27 per 100 live births. That Thailand was able to reduce its rate of natural increase between 1964 and 1975 substantially without these deleterious consequences is a credit to the success of the Government of Thailand's National Family Planning Program.

References

- Arnold, Fred, and Matana Phananimamai. 1975. "Revised Estimates of the 1970 Population of Thailand." Research Paper No. 1, Population Survey Division, National Statistics Office, Bangkok (July).
- Bogue, Donald J. 1971. *Demographic Techniques of Fertility Analysis*. RFFPI Manual Number 2. Chicago: Community and Family Study Center, The University of Chicago.
- _____, Scott Edmonds, and Elizabeth J. Bogue. 1973. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Status on Birth Rates*. RFFPI Manual Number 6. Chicago: Community and Family Study Center, The University of Chicago.
- Colombian Working Committee for the Study of the Impact of Family Planning on the Demographic, Economic, and Social Structure of Colombia. 1976. "An Estimate of the Direct Impact of Family Planning Programs on the Birth Rate of Colombia." Unpublished manuscript, The University of Chicago.
- Cook, Michael J., and Boonlert Leoprapai. 1974. "Some Observations on Abortion in Thailand." Paper prepared for Asian Research Seminar on Psychological Aspects of Abortion. Kathmandu, Nepal (November 26-29).
- Edmonds, Scott. 1976. "Family Planning Service Statistics Annual Report—Thailand." United States Agency for International Development/Bangkok (May 10).

- Institute of Population Studies, Chulalongkorn University and Population Survey Division, National Statistical Office. 1977. *The Survey of Fertility in Thailand: Country Report*. Bangkok, Thailand.
- Knodel, John, and Pichit Pitaktepsombati. 1975. "Fertility and Family Planning in Thailand: Results of the Second Round of a National Survey." Paper No. 19, Chulalongkorn University, Institute of Population Studies.
- _____, and Visid Prachuabmoh. 1973. *The Fertility of Thai Women*. Research Report No. 10, Chulalongkorn University, Institute of Population Studies.
- _____, and Visid Prachuabmoh. 1974. "Demographic Aspects of Fertility in Thailand." *Population Studies* 28 (November): 423-48.
- McDaniel, Edwin B., and Tieng Pardthaisong. 1974. "Use-Effectiveness of Six-Month Injections of DMPA as a Contraceptive." *American Journal of Obstetrics and Gynecology* 119 (May): 175-80.
- Ministry of Public Health, National Family Planning Program. 1972. "Family Planning in Thailand, 1965-1971." Bangkok: Ministry of Public Health.
- _____. 1976a. "Annual Statistics Report, 1975." Bangkok: Ministry of Public Health.
- _____. 1976b. "The Continuation of Oral Contraceptive Practice in Thailand: The 1974 Follow-Up Survey." Bangkok: Ministry of Public Health.
- _____. 1977. "Bi-Regional Seminar on Physician and Population Change, Country Statements: Thailand." Bangkok: Ministry of Public Health.
- National Economic and Social Development Board. 1975. "Projecting Fertility in Thailand." Bangkok: Population and Family Planning Division, NESDP (March).
- Nortman, Dorothy, and John Bongaarts. 1975. "Contraceptive Practice Required to Meet a Prescribed Crude Birth Rate Target: A Proposed Macro-Model (TABRAP) and Hypothetical Illustrations." *Demography* 12 (August): 471-89.
- The Population Council. 1971. "Thailand: Family Planning Activities 1968-1970." *Studies in Family Planning* 2:9 (September): 182-204.
- _____. 1972. "Thailand." *Country Profiles* (March).
- _____. 1973. "Population and Family Planning Programs: A Factbook." *Reports on Population/Family Planning* 5:2 (September). Prepared by Dorothy Nortman and Ellen Hofstatter.
- _____. 1974. "Population and Family Planning Programs: A Factbook." *Reports on Population/Family Planning* 6:2 (December). Prepared by Dorothy Nortman and Ellen Hofstatter.
- _____. 1975. "Population and Family Planning Programs: A Factbook." *Reports on Population/Family Planning* 7:2 (October). Prepared by Dorothy Nortman and Ellen Hofstatter.

- Rachapaetayakom, Jawalaksana. 1975. "Mortality and Life Expectancy of Thai Population in 1969-1971." National Economic and Social Development Board, Population and Manpower Division (July).
- Riley, James Nelson, and Santhat Sermsri. 1974. "The Variegated Thai Medical System as a Context for Birth Control Services." Working Paper No. 6, Mahidol University, Institute for Population and Social Research.
- Rungpitarangsi, Benjawan. 1974. "Mortality Trends in Thailand: Estimates for the Period 1937-1970." Paper No. 10, Chulalongkorn University, Institute of Population Studies.
- Smith, Shirley J. 1970. "Evaluation of the Demographic Impact of a Family Planning Program." Research Document No. 1, U.S. Department of Commerce, Bureau of the Census.
- Social Science Research Center and Faculty of Medicine, Chiang Mai University. 1977. "Fertility and Family Planning in Rural Northern Thailand." A preliminary report from the 1976-1977 Northern Thailand Fertility Study. Chicago: Community and Family Study Center, The University of Chicago.
- Thai-American Evaluation Team. 1975. "Thai National Family Planning Project Evaluation: Preliminary Reports and Recommendations." Bangkok: Ministry of Public Health.
- Westinghouse Population Center, 1973. "Summary Report, Part One, of the Survey of Global Patterns of Contraceptive Distribution in the Private Sector in Selected Developing Countries."

Chapter Five

EVALUATION OF THE IMPACT OF FAMILY PLANNING ON JAVA'S BIRTH RATE

Jay Teachman

I

Introduction

With a 1976 population of over 125 million, Indonesia is the fifth most populous nation in the world and by far the most populous nation in Southeast Asia. A per capita gross national product (1976) of about 150 to 200 dollars, coupled with high illiteracy rates (over 30 percent of the total population) and a large agricultural labor force (over 60 percent of the total labor force), makes Indonesia one of the least developed nations in the Third World. Somewhat paradoxically, however, Indonesia has not suffered from the population growth rates endemic to many less-developed nations. To be sure, the growth rates have been high; from 1961 to 1971, the population grew at 2.08 percent per year and, from 1971 to 1976, at 1.63 percent per year. Yet, when compared to growth rates approaching and surpassing 3.0 percent per year (currently found among nations in Latin America and Africa), the rates experienced by Indonesia seem mild.

Despite relatively low growth rates, the problem of overpopulation has posed a persistent threat to Indonesia's development. Leaving aside a myriad of economic dysfunctions such as poor capital growth, restrictive foreign investment laws, and chronic unemployment, the pressure of Indonesia's large population makes enormous demands for health, education, and food on a poorly developed infrastructure. Unlike many other developing nations that have only recently experienced rapid population growth, Indonesia has experienced a steady population growth rate of 1.5 to 2.0 percent for over 120 years (White, 1976). Mortality has consistently been 15 to 20 points below

fertility, in contrast to the sudden drops in mortality that account for the disabling population growth rates found in other developing nations. The problem is compounded by the fact that over 60 percent of Indonesia's population lives on the island of Java, which comprises only 7 percent of the total land area. As a consequence, the population density of Java has reached 640 persons per square kilometer, and, despite intense wet rice cultivation, the island has turned into a net importer of food.

Before 1968, Indonesia's population policy was pronatalist, generally operating under the belief that the abundance of land in the Outer Islands (those islands comprising Indonesia other than Java and Bali) could absorb any excess population. The population control policy consisted of an effort to transfer population from Java to the Outer Islands. Although such a migration program has been in existence since the 1930s (before Indonesia's independence from the Dutch in 1945), it has been singularly unsuccessful. Widjojo (1970) has shown that the amounts of migration necessary to slow Java's population growth would be almost impossible to attain. In addition, the ability of the Outer Island ecology to support dramatically increased population densities has been challenged (Missen, 1972).

Finally recognizing the need to come to grips with the population problem, the Indonesian government actively began supporting conventional family planning activities in 1968.¹ A semigovernmental agency, the National Family Planning Institute, was created to help coordinate the existing private family planning activities as well as the emerging program being sponsored by the Health and Information Ministries. Cognizant of the concentration of population on Java, the National Family Planning Institute restricted its activities to Java and Bali.²

In 1970 the National Family Planning Institute was reorganized into a full government agency and renamed the National Family Planning Coordinating Board (NFPCB). Although the actual provision of family planning services was still in the hands of various governmental ministries and the area still restricted to Java and Bali, the newly formed NFPCB differed from its predecessor by having increased budgets, greater commitment on the part of the implementing agencies, abolition of fees for services and supplies, and a coherent overall plan of action.

The goal of the NFPCB is to reduce by one half the total fertility rate (TFR) of about 5.2 children per woman in 1971 by the year 2000. A short-term goal has been to recruit enough family planning acceptors so that 25 percent of all eligible couples on Java and Bali would be contracepting by 1979. Based on the number of acceptors alone, the NFPCB has made great strides in meeting its goals. In fiscal year (April to March) 1971/72, 519,000 acceptors were recruited. By the next fiscal year, this number had jumped to 1,079,000 new acceptors. In fiscal year 1975/76, 1,785,908 new acceptors were recruited (Soetedjo and Parsons, 1977). There is also strong evidence that the birth rate has declined significantly in recent years. Data from the 1973

Fertility and Mortality Survey (FMS) indicate a 1971 crude birth rate (CBR) of about 38 to 39 for Java-Bali (McDonald, Yasin, and Jones, 1976). Using data from the 1976 Java-Bali Fertility Study (JBS), Sinquefield and Sungkono (1977) estimate a CBR of 34 for Java-Bali. This corresponds to a drop in the TFR from 5.2 to 4.5.

This examination assesses the contribution made by the organized national family planning program (NFPP) in Indonesia toward reducing the birth rate in Java-Bali.³ In doing so, the NFPP impact in each of Java-Bali's six provinces is examined. By disaggregating the analysis by province, it can be proven that, because the NFPP has taken different paths, it has had differential impact in each of the provinces. Such a disaggregation will thus pinpoint those areas in which the program has minimal and maximal success. Before proceeding any further, however, it is necessary to outline briefly the methodology that will be used to determine program impact.

II

Contraception Needed To Reach a Birth Rate Target

As described in Chapter One of this monograph, there are two computer models, PROJTARG being one which can be used in carrying out an impact evaluation. The second model which can be used is TABRAP/CONVERSE, developed mainly by Dorothy Nortman and John Bongaarts of the Population Council.⁴ In actuality, TABRAP and CONVERSE are two distinct, though related, programs. At this point, however, only TABRAP will be considered since it estimates the contraceptive practice required to meet a birth rate target as measured by woman years of protection. As is the case with PROJTARG, TABRAP can be used either prospectively or retrospectively, that is, with either a hypothesized or actual path of birth rate change.

Whereas PROJTARG initially assumes an invariant linear change in the proportion of fecund women protected from childbearing as the birthrate changes, TABRAP does not explicitly make such an assumption. In estimating necessary contraception, TABRAP begins by calculating a required annual birth cohort. Assuming the relationship between a birth cohort and the average person-years lived before age one in a given life table, a target birth cohort for year t is given by solving the following equation for B_t :⁵

$$\begin{aligned} \text{CBR}_t &= \frac{B_t}{l_{t p_t} + l_{L_t} (B_t + B_{t-1}) / 2} \\ &= \frac{B_t}{l_{t p_t} + l_{p_t}} \end{aligned} \quad (1)$$

- where CBR_t = Crude birth rate in year t
- B_t = Births in year t
- B_{t-1} = Births in year t - 1
- $1_{t p_t}$ = Population one year and over in midyear (consisting of the survivors of the midyear t - 1 population t)
- 1_{p_t} = Infants under one year in midyear t (consisting of the survivors of the allowed births in the one year interval between midyear t - 1 and midyear t)
- 1_{L_t} = Average person years lived in age group 0 - 1 at time t.

TABRAP also survives the female population, one year at a time, by five-year age groups over the stipulated time period according to the given life table trend. To the surviving female population, age-specific proportions married (or in conjugal union) are applied (these proportions can vary over time), yielding estimates of married women of reproductive age. Multiplied by age-specific marital fertility rates and summed over age groups, these estimates are the expected annual cohort of birth (E_t) in the absence of contraception. As such, the difference between E_t , the expected births, and B_t , births required to meet a birth rate target, yields the number of births that must be averted by either contraception or abortion.⁶

Once the needed births averted are calculated, TABRAP enters a second phase of estimation, converting acceptors into births averted via contraceptive use. The user of TABRAP must postulate an age-method specific mix of acceptors each with a unique dropout or attrition rate assigned.⁷ TABRAP uses the exponential decay curve.⁸

$$C = a \exp (-rt)$$

where C = proportion remaining at time t after acceptance

r = annual attrition rate

a = proportion not immediately dropping out.

Integrating this curve between two points in time, t_1 and t_2 , gives the use per acceptor in the time interval (measured from time of acceptance, not program start). Taking twelve-month use intervals set back nine months from successive target years (to allow for gestation), the use interval is correctly aligned with the period of averted births.

Annual acceptors are assumed to be inputted simultaneously at midyear. Assuming nine months for gestation use in the intervals PA to .75 years (.75

to 1.75 years, 1.75 to 2.75 years, etc.) will avert births in successive calendar years, beginning with the first calendar year *after* the start of contraception. The constant PA is the length of postpartum amenorrhea overlap, measured in years. The curve is integrated from PA to .75 years rather than from 0 to .75 years since any contraceptive overlap with postpartum amenorrhea does not prevent births. Remembering that attrition schedules are age-method specific, TABRAP weights the method-specific use of each age group by the proportion of the group accepting the method to obtain average use per acceptor of a given age during the respective use intervals for averting births in successive program years after acceptance.

TABRAP's second phase ends by multiplying average age-specific use times age-specific marital fertility, adjusted for sterility (i.e., each acceptor's potential fertility) nine months after the use interval to yield births averted per acceptor.

In a third phase, TABRAP estimates the number, year by year, by age of acceptors in year t such that they will avert births in year $t + 1$, which is the difference between the sum of births averted by acceptor cohorts prior to year t and the number of births that must be averted to meet the postulated birth rate path. The user postulates a schedule of relative age-specific acceptance rates among eligible women. Given such a pattern, TABRAP inflates (or deflates) an initial input of acceptors conforming to the pattern such that they (plus continuing users from previous cohorts) will avert the correct number of births to meet the CBR target.

In this fashion woman-years of contraception required to meet the birth rate target path is the product of acceptors required times woman-years of use per acceptor (the latter coming from phase 2 of TABRAP summed over all age groups). After year one, woman-years of protection is a function not only of new acceptors but also of continuing users from previous acceptor cohorts. Since use nine months before a calendar year averts births in that year, and TABRAP averts birth by calendar year, the woman-years of protection calculated this way are not calendar year estimates of contraception provided. It is a simple matter, however, to distribute such estimates of contraception into calendar years (which is the manner in which TABRAP prints out required contraception).

III

Contraception Provided by Program Sources

Just as one can estimate the amount of contraception (woman-years of protection) required to meet a birth rate target, the amount of contraceptive protection provided by program and/or nonprogram sources can also be calculated. There are several methodologies which might be used to accomplish

the task (Bogue, Edmonds, and Bogue, 1973: 38). The accuracy of the estimates depends upon the simplifying assumptions used in each technique. In turn, the simplifying assumptions are based upon the amount and quality of data available.

PROJTARG has no facility for estimating program and nonprogram woman-years of protection from actual retrospective data.⁹ However, the CONVERSE portion of TABRAP/CONVERSE does provide the user with a sophisticated estimating routine for calculating woman-years of protection from retrospective user data. Basically, CONVERSE is a minor modification of the TABRAP program. Whereas TABRAP calculates births averted and woman-years of protection required to meet a birth rate target and then translates this into required number of acceptors (given age-method propensities to accept and user per acceptor in various time intervals), CONVERSE accepts actual numbers of family planning adopters (on an age-method specific basis) and translates them into births averted.¹⁰ Once the births averted have been calculated, it is a simple matter to calculate the implied birth rate.

Woman-years of protection provided is also calculated and is merely the product of the input of acceptors and the use (in various time intervals) per acceptor (on a method-weighted age-specific basis) calculated from the exponential decay curve. These estimates are then output on a calendar year specific basis (remembering that the birth rate in any one year is the result of protection provided nine months prior to the year). Obviously, CONVERSE provides the user with a powerful tool for estimating the impact of program (and/or nonprogram) acceptors. Age-method specific acceptors whose decay curves are known (or can be estimated) can be easily converted into estimates of birth rate decline and woman-years of protection provided.

IV Two Impact Strategies

Depending on the amount of data available, a researcher can follow one of two research strategies (using either PROJTARG or TABRAP/CONVERSE) in evaluating the impact of a family planning program on fertility. If the investigator knows both the trend in birth rates (and other important demographic parameters such as age at marriage) and acceptor data between two points in time, a two-pronged attack can be mounted. First of all, by knowing the birth rate trend, PROJTARG or TABRAP can be used to estimate the *total* amount of contraception required to cause the observed fertility decline. This estimate of contraception will include protection from all sources, both program and nonprogram. Program source contraception can then be independently estimated from acceptor data (using CONVERSE). Similarly, the birth rate which would have occurred if no protection from nonprogram sources was provided can be calculated (again, using CONVERSE).

In this fashion, the amount of contraception provided by the program and the resultant birth rate can be compared with that which actually took place.¹¹ Demographically, therefore, it is possible to estimate the role of a family planning program in bringing about an observed decline in fertility. The role played by the private sector either can be estimated as a residual or can be deliberately structured into the model (in an attempt to distinguish the effect of the modern and traditional sectors). Examples of this approach can be found in Hogan (1976) and Teachman, Hogan, and Bogue (1978).

The second research strategy follows when birth rate estimates are known only for the base period and not for the terminal period. In such a case, neither PROJTAG nor TABRAP can be used to estimate required contraception. However, assuming that the acceptor data are available, CONVERSE can be used to calculate contraception provided by the program and the birth rate implied by this level of contraception. Unless the program has provided 100 percent of all contraception—a highly unusual case—the values which result from the analysis will underestimate the values which result from all sources.

The first strategy is preferable for Indonesia: unfortunately, the Indonesian data do not provide a sufficient estimate of recent fertility levels, although some preliminary estimates can be found in Siquefield and Sungkono (1977). Even though the proportion of an observed birth rate decline accounted for by the program cannot be estimated, the birth rate decline attributable to the program can be calculated, and the extent of this decline is quite large. In fact, the size of the estimated decline is so large it virtually assures that the program must have provided most of the total contraception which did occur in the country over the studied time period.

V

The Impact of NFPP on the Birth Rate of Java-Bali

The Indonesian data are specific by province for the period 1971 to 1976. Table 5-1 presents the estimated TFR and CBR for provinces of Java-Bali in 1971. The female base population distribution and the values of expectation of life at birth used to select the West Model life table functions for surviving the population are given in Table 5-2.¹² Tables 5-3, 5-4, and 5-5 show the age-specific marital fertility rates, by province, for 1971. Also shown are the age-specific proportions married in 1971 and 1976 as well as proportion sterile at each age.¹³

Given in Tables 5-6 through 5-11 are the basic parameters, by province, for determining the exponential decay curve.¹⁴ Column 1 gives the "a" parameter or the proportion not immediately discontinuing use. Column 2 presents the "r" parameter or the annual rate of discontinuation. The average duration of

Table 5-1. TOTAL FERTILITY RATES AND CRUDE BIRTH RATES FOR JAVA-BALI: 1971.

Province	Total fertility rate	Crude birth rate	Female crude birth rate (a)
Jakarta	5175	44.7	44.1
West Java	6270	48.6	47.8
Central Java	5320	39.9	38.0
Yogyakarta	4755	33.9	32.1
East Java	4850	38.6	36.6
Bali	5950	44.4	42.9
Java-Bali	5200	39.0	--

(a) Female births to female population.

Source. Figures are the average of those found from the 1971 Census (CBS, 1976) and the 1973 Fertility-Mortality Survey (McDonald, Yasin, and Jones, 1975).

Table 5-2. AGE DISTRIBUTION, TOTAL FEMALE POPULATION, AND EXPECTATION OF LIFE AT BIRTH FOR JAVA-BALI.

Age	Province					
	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali
1971 population	2,249,298	10,986,985	11,185,362	1,280,932	13,127,053	1,071,092
Percent						
0-4	17.0	16.7	14.9	12.9	14.2	16.8
5-9	14.2	15.8	15.5	14.0	14.6	15.0
10-14	11.9	11.1	11.6	12.6	10.5	9.9
15-19	11.8	9.2	9.2	9.8	8.7	9.5
20-24	10.1	7.9	6.5	6.4	6.9	8.0
25-29	9.0	8.5	7.7	7.2	9.6	8.1
30-34	7.3	6.9	7.2	6.8	7.9	6.5
35-39	6.0	6.7	7.2	6.8	7.7	6.0
40-44	4.2	5.1	5.4	5.6	5.7	4.9
45-49	2.7	3.5	4.1	4.2	4.3	3.6
50-54	2.1	3.1	3.6	3.9	3.7	3.5
55-59	1.1	1.5	2.2	2.6	2.2	2.1
60-64	1.1	1.9	2.3	2.8	2.5	2.7
65-69	0.6	0.8	1.1	1.8	1.1	1.3
70-74	0.5	0.7	1.0	1.6	0.9	1.2
75-79	0.2	0.3	0.4	0.7	0.4	0.5
80+	0.2	0.2	0.3	0.6	0.3	0.5
e ⁰ 1971	46.0	42.6	45.6	47.0	46.2	46.0
e ⁰ 1976	50.0	43.0	51.6	47.5	47.2	47.0

Table 5-3. AGE-SPECIFIC FERTILITY RATES AND MARITAL
FERTILITY RATES FOR JAVA-BALI: 1971.

Age	Province											
	Jakarta		West Java		Central Java		Yogyakarta		East Java		Bali	
	ASFR	ASFR(N)	ASFR	ASFR(N)	ASFR	ASFR(N)	ASFR	ASFR(N)	ASFR	ASFR(N)	ASFR	ASFR(N)
15-19. . .	140	498	208	468	140	413	68	519	157	425	124	697
20-24. . .	266	399	309	380	277	370	253	453	250	345	295	440
25-29. . .	268	322	285	321	262	298	252	298	222	261	298	356
30-34. . .	198	232	229	258	203	233	199	230	170	198	222	261
35-39. . .	110	132	145	170	115	137	117	135	105	128	152	178
40-44. . .	41	56	65	85	56	73	48	59	54	75	80	100
45-49. . .	12	18	13	19	11	16	14	19	12	19	19	25

Table 5-4. AGE-SPECIFIC PROPORTIONS MARRIED FOR JAVA-BALI: 1971 AND 1976.

Age	Province											
	Jakarta		West Java		Central Java		Yogyakarta		East Java		Bali	
	1971	1976	1971	1976	1971	1976	1971	1976	1971	1976	1971	1976
15-19. . .	0.281	0.243	0.444	0.407	0.331	0.259	0.131	0.134	0.369	0.311	0.178	0.165
20-24. . .	0.657	0.592	0.814	0.776	0.748	0.679	0.559	0.530	0.725	0.689	0.670	0.624
25-29. . .	0.837	0.780	0.889	0.875	0.878	0.840	0.847	0.782	0.852	0.838	0.838	0.829
30-34. . .	0.854	0.861	0.889	0.866	0.870	0.861	0.866	0.837	0.860	0.856	0.851	0.855
35-39. . .	0.831	0.835	0.851	0.859	0.838	0.848	0.866	0.829	0.822	0.841	0.855	0.854
40-44. . .	0.737	0.768	0.763	0.793	0.764	0.770	0.811	0.805	0.720	0.747	0.799	0.783

Table 5-5. AGE-SPECIFIC PROPORTIONS
STERILE FOR JAVA-BALI.

Age	Proportion sterile (a)
15-19 years. . .	0.051
20-24 years. . .	0.038
25-29 years. . .	0.076
30-34 years. . .	0.123
35-39 years. . .	0.210
40-44 years. . .	0.472

(a) Assumed constant across
provinces and time.

Table 5-6. PROPORTION OF ACCEPTORS NOT IMMEDIATELY
DISCONTINUING, ANNUAL RATE OF DISCONTINUATION,
AND AVERAGE DURATION OF USE BY AGE
FOR JAKARTA.

Method	Proportion not immediately discontinuing	Annual rate of discon- tinuation	Average duration of use
<u>Pill</u>			
15-19. . .	.837	.629	1.33
20-24. . .	.844	.447	1.99
25-29. . .	.831	.379	2.19
30-34. . .	.812	.346	2.35
35-39. . .	.813	.325	2.50
40-44. . .	.763	.265	2.88
<u>IUD</u>			
15-19. . .	.975	.409	2.38
20-24. . .	.975	.255	3.82
25-29. . .	.975	.165	5.91
30-34. . .	.975	.108	9.03
35-39. . .	.975	.067	14.55
40-44. . .	.975	.071	13.73
<u>Condom</u>			
15-19. . .	.527	.677	0.78
20-24. . .	.596	.693	0.86
25-29. . .	.620	.492	1.26
30-34. . .	.613	.458	1.34
35-39. . .	.625	.486	1.29
40-44. . .	.653	.353	1.85

Note. Average duration of use is in years.
Source. Based on data from the Indonesian Quarterly
Acceptor Survey.

Table 5-7. PROPORTION OF ACCEPTORS NOT IMMEDIATELY DISCONTINUING, ANNUAL RATE OF DISCONTINUATION, AND AVERAGE DURATION OF USE BY AGE FOR WEST JAVA.

Method	Proportion not immediately discontinuing	Annual rate of discontinuation	Average duration of use
<u>Pill</u>			
15-19. . .	.975	.400	2.44
20-24. . .	.975	.284	3.43
25-29. . .	.975	.242	4.03
30-34. . .	.958	.220	4.35
35-39. . .	.960	.206	4.66
40-44. . .	.900	.139	6.47
<u>IUD</u>			
15-19. . .	.939	.247	3.80
20-24. . .	.927	.154	6.02
25-29. . .	.939	.100	9.39
30-34. . .	.934	.065	14.37
35-39. . .	.928	.040	23.20
40-44. . .	.930	.043	21.63
<u>Condom</u>			
15-19. . .	.764	.535	1.43
20-24. . .	.865	.293	2.95
25-29. . .	.900	.208	4.33
30-34. . .	.889	.194	4.58
35-39. . .	.907	.205	4.42
40-44. . .	.948	.149	6.36

Note. Average duration of use is in years.

Source. Based on data from the Indonesian Quarterly Acceptor Survey.

Table 5-8. PROPORTION OF ACCEPTORS NOT IMMEDIATELY DISCONTINUING, ANNUAL RATE OF DISCONTINUATION, AND AVERAGE DURATION OF USE BY AGE FOR CENTRAL JAVA.

Method	Proportion not immediately discontinuing	Annual rate of discontinuation	Average duration of use
<u>Pill</u>			
15-19. . .	.921	.440	2.09
20-24. . .	.929	.313	2.97
25-29. . .	.915	.266	3.44
30-34. . .	.894	.242	3.69
35-39. . .	.896	.277	3.95
40-44. . .	.840	.153	5.49
<u>IUD</u>			
15-19. . .	.975	.243	4.01
20-24. . .	.975	.152	6.41
25-29. . .	.975	.098	9.95
30-34. . .	.975	.064	15.23
35-39. . .	.975	.040	24.38
40-44. . .	.975	.042	23.21
<u>Condom</u>			
15-19. . .	.712	.750	0.95
20-24. . .	.805	.512	1.57
25-29. . .	.836	.836	2.28
30-34. . .	.828	.343	2.41
35-39. . .	.846	.364	2.32
40-44. . .	.883	.265	3.33

Note. Average duration of use is in years.

Source. Based on data from the Indonesian Quarterly Acceptor Survey.

Table 5-9. PROPORTION OF ACCEPTORS NOT IMMEDIATELY DISCONTINUING, ANNUAL RATE OF DISCONTINUATION, AND AVERAGE DURATION OF USE BY AGE FOR YOGYAKARTA.

Method	Proportion not immediately discontinuing	Annual rate of discontinuation	Average duration of use
<u>Pill</u>			
15-19. . .	.667	.076	8.78
20-24. . .	.673	.054	12.46
25-29. . .	.663	.046	14.41
30-34. . .	.648	.042	15.42
35-39. . .	.649	.039	16.64
40-44. . .	.609	.030	20.30
<u>IUD</u>			
15-19. . .	.975	.273	3.57
20-24. . .	.975	.170	5.74
25-29. . .	.975	.110	8.86
30-34. . .	.975	.072	13.54
35-39. . .	.975	.045	21.67
40-44. . .	.975	.047	20.74
<u>Condom</u>			
15-19. . .	.688	.750	0.89
20-24. . .	.756	.568	1.33
25-29. . .	.786	.402	1.96
30-34. . .	.777	.375	2.07
35-39. . .	.793	.398	1.99
40-44. . .	.828	.289	2.87

Note. Average duration of use is in years.
 Source. Based on data from the Indonesian Quarterly Acceptor Survey.

Table 5-10. PROPORTION OF ACCEPTORS NOT IMMEDIATELY DISCONTINUING, ANNUAL RATE OF DISCONTINUATION, AND AVERAGE DURATION OF USE BY AGE FOR EAST JAVA.

Method	Proportion not immediately discontinuing	Annual rate of discontinuation	Average duration of use
<u>Pill</u>			
15-19. . .	.931	.440	2.12
20-24. . .	.939	.313	3.00
25-29. . .	.925	.266	3.48
30-34. . .	.903	.242	3.73
35-39. . .	.905	.227	3.99
40-44. . .	.848	.153	5.54
<u>IUD</u>			
15-19. . .	.975	.247	3.95
20-24. . .	.975	.154	6.33
25-29. . .	.975	.100	9.75
30-34. . .	.975	.065	15.00
35-39. . .	.975	.041	23.78
40-44. . .	.975	.043	22.67
<u>Condom</u>			
15-19. . .	.704	.705	0.94
20-24. . .	.798	.467	1.71
25-29. . .	.829	.331	2.50
30-34. . .	.820	.309	2.65
35-39. . .	.837	.328	2.55
40-44. . .	.874	.238	3.67

Note. Average duration of use is in years.
 Source. Based on data from the Indonesian Quarterly Acceptor Survey.

Table 5-11. PROPORTION OF ACCEPTORS NOT IMMEDIATELY DISCONTINUING, ANNUAL RATE OF DISCONTINUATION, AND AVERAGE DURATION OF USE BY AGE FOR BALI.

Method	Proportion not immediately discontinuing	Annual rate of discontinuation	Average duration of use
<u>Pill</u>			
15-19. . .	.724	.345	2.69
20-24. . .	.730	.246	2.97
25-29. . .	.719	.209	3.44
30-34. . .	.702	.190	3.69
35-39. . .	.704	.179	3.93
40-44. . .	.660	.120	5.50
<u>IUD</u>			
15-19. . .	.975	.153	6.37
20-24. . .	.975	.096	10.16
25-29. . .	.975	.062	15.73
30-34. . .	.975	.040	24.38
35-39. . .	.975	.025	39.00
40-44. . .	.975	.027	36.11
<u>Condom</u>			
15-19. . .	.764	.494	1.55
20-24. . .	.865	.271	3.19
25-29. . .	.899	.192	4.68
30-34. . .	.889	.179	4.97
35-39. . .	.907	.190	4.78
40-44. . .	.948	.138	6.87

Note. Average duration of use is in years.

Source. Based on data from the Indonesian Quarterly Acceptor Survey.

use, column 3, is calculated by dividing a by r. It can be interpreted as the number of years, on the average, that an acceptor of a certain method and age will continue using.¹⁵

Values of postpartum amenorrhea (PA) are based on Teachman (1977) and are assumed to be constant across provinces. For the pill, overlap is estimated as .059 months; for the IUD, .161 months; and for condom users, .128 months. The first .161 months of IUD use, for instance, do not provide protection from pregnancy since an average woman is still in a state of amenorrhea.

Table 5-12 presents the adjusted number of NFPP acceptors by method, province, and year.¹⁶ Table 5-13 shows the method distribution over time by province and method. The age distribution by method (assumed constant over province) is given in Table 5-14. Since the NFPP actually became active in 1968 (though at a considerably reduced level), in 1971 there were still continuing users from previous program years. These continuing users cannot be ignored, since they represent valid program contraception. Fortunately, TABRAP and CONVERSE contain a facility which can handle individual users (by treating them as a special group of acceptors). Table 5-15 presents the number of initial users in 1971 by method and province as well as the proportion of married women in each age class using all methods combined.

Table 5-12. ADJUSTED NUMBER OF FAMILY PLANNING ACCEPTORS
BY YEAR AND METHOD FOR JAVA-BALI.

[Hundreds]

Year	Province								
	Jakarta			West Java			Central Java		
	Pill	IUD	Condom	Pill	IUD	Condom	Pill	IUD	Condom
1969-70 . . .	36.1	113	29.5	30.6	29	8.0	17.2	45	8.0
1970-71 . . .	49.1	160	31.1	271.6	87	41.5	101.4	131	39.1
1971-72 . . .	114.8	205	18.3	736.5	172	32.7	418.0	565	59.8
1972-73 . . .	270.7	178	136.4	1439.5	209	113.2	1061.7	927	197.0
1973-74 . . .	343.4	130	229.7	2046.9	166	228.1	1459.6	335	431.4
1974-75 . . .	473.5	122	223.3	2278.4	129	303.1	1916.8	474	872.5
1975-76 . . .	603.6	145	216.9	3370.7	155	389.2	3027.3	453	1193.9
1976-77 . . .	716.4	171	154.7	5142.1	246	224.9	3328.6	511	1005.6

Year	Province								
	Yogyakarta			East Java			Bali		
	Pill	IUD	Condom	Pill	IUD	Condom	Pill	IUD	Condom
1969-70 . . .	6.7	18	7.2	41.1	59	20.7	7.7	27	0.8
1970-71 . . .	15.3	28	18.3	305.1	256	63.0	20.1	102	5.6
1971-72 . . .	36.3	121	24.7	1334.3	876	51.0	53.6	187	12.8
1972-73 . . .	97.6	162	94.9	2857.1	2057	161.1	24.5	269	27.1
1973-74 . . .	180.8	105	212.1	4086.2	1408	512.5	134.9	287	47.1
1974-75 . . .	93.7	48	205.0	4788.2	701	661.9	110.0	199	109.3
1975-76 . . .	130.1	61	193.8	4286.1	1190	614.1	118.6	223	74.2
1976-77 . . .	134.6	67	194.6	3543.8	2310	459.4	101.4	258	50.2

Source. Based on BKKBN monthly service statistics reports. Adjustments based on information in Nurhayati, Parsons, and Teachman (1977).

Table 5-13. PERCENTAGE DISTRIBUTION OF METHOD OF FAMILY PLANNING ACCEPTORS FOR JAVA-BALI: 1969-70 TO 1976-77.

Year	Province								
	Jakarta			West Java			Central Java		
	Pill	IUD	Condom	Pill	IUD	Condom	Pill	IUD	Condom
1969-70 . . .	20.3	13.2	16.5	45.3	42.9	11.8	24.5	64.1	11.4
1970-71 . . .	20.6	66.4	12.9	67.9	21.7	10.4	37.3	48.3	14.4
1971-72 . . .	33.9	60.7	5.4	78.3	18.3	3.5	40.1	54.2	5.7
1972-73 . . .	46.3	30.4	23.3	81.7	11.9	6.4	49.6	42.2	9.0
1973-74 . . .	48.8	18.5	32.7	83.9	6.8	9.3	53.5	30.6	15.8
1974-75 . . .	57.8	14.9	27.3	84.1	4.8	11.2	58.7	14.5	26.7
1975-76 . . .	52.5	15.0	22.5	86.1	4.0	9.9	64.8	9.7	25.5
1976-77 . . .	58.7	16.4	14.8	91.6	4.4	4.0	68.7	10.5	20.8

Year	Province								
	Yogyakarta			East Java			Bali		
	Pill	IUD	Condom	Pill	IUD	Condom	Pill	IUD	Condom
1969-70 . . .	21.0	56.4	22.6	34.0	48.8	17.1	21.7	76.1	2.3
1970-71 . . .	42.0	76.9	50.3	48.9	41.0	10.1	15.7	79.9	4.4
1971-72 . . .	19.9	66.5	13.6	59.0	38.7	2.3	20.8	74.1	5.1
1972-73 . . .	27.5	45.7	26.8	56.3	40.5	3.2	25.0	68.2	6.9
1973-74 . . .	36.3	21.1	42.6	67.1	23.1	9.7	28.8	61.2	10.0
1974-75 . . .	27.0	13.8	59.1	77.8	11.4	10.8	26.3	47.6	26.1
1975-76 . . .	33.8	15.8	50.4	70.4	19.5	10.1	28.7	53.5	17.8
1976-77 . . .	41.4	15.0	43.6	56.1	36.6	7.3	24.8	63.0	12.3

Source. Based on Table 5.

Table 5-14. AGE-METHOD DISTRIBUTION OF FAMILY PLANNING ACCEPTORS.

Age	Method		
	Pill	IUD	Condom
15-19 years. . .	7.6	2.5	4.8
20-24 years. . .	23.0	18.0	19.7
25-29 years. . .	28.3	29.4	23.8
30-34 years. . .	22.1	31.4	28.1
35-39 years. . .	15.7	14.7	17.6
40-44 years. . .	3.3	3.2	6.0

Source. Based on data from the Indonesian Quarterly Acceptor Survey.

All of the acceptor data refers only to program sources of activity. No mention is made of nonprogram contraception (either traditional or modern). The omission is due to the virtually complete lack of information on nonprogram sources of contraception in Indonesia. This pertains both to the number of users and the length of use. In Table 5-16, the most recent and detailed summary of nonprogram use is given. Columns 2 and 3 are the most critical since they give the percent of modern methods being used which come from program sources. In all provinces the overwhelming majority of all modern contraception is supplied by the program; only in Jakarta does the percentage slip to under 80 percent. Even considering all contraception (traditional and modern), the program supplies most of the contraception. In the two special provinces, Jakarta and Yogyakarta, the percentage dips below 50 percent, but in the larger remaining provinces, program sources of contraception account for more than 60 percent of all contraception, an astounding figure since the program had been in effective existence for only five years by 1976.

These figures must remain illustrative, however, since there is no way to convert them into estimates of births averted or woman-years of protection provided. The effect of nonprogram sources of contraception must therefore be calculated as a residual, estimated after the impact of program contraception has been taken into account. The data in Table 5-16 merely serve to show that the level of program activity is quite high with respect to nonprogram activity (regardless of the relative effectiveness of each).

VI

Woman-Years of Protection

Table 5-17 presents the woman-years of protection (WYP) provided under two assumptions about the number of acceptors. The first, called the high program estimate, gives the WYP that would have occurred from program sources if all of the parameters in Table 5-16 are correct. The second, termed the low

Table 5-15. NUMBER OF INITIAL USERS AND PROPORTION OF WOMEN USING ALL METHODS COMBINED FOR JAVA-BALI: 1971.

Province	Married women								
	Proportion by age using all methods combined						Number using contraceptive, by method		
	15-19	20-24	25-29	30-34	35-39	40-44	Pill	IUD	Condom
Jakarta	0.012	0.035	0.047	0.058	0.036	0.013	3,450	21,694	1,899
West Java . . .	0.004	0.009	0.010	0.011	0.007	0.002	20,301	9,210	497
Central Java . .	0.003	0.009	0.010	0.010	0.006	0.002	7,344	16,067	1,802
Yogyakarta . . .	0.014	0.025	0.021	0.023	0.012	0.004	1,113	3,818	813
East Java	0.006	0.017	0.016	0.016	0.009	0.003	21,400	27,573	3,050
Bali	0.023	0.044	0.054	0.069	0.037	0.011	1,485	11,597	405

Source. Based on number of acceptors prior to 1971 survived forward using continuation rates from the Indonesian Quarterly Acceptor Survey.

Table 5-16. ESTIMATES OF USE OF FAMILY PLANNING BY CURRENTLY MARRIED WOMEN AGED 15 TO 44 FOR JAVA-BALI.

Province	Percent		
	Modern methods to total methods	Program methods to total methods	Program methods to modern methods
Jakarta . . . . .	.68	.48	.71
West Java . . . . .	.85	.63	.81
Central Java . . . . .	.87	.68	.89
Yogyakarta . . . . .	.35	.46	.89
East Java . . . . .	.89	.69	.90
Bali . . . . .	.98	.85	.88
Java-Bali . . . . .	.84	.73	.88

Source. Sinquefield and Sungkono (1977).

program estimate, gives the WYP that would have occurred from program sources if all of the parameters in Table 5-16 are correct but assuming a 25 percent deflation in reported acceptors. The low program estimate is a conservative figure that with the high program estimate should bound the true value of WYP supplied by the program.

Column 1 shows the WYP beyond structural protection such as sterility, delayed age at marriage, and so on, provided in each year by the national family planning program and assuming the high program estimate. It is apparent that in each province a vast increase in WYP supplied by the program came about between 1971 and 1976. In Jakarta, program protection increased 258 percent between 1971 and 1976. West Java experienced an 831 percent increase in program-based contraception. The corresponding percent increases in WYP provided between 1971 and 1976 for Central Java, Yogyakarta, East Java, and Bali are respectively 1051, 558, 833, and 458. If the high program estimates are accurate, each province has undergone a significant increase in the amount of program source contraception provided. Column 2 indicates that sharp increases in WYP also occurred by assuming the low program estimates of number of acceptors.

Columns 3 and 4 indicate the percent of married women of reproductive age (MWRA) protected in each year by program sources of contraception under the two assumptions of program activity. As expected, in each province the proportion of fecund, exposed women (which, in Indonesia, is essentially equal to MWRA) protected by program contraception increased sharply during the five years of program activity. On the basis of this information alone, considerable fertility reduction in each province can be attributed to the NFPP. A more accurate idea of the actual extent of such fertility declines is gained by examining the birth rates that CONVERSE estimates would have occurred given the levels of WYP shown in Table 5-17.

Table 5-17. ESTIMATES OF WOMAN-YEARS OF PROTECTION AND PERCENT OF MARRIED WOMEN OF REPRODUCTIVE AGE PROTECTED UNDER TWO ASSUMPTIONS OF PROGRAM ACTIVITY.

Province	Assumptions of program activity			
	Woman years of protection provided by program		Percent of married women of reproductive age protected by program	
	High program estimate	Low program estimate	High program estimate	Low program estimate
Jakarta				
1971. . .	40,522	37,163	5.67	5.20
1972. . .	64,402	53,839	8.84	7.39
1973. . .	91,537	73,274	12.33	9.87
1974. . .	118,049	92,413	15.61	12.22
1975. . .	145,234	112,198	18.86	14.57
West Java				
1971. . .	66,471	57,559	1.79	1.55
1972. . .	156,580	123,567	4.17	3.29
1973. . .	290,063	222,483	7.64	5.86
1974. . .	439,888	334,330	11.46	8.71
1975. . .	618,935	467,596	15.92	12.03
Central Java				
1971. . .	60,376	51,651	1.73	1.48
1972. . .	166,899	130,434	4.76	3.72
1973. . .	326,867	249,729	9.28	7.09
1974. . .	498,821	378,185	13.88	10.52
1975. . .	695,022	525,054	19.56	14.78
Yogyakarta				
1971. . .	12,370	10,727	3.54	3.07
1972. . .	23,967	23,265	6.83	6.62
1973. . .	44,411	41,485	12.60	11.77
1974. . .	66,817	57,186	18.87	15.15
1975. . .	81,366	67,278	22.87	18.91
East Java				
1971. . .	134,765	114,164	7.14	2.66
1972. . .	380,474	296,020	8.83	6.87
1973. . .	741,986	565,900	17.15	13.08
1974. . .	1,090,477	825,895	25.10	19.01
1975. . .	1,367,378	1,032,732	31.34	23.67
Bali				
1971. . .	23,405	20,909	7.69	6.87
1972. . .	46,659	38,085	15.14	12.36
1973. . .	74,236	60,574	23.80	19.42
1974. . .	106,452	82,554	33.72	26.15
1975. . .	130,725	100,631	40.92	31.50

VII Birth and Growth Rates

Table 5-18 gives CBR and TFR estimates for the years 1971 through 1976 under several different assumptions. Column 1 gives the CBR values that would have occurred if no NFPP effort were supplied (beyond the initial users). This column indicates the fertility decline that can be attributed to reduced exposure which in turn is due primarily to an increase in the age at marriage. (Note that the CBRs presented here are female CBRs. What is normally presented as the CBR - births to 1,000 total population - would be somewhat higher.) Without the NFPP or other forms of contraception, reduced fertility would have occurred in West Java, Central Java, East Java, and Bali. Little or no change in fertility would have been expected in Jakarta and Yogyakarta. Columns 2 and 3 give the CBRs that would be expected if the high estimate path and the low estimate path had occurred and reflect the impact of both reduced exposure and contraception.

The figures in parentheses next to the 1976 CBR estimates in columns 2 and 3 represent the male traditional CBR measure (as opposed to the female CBR). If the high program estimate is to be believed, the CBR in 1976 for Jakarta was 38.0. For West Java, Central Java, and Yogyakarta, the values are respectively 38.4, 29.1, and 26.8. East Java shows a CBR of 24.8 and Bali a CBR of 26.8. The low program 1976 CBR estimates are Jakarta, 39.6; West Java, 40.2; Central Java, 30.8; Yogyakarta, 28.2; East Java, 27.1; and Bali, 30.7. Whichever path is accepted, the five-year CBR changes indicate significant fertility decline in each province. The reductions seem particularly sharp in East Java and Bali, followed by Central Java and Yogyakarta; smaller declines have probably come about in West Java and Jakarta.

Columns 4 and 5 show the TFR path associated with the CBR changes for the high and low program estimates respectively.¹⁸ Given the necessary relationship between CBR and TFR, those provinces with the greatest CBR decline experienced the largest TFR decline. If the high program estimate is used, Jakarta pared completed family size by .7 children; West Java by 1.2 children; Central Java by 1.4 children; Yogyakarta by 1.2 children; East Java by 1.7 children; and Bali by 2.5 children. These are truly remarkable declines. Even if the low estimates are used, the declines in TFR from Jakarta to Bali reads 0.5, 0.9, 1.1, 1.0, 1.3, and 1.9. There seems to be little doubt that the NFPP has had a significant impact on provincial birth rates.

Table 5-19 lists the reduction below potential CBR (where potential CBR refers to the female CBR that would have occurred in the absence of contraceptive practice after 1971, i.e., reduction due to increased exposure alone) attained by the high and low program estimates. This figure thus shows the

Table 5-18. ESTIMATES OF CRUDE BIRTH RATES AND TOTAL FERTILITY RATES UNDER VARIOUS ASSUMPTIONS FOR JAVA-BALI.

Province	Crude birth rates			Total fertility rates	
	No contraceptive services provided	High estimate of program contraception	Low estimate of program continuation	High estimate of program contraception	Low estimate of program contraception
Jakarta					
1971. . .	44.1	44.1	44.1	5.2	5.2
1972. . .	44.1	43.1	43.4	5.1	5.1
1973. . .	44.0	41.4	42.1	4.9	5.0
1974. . .	44.0	39.9	40.9	4.8	4.9
1975. . .	44.0	38.6	40.0	4.6	4.8
1976. . .	43.9	37.5 (38.0)	39.1 (39.6)	4.5	4.7
West Java					
1971. . .	47.6	47.6	47.6	6.3	6.3
1972. . .	46.8	46.1	46.3	6.2	6.2
1973. . .	45.8	43.9	44.4	6.0	6.1
1974. . .	45.1	41.6	42.5	5.7	5.8
1975. . .	44.5	39.5	40.7	5.4	5.6
1976. . .	44.0	37.1 (38.4)	38.9 (40.2)	5.1	5.4
Central Java					
1971. . .	38.0	38.0	38.0	5.3	5.3
1972. . .	37.2	36.7	36.8	5.2	5.2
1973. . .	36.5	34.7	35.1	4.9	5.0
1974. . .	35.8	32.3	33.2	4.6	4.8
1975. . .	35.2	30.1	31.4	4.3	4.5
1976. . .	34.6	27.7 (29.1)	29.4 (30.8)	3.9	4.2
Yogyakarta					
1971. . .	32.1	32.1	32.1	4.7	4.7
1972. . .	32.1	31.3	31.5	4.6	4.6
1973. . .	32.1	30.1	30.1	4.4	4.4
1974. . .	32.1	27.9	28.3	4.0	4.1
1975. . .	32.1	26.2	27.2	3.7	3.8
1976. . .	32.1	25.3 (26.8)	26.7 (28.2)	3.5	3.7

Table 5-18. ESTIMATES OF CRUDE BIRTH RATES AND TOTAL FERTILITY RATES
UNDER VARIOUS ASSUMPTIONS FOR JAVA-BALI—Continued.

Province	Crude birth rates			Total fertility rates	
	No contraceptive services provided	High estimate of program contraception	Low estimate or program continuation	High estimate of program contraception	Low estimate of program contraception
<u>East Java</u>					
1971. . .	36.6	36.6	36.6	4.8	4.8
1972. . .	35.9	34.9	35.2	4.7	4.7
1973. . .	35.3	31.9	32.8	4.3	4.4
1974. . .	34.7	28.4	29.9	3.9	4.1
1975. . .	34.1	25.4	27.6	3.4	3.8
1976. . .	33.7	23.3 (24.8)	25.6 (27.1)	3.1	3.5
<u>Bali</u>					
1971. . .	42.9	42.9	42.9	6.0	6.0
1972. . .	42.4	40.6	41.0	5.7	5.8
1973. . .	42.0	36.6	37.9	5.1	5.4
1974. . .	41.5	32.1	34.5	4.5	4.9
1975. . .	41.2	28.5	31.7	3.9	4.4
1976. . .	40.9	25.9 (26.8)	29.8 (30.7)	3.5	4.1

Table 5-19. CRUDE BIRTH RATE REDUCTION BELOW POTENTIAL UNDER VARIOUS ASSUMPTIONS FOR JAVA-BALI.

Province	Crude birth rate reduction below potential	
	High program estimate	Low program estimate
Jakarta		
1972. . .	1,0	0,7
1973. . .	2,6	1,9
1974. . .	4,1	3,1
1975. . .	5,4	4,0
1976. . .	6,4	4,8
West Java		
1972. . .	0,7	0,5
1973. . .	1,9	1,4
1974. . .	3,5	2,6
1975. . .	5,0	3,8
1976. . .	6,9	5,1
Central Java		
1972. . .	0,5	0,4
1973. . .	1,8	1,4
1974. . .	3,5	2,6
1975. . .	5,1	3,8
1976. . .	6,9	5,2
Yogyakarta		
1972. . .	0,8	0,6
1973. . .	2,0	2,0
1974. . .	4,2	3,8
1975. . .	5,9	4,9
1976. . .	6,8	5,4
East Java		
1972. . .	1,0	0,7
1973. . .	3,4	2,5
1974. . .	6,3	4,8
1975. . .	8,7	6,5
1976. . .	10,4	8,1
Bali		
1972. . .	1,8	1,4
1973. . .	5,4	4,1
1974. . .	9,4	7,0
1975. . .	12,7	9,5
1976. . .	15,0	11,1

fertility decline attributable to contraception alone. In both the high and low program estimates, Bali and East Java record the highest CBR reductions. In all, the CBR declines over potential are significant. At the least, Bali's CBR decline attributable to contraception was 11 points, or an average of over 2 CBR points per year. If the high program estimate is believed, the rate of decline was an average of 3 CBR points per year. The high and low program estimates also show at least an average of 1 CBR point decline over the evaluation period for every other province. For East Java, the average CBR decline due to contraception may have reached 2 CBR points per year (high program estimate).

Table 5-20. PERCENT CBR DECLINE FROM NO-PROGRAM PATH UNDER VARIOUS ASSUMPTIONS FOR JAVA-BALI.

Province	Estimated crude birth rate decline			
	High program estimate		Low program estimate	
Jakarta . . .	14.6 ^(a)	(13.2) ^(b)	10.9 ^(a)	(9.4) ^(b)
West Java . . .	15.6	(14.1)	11.6	(10.5)
Central Java .	19.9	(17.8)	15.0	(13.3)
Yogyakarta . .	21.2	(19.3)	16.8	(15.8)
East Java . . .	30.9	(28.2)	24.0	(21.0)
Bali	36.7	(33.2)	27.1	(24.6)

(a) Percentage decline in crude birth rate.

(b) Women years of protection as percentage of married women of reproductive age in 1975.

Table 5-20 gives the percent reduction in fertility in 1976 over and above that which would have been expected in the absence of additional contraception after 1971. Again, the figures are given for the high and low program paths. Considering the high program estimate, Bali once again has the largest decline (36.7) in fertility, followed by East Java (30.9 percent), Yogyakarta (21.2 percent), Central Java (19.9 percent), West Java (15.6 percent), and Jakarta (14.6 percent).¹⁹ Examining the low program path, a pattern similar to (though lower than) the high program path emerges. Even if the low program estimates are used as "best" estimates, truly significant declines in fertility (due to contraception) have occurred. All provinces show at least a 10 percent decline over the five-year period, and 25 percent reductions are evident in East Java and Bali.

The data in Table 5-20 are the source of another interesting analysis. If it can be assumed that the potential fertility of contraceptive users is equal to that of fecund, exposed women in the general population, the percentage reduction in fertility (measured as births to fecund, exposed women) is equal to the change in the proportion of WYP to fecund, exposed women (FEW).²⁰ Mathematically, this is:²¹

$$\frac{B_2}{FEW} = \frac{B_1}{FEW} [1 - (WYP_2 - WYP_1)/FEW_2] \quad (3)$$

where B_1 and B_2 are births, at respective time points, to fecund, exposed women.

Rewriting the terms of the proof (see note 21), it is:

$$CBR_{t+n} = CBR_t [1 - (WYP_2 - WYP_1) / MWRA_{t+n}] \quad (4)$$

Moving from equation 3 to 4, some bias is introduced since births to females, exposed women may, in different populations, be related to different CBRs because of varying age patterns and since CBR_{t+n} and CBR_t will have slightly different denominators (see note 21). In general, however, such biases should be small, given the high correlations that have been noted between most major fertility measures (Bogue, 1971).²² Some small bias is also introduced by using MWRA in place of FEW. Given that these biases should be small, equation 4 provides a convenient link between WYP and CBR decline.²³

The values in parentheses in Table 5-20 are the CONVERSE estimates of 1975 percent WYP to MWRA. These figures should be approximately the same as the percentage reduction in fertility. Indeed, the two figures (percentage reduction in fertility and percent WYP to MWRA) are quite close. The importance of equations 3 and 4 is that they show a linear relationship between WYP and fertility decline, as evidenced by the data. Thus, the large increases in WYP shown in Table 5-17, if true, must translate into significant fertility declines. The only way smaller fertility declines could have come about is through the provision of less contraceptive protection on the part of the program.

Another way of examining program impact is to consider the effect on annual rates of growth. Of course, growth rates are affected by death rates as well as birth rates. Thus, any change in the growth rate can be explained in part by changing death rates. In this analysis, the effects of changing death rates can be controlled for by examining the difference between the growth rate which would have occurred with no further contraceptive services after 1971 and the growth rate under various birth rate paths. Table 5-21 presents the data necessary for such an analysis. The differences between column 1 and columns 2 or 3 yield the impact on the growth rate attributable to the respective birth rate paths.

Jakarta and West Java by 1976 still had annual growth rates of about 2.0 percent or better under each birth rate path.²⁴ In Jakarta, the figures for the high and low program estimates are, respectively, reductions of 0.6 and 0.4 points. In West Java by 1976, the high program birth rate path reduces the potential growth rate by 0.6 points, and the low program birth rate path reduces the potential growth rate by 0.5 points. Each birth rate path also has an effect on the doubling time, the time required for a population with a certain growth rate to double in size. For Jakarta, the increases in doubling time for high and low program birth rate paths (compared to the no contraception doubling time) are 5.8 and 3.6 years, respectively. For West Java, the corresponding figures are 8.8 and 7.0 years.

In Central Java and Yogyakarta, the 1976 growth rates are lower than either Jakarta or West Java. Comparing Central Java and Yogyakarta, the latter ap-

Table 5-21. ANNUAL GROWTH RATES UNDER VARIOUS ASSUMPTIONS FOR JAVA-BALI.

Province	Annual growth rate		
	No family planning	High program	Low program
<u>Jakarta</u>			
1971	2.9	2.9	2.9
1972	2.9	2.8	2.8
1973	2.9	2.7	2.7
1974	2.9	2.6	2.7
1975	3.0	2.5	2.6
1976	3.0	2.4	2.6
<u>West Java</u>			
1971	2.8	2.8	2.8
1972	2.7	2.7	2.7
1973	2.7	2.5	2.5
1974	2.6	2.3	2.3
1975	2.5	2.1	2.2
1976	2.5	1.9	2.0
<u>Central Java</u>			
1971	2.1	2.1	2.1
1972	2.1	2.0	2.0
1973	2.1	1.9	2.0
1974	2.1	1.8	1.9
1975	2.1	1.6	1.8
1976	2.1	1.5	1.6
<u>Yogyakarta</u>			
1971	1.5	1.5	1.5
1972	1.5	1.4	1.5
1973	1.5	1.3	1.3
1974	1.5	1.1	1.1
1975	1.5	1.0	1.0
1976	1.5	0.9	1.0
<u>East Java</u>			
1971	2.0	2.0	2.0
1972	2.0	1.9	1.9
1973	1.9	1.6	1.7
1974	1.9	1.3	1.4
1975	1.8	1.0	1.2
1976	1.8	0.9	1.1
<u>Bali</u>			
1971	2.4	2.4	2.4
1972	2.4	2.2	2.3
1973	2.4	1.9	2.0
1974	2.4	1.5	1.7
1975	2.4	1.2	1.5
1976	2.3	1.0	1.3

pears to have the lowest growth rates. The high and low program growth rates for Central Java are respectively 1.5 percent and 1.6 percent while the same rates for Yogyakarta are 0.9 percent and 1.0 percent. Examining the reduction in growth rate below potential in 1976, Central Java shows values of 0.6 and 0.5 points for the high and low program estimates. In Yogyakarta, these values are 0.6 and 0.5 points. As for increase in population doubling time, for

the high program CBR path the Central Java value is 13.3 years and the Yogyakarta value 46.7 years; for the low program CBR path, 10.4 is the Central Java value and 23.3 is the Yogyakarta value.

East Java and Bali show low 1976 growth rates which compare quite favorably with those for Yogyakarta. In East Java, high and low program growth rates are 0.9 and 1.1 percent respectively. In Bali, the corresponding figures are 1.0 and 1.3 percent. In 1976, East Java growth rates represent reductions below potential of 0.9 and 0.7 points respectively; in Bali, these values are 1.3 and 1.0 points. The number of years in increased doubling time are 38.9 and 24.7 respectively for East Java and 39.6 and 31.4 for Bali.

In general, the growth rate analysis parallels that of the CBR analysis. Examining the high and low birth rate paths, the provinces with the best records are located in the East (Bali, East Java, and Yogyakarta). The worst records clearly belong to Jakarta and West Java. In Bali, East Java, and Yogyakarta, the low and high program estimates would appear to have significantly increased the population doubling time with smaller increases in Central Java, West Java, and Jakarta. As for reduction of the growth rate below potential, East Java and Bali have the best records. The remaining provinces are fairly well grouped together on this measure.

VIII

Protection Provided by Various Methods

Another interesting and valuable statistic is the distribution among methods of the WYP needed to accomplish a given birth rate decline. Table 5-22 reports these data for the high and low program estimates of the CBR path.²⁵ The most immediate observation is the shift toward more reliance on the pill to meet WYP requirements at the expense of the IUD. In 1971, four provinces (Jakarta, Central Java, Yogyakarta, and Bali) were dependent on the IUD for more than 50 percent of WYP (and still registered an 11.9 percent decline in the percentage of WYP attributable to the IUD). By 1975, only two provinces, Yogyakarta and Bali, were not meeting the majority of their WYP requirements by the pill. Condom use (as measured by the percent of WYP accounted for) has increased in Jakarta, Central Java, Yogyakarta, and Bali. Increased condom usage has been greatest in Yogyakarta where fully one-third of the contraceptive protection from modern methods in 1975 came from this source.

In view of the data in Tables 5-6 through 5-11 indicating a much lengthier pattern of effective use on the part of IUD users when compared to pill and condom users, the figures in Table 5-22 indicate that the NFPP has not chosen the easiest path to fertility decline by shifting focus to the pill. The NFPP has had to recruit more acceptors to reach a certain WYP level than if the 1971

Table 5-22. DISTRIBUTION OF WOMAN YEARS OF PROTECTION BY MAJOR METHODS, 1971 AND 1975 FOR JAVA-BALI.

Province	Method		
	Pill	IUD	Condom
Jakarta			
1971	19,2	70,5	10,3
1975	49,0	33,3	17,8
West Java			
1971	65,5	26,7	7,8
1975	82,8	9,6	7,6
Central Java			
1971	31,1	63,3	5,5
1975	54,6	28,6	16,8
Yogyakarta			
1971	21,7	58,4	19,9
1975	29,0	37,3	33,7
East Java			
1971	47,4	45,4	7,2
1975	61,7	31,7	6,5
Bali			
1971	15,3	81,7	3,0
1975	20,5	69,8	9,7

pattern of reliance on the IUD had been retained. The rapid shift to resupply methods, then, makes the estimated CBR decline under the high and low program estimates even more remarkable. Not only were the CBR declines achieved with a changing method mix, but they also were reached in the face of increasing numbers of MWRA. Column 1 of Table 5-23 shows that between 1971 and 1976, MWRA increased in every province, meaning that increased program effort would have been needed merely to hold the CBR stable (even without the shift in method mix toward pills). The impact of the NFPP in recruiting and keeping acceptors is shown in columns 2 and 3 of Table 5-23. These columns indicate that under the high and low program estimates, the number of women eligible for acceptance (which includes past but not currently using family planning acceptors) declined in every province where it would have been expected to increase on the basis of MWRA alone.

What do these figures mean for Java and Bali as a whole? In analyzing fertility change, the whole is necessarily the sum of the parts. TABRAP or CONVERSE estimates the births and total female population for each province. After summing births and population, divide the two sums to arrive at the Java-Bali birth rate under various change paths. First note that, in 1976, the potential female CBR (i.e., that CBR of Java-Bali which would result if there were no further contraceptive services provided after 1971) is 37.7.

Table 5-23. ESTIMATES OF MARRIED WOMEN OF REPRODUCTIVE AGE AND NUMBER OF ELIGIBLE WOMEN UNDER VARIOUS ASSUMPTIONS FOR JAVA-BALI.

Province	Women eligible for acceptance		
	Married women of reproductive age (a)	High program estimate	Low program estimate
Jakarta			
1971. . . .	714,667	687,684	687,624
1972. . . .	728,532	684,066	689,667
1973. . . .	742,394	675,152	687,389
1974. . . .	756,242	666,964	685,433
1975. . . .	770,064	659,269	683,676
West Java			
1971. . . .	3,713,488	3,683,478	3,683,478
1972. . . .	3,754,915	3,668,823	3,684,224
1973. . . .	3,796,641	3,609,348	3,651,138
1974. . . .	3,838,461	3,518,296	3,594,149
1975. . . .	3,888,468	3,428,884	3,538,220
Central Java			
1971. . . .	3,489,922	3,464,709	3,464,709
1972. . . .	3,506,289	3,423,441	3,438,813
1973. . . .	3,522,276	3,307,968	3,356,961
1974. . . .	3,593,742	3,170,836	3,258,549
1975. . . .	3,552,465	3,038,691	3,163,500
Yogyakarta			
1971. . . .	349,425	343,581	343,581
1972. . . .	350,909	334,070	337,011
1973. . . .	352,467	325,037	323,726
1974. . . .	354,092	301,225	307,363
1975. . . .	355,778	288,099	298,784
East Java			
1971. . . .	4,291,872	4,239,840	4,239,840
1972. . . .	4,308,874	4,124,053	4,159,424
1973. . . .	4,326,499	3,838,737	3,951,517
1974. . . .	4,344,529	3,518,587	3,717,112
1975. . . .	4,363,043	3,262,230	3,530,145
Bali			
1971. . . .	304,355	290,868	290,868
1972. . . .	308,135	277,322	281,924
1973. . . .	311,916	254,482	285,973
1974. . . .	315,694	227,649	246,976
1975. . . .	319,465	206,634	232,279

(a) Age 15-44.

The CBR expected under the estimated actual or predicted path is 33.9, or a reduction of 3.9 CBR points below potential. The high program estimate of contraception provided yields a 1976 CBR of 29.4, a reduction of 8.3 CBR points below potential. For the low program estimate of protection provided, a CBR of 31.5 is expected, or a 6.2 CBR point reduction below potential. Thus, as expected from the provincial data, there has been a significant decline in fertility over the entire island area. Taking the high or low estimates

of program activity as accurate, considerable reduction in the CBR can be attributed to the NFPP. The high estimate indicates an average yearly CBR decline of 1.7 points; the low estimate indicates a decline of 1.2 CBR points yearly.

IX

The Socioeconomic Context of Indonesia's Fertility Decline

The rapid decline in fertility levels in Java and Bali take on particular significance since the decline appears to have occurred in the absence of significant socioeconomic development. Before 1971, Java and Bali appear to have recorded little socioeconomic development or fertility change. Consequently, Java-Bali would appear to support the notion that a family planning program alone can have significant impact on the birth rate.

Sociologists, economists, and demographers have long argued over the necessity of economic and social development in fertility decline. Beginning with the development of the theory of demographic transition (Notestein, 1945), researchers have emphasized the role of social and economic development. Theorists such as Thompson (1946), Blacker (1947), and Davis (1949) have surveyed world economic and fertility data and arrived at the conclusion that various levels of development (usually equated with industrialization) are inversely related to levels of fertility and mortality. On a more quantitative level, some researchers have identified a set of social and economic variables which are usually inversely related to fertility levels (Kasarda, 1971; Ekanem, 1972; Bell, 1976; Adelman and Morris, 1966).²⁶ The set of economic and social variables usually includes some measure of income, literacy, urbanization and industrialization.

These quantitative studies, however, have most always been based on cross-sectional data. Other researchers (Heer, 1966, and Janowitz, 1973) indicate that for single nations, over time, there does not seem to be a univariate relationship between socioeconomic development and fertility. Recognizing these problems, investigators have turned to examining historical declines in fertility. With respect to developed Western nations, the assumed inverse relationship between socioeconomic development and fertility has been called into question. It is in the developing world, however, that these relationships have undergone closest examination. The Third World nations have provided the test tube situation for the efficacy of deliberate fertility control programs. In these nations, with high birth rates and explosive growth rates, organized national family planning programs have been accepted as a means to cope with population growth (Ravenholt and Brackett, 1976). It is the evaluation of these programs that offers some evidence of the relationships among family planning, socioeconomic development, and fertility.

Unfortunately, however, the answers have not been clear. Countries such as Taiwan, Japan, and South Korea (which have recently experienced rapid fertility declines) have not only had family planning programs but also un- questionable social and economic growth. No methodology has yet been developed which can adequately separate the two components on a macro level. As such, the same data sources may lead different investigators to different conclusions. For example, Feachman, Hogan, and Bogue (1978) argue that the recent decline in Colombia fertility can be attributed to the family planning program, regardless of socioeconomic change. Potter (1977), however, feels that the Colombian fertility decline cannot be separated from socioeconomic development in the country.

Indonesia, however, may be a case of fertility decline in the presence of a family planning program and without significant socioeconomic development. In terms of per capita gross national product, literacy, urbanization, and agricultural employment, Indonesia has remained among the ranks of less developed nations. For instance, estimates of the 1974 per capita gross national product of Indonesia are around \$100 (U.S.), with 10 percent of the population controlling 37 to 38 percent of the wealth.²⁷ Such figures are certainly extreme, even in the developing world. A variety of statistics clearly establish Indonesia's less developed status; most of the following figures are for the 1961-1971 period, just preceding the years of the impact evaluation. Ideally, it would be best also to have 1976 measurements on the variables used; although a 1976 intercensal population survey was conducted, the needed tabulations have not yet been made. Given the short period of time covered by the impact evaluation (five years) and the fact that economic and social changes undoubtedly need a certain length of time to be translated into a behavioral reaction such as reduced fertility, the 1961-1971 data should present a relatively accurate picture of the economic and social conditions upon which the estimated fertility declines are based.

Urbanism

In 1961, Java-Bali was 84.4 percent rural. By 1971, this figure had only decreased to 82 percent. This means that the percent urban only increased from 15.6 to 18 percent, or an increase of 2.4 percentage points. Over the entire ten-year period, the urban population of Java-Bali increased at an annual rate of 3.4 percent compared to 1.6 percent annual growth rate for the rural population; the urban population grew roughly twice as fast as the rural population. While this may seem to be a large disparity, it is quite minimal when compared to the 5 to 10 percent annual increase in urban population often noted in other developing countries.

Overall, between 1961 and 1971, the urban population grew by some four million, of which only one million, or 25 percent, can be attributed to mi-

gration. Consequently, much of Java-Bali's increase in urban population cannot be attributed to persons moving from rural to urban areas where traditional theory holds that new values and lifestyles may be translated into lowered fertility; instead, most of the urban population increase was due to the fertility of urban residents.

At any rate, the impact data might indicate that urbanization in Indonesia is not overly conducive to fertility decline. While urban fertility during the 1961-1971 decade was lower than rural fertility (TFR of 4.7 vs. TFR of 5.4), the largest fertility reductions between 1971 and 1976 took place in the rural provinces. In East Java (86 percent rural in 1971) and Bali (90 percent urban in 1971), fertility declines far outstripped those in the 100 percent urban Jakarta special province. It is in Jakarta, the capital city, with the largest concentration of health centers, physicians, retail drug outlets, and so on that the greatest amount of fertility control would be expected to occur, but where fertility reduction has been minimal. Jakarta, however, has relied more heavily on the private sector for contraceptive services than the other provinces. In 1976, only 71 percent of all modern methods were supplied by the program, compared to 90 percent in East Java and 88 percent in Bali.

These data would seem to indicate that Java-Bali has not been urbanizing quickly and that such urbanization if it had occurred may not have been a sufficient cause for fertility reduction. The comparisons are tenuous, of course, but it seems to be the case that heavy program efforts in rural areas produce greater fertility decline than in urban areas.

Literacy

Literacy is one area in which Indonesia has shown some solid progress. In 1961, 59 percent of the male population and 33 percent of the female population were able to read and write in some language. By 1971, these figures had increased to 70 and 46 percent, respectively. Still, 43 percent of the population was completely illiterate in 1971. The increase in literacy stems from the increase in the number of persons (10 years of age or older) completing elementary school. In 1961, only 28 percent of the population had finished elementary school. By 1971, the percentage had increased to 50 percent. These figures are balanced somewhat, however, by the virtual stagnation in higher education. In 1971, only 1.2 percent of Java-Bali's population 10 years of age or older had completed high school compared to 0.6 percent in 1961.

The increase in literacy has uncertain implications for fertility in Indonesia since, contrary to general transition theory, higher education is associated with higher fertility. For the 1960-1970 decade, individuals with no school on Java-Bali had an estimated TFR of 4.8. Those who had completed elementary school had an estimated TFR of 5.6. It may be, then, that increased literacy is a factor favoring higher fertility as opposed to lower fertility.

Table 5-24. GROWTH IN PERCAPITA GROSS SECTOR PRODUCT FOR INDONESIA, 1961 TO 1971 (USING GROSS DOMESTIC PRODUCT).

Sector	Number employed ^(a)			Gross sector product ^(b)			Per capita gross sector product ^(a)		
	1961	1971	Percent change	1961	1971	Percent change	1961	1971	Percent change
Total	32,072	37,617	17.3	393.4	579.0	47.2	12,266	15,392	25.5
Agriculture	23,516	24,772	5.3	213.9	281.0	31.4	9,096	11,443	24.7
Mining	87	90	3.4	14.6	34.0	132.9	167,816	377,778	125.1
Manufacturing	1,856	2,932	57.9	36.6	58.0	58.5	19,720	19,782	0.3
Construction	582	737	26.6	10.2	18.0	76.5	17,526	24,423	39.4
Electricity and gas	51	38	-25.5	1.2	3.0	150.0	23,529	78,947	235.5
Trade and finance	2,194	4,209	91.8	77.7	131.0	68.6	35,415	31,123	-12.1
Transportation and communication	691	916	32.6	14.5	22.0	51.7	20,984	24,017	14.5
Services	3,095	3,923	26.8	24.7	32.0	29.6	7,991	8,157	2.2

(a) In thousands.

(b) In billions of rupiah (excluding income from public administration).

Income and occupational structure

Table 5-24 reports the basic income and occupational structure of employed persons in Indonesia for the 1961 and 1971 periods.²⁸ Columns 1 and 2 indicate that there was an absolute increase in the numbers of those employed in agriculture. Despite this, the growth in total labor force turns this into a relative decrease, from 73 to 66 percent. Column 3 shows that manufacturing and trade and finance positions were the fastest growing occupations during the decade though their absolute numbers are still relatively small.²⁹ The general trend is thus a small outflow from agriculture into other occupations, although the vast majority of Indonesians still earn their living from the land. Indeed, the shift from agriculture (in relative terms) is quite small when compared with declines in other developing countries. The 7 percent decline noted in Indonesia is small in relation to the 17 percent decline found in Colombia for the period 1963-1974.

It should also be noted that the flow from agriculture may well be the result of "push" as opposed to "pull" factors. In other words, farmers experiencing difficulty in earning a living from the already intensely cultivated rice lands might be forced out of the occupation rather than enticed by the profits in other jobs. White (1976) describes a process by which marginal agricultural workers are forced into a multiplicity of other trades, the choice depending upon the relative possible gains. These people are not absorbed by a rapidly enlarging industrial or manufacturing sector which might encourage fertility, but must constantly move between alternative low paying tasks.

This problem is illustrated in column 9 of Table 5-24 which shows a decline in per capita income for those employed in trade and finance. The trade and finance sector contains a wide variety of small traders who buy and sell whenever they can gain a profit. It is often the only job available to unskilled farm labor who no longer have land to work. Although the gross sector product for trade and finance went up significantly (69 percent), the increase in the numbers of those employed in this sector went up more rapidly (92 percent), resulting in a decrease in per capita sector product. In fact, in all sectors of the economy, much of the increase in gross sector product for the period was absorbed by increasing numbers employed. (Trade and finance was the only sector in which per capita sector income actually decreased.)

In agriculture, per capita income increased 25 percent from 9,096 *rupiah* to 11,343 *rupiah*. Overall, between 1961 and 1971, per capita income went up 26 percent from 12,266 *rupiah* to 15,392 *rupiah*. Since Table 5-24 is in constant 1960 values, the 1961 to 1971 increase in agricultural earnings per employed person (note that these figures seem slightly high since they exclude nonemployed persons from the base) of 2,247 *rupiah* corresponds to an increase of \$50 (U.S.). These growth figures are not particularly impressive, especially since they occurred over a ten-year span. They are even less impressive when one realizes that the average household size in Indonesia for

this period was 6.1 persons, which considerably dilutes the effect of the income increases.

The image that emerges from these data is one of a country experiencing slow economic development. A large proportion of the employed labor force was, as of 1971, still engaged in traditional agricultural pursuits. Furthermore, the reimbursement from these pursuits increased only slightly over the period. There appears to have been no dynamic industrial or manufacturing growth to spur nonagricultural employment and income growth. The entire economic front showed little tendency to change or progress, especially when absolute and not relative growth measures are considered.³⁰ As a consequence, one can find little rationale for hypothesizing that economic growth could have been a strong causative force in the fertility decline registered on Java-Bali.

X

The Role of the Private Sector

Each of the above sections seems to point rather strongly to the role of the Indonesian NFPP in Java-Bali's estimated fertility decline. This conclusion follows from the fact that there is little developmental evidence to indicate that contraception would have been practiced privately on a scale large enough to account for the CBR declines noted above for the provinces of Java-Bali. To be sure, some sort of birth control must have been in force during the 1961-1971 decade, since the TFR estimates (for the area as a whole, 5.2) are well below natural fertility levels. Almost certainly, however, the contraceptive protection needed to reduce fertility from natural levels was the result of traditional practices such as withdrawal, abstinence, and extended breast-feeding. Prior to 1968, Indonesia's population policy was decidedly pronatalistic (see the Introduction). Family planning was viewed as unnecessary and perhaps even as immoral.

The data in the preceding sections also show that there is little a priori reason to believe socioeconomic development could have spurred a demand for family planning services from the private sector. There is evidence that, even if such a demand had been created, the private sector could hardly have supplied the required amount of contraception to reach the estimated 1976 CBR levels. Besides the purely economic drain on families to purchase contraceptives (which are provided free of charge by the NFPP), there are organizational constraints. For one, Indonesia does not manufacture either pills or condoms at the present time. Today, every cycle of pills distributed has to be imported (mostly through the assistance of U.S.A.I.D.) as well as every IUD inserted.³¹ Additionally, until very recently, pills had to be prescribed by a physician (private supplies are still subject to this condition), and IUDs must still be inserted by a physician or qualified midwife. Presently, there is only one

doctor per 21,000 population and one midwife per 25,000 population, and the problem is compounded by their heavy concentration in urban areas, especially Jakarta. Even if a patient had access to a physician (some of whom will not prescribe family planning), she would have trouble finding a place to have her prescription filled. In 1973, there were only 867 pharmacies on Java-Bali (613 outside of Jakarta) or one for every 150,000 people (one for every 200,000 people outside of Jakarta). It is only by relying on government-controlled health facilities (which now number over 2,700) that the NFPP has been able to supply contraceptives to large numbers of family planning users.³²

The characteristics of the family planning acceptors over the 1971 to 1975 period also argue against a substitutability hypothesis. Based on interviews of family planning acceptors for this time period (taken from the Quarterly Acceptor Survey), 90 percent are from rural areas, 44 percent are illiterate, 66 percent have never finished elementary school, and 89 percent are employed either in agricultural or general labor or do not work. These are hardly the characteristics of women who would be seeking family planning services in the private sector, especially given the infrastructure problems noted above.

Although there is very little hard data to rely on in the way of nonprogram contraception, it would seem impossible for the private sector to have provided the contraception required to meet the 1976 estimated CBR levels. Nor is the medical infrastructure sufficiently well developed or the characteristics of acceptors of the predicted sort for private practice contraception to be probable on any large scale. The only remaining possibility would be abortion. In Indonesia, however, abortion is allowed only for medical reasons. It is against both religious and ethical standards and, even though there are no estimates of illegal abortions, they certainly could not be of a magnitude required to meet CBR estimates.

Notes

¹Prior to 1968, family planning services were available through the Indonesian Planned Parenthood Association which was formed in 1957. Although open government support was not given, the association was able to function without fear of reprisals. The lack of funds and general support, however, restricted most of the family planning activities to urban areas where contraceptives could be sold for a profit.

²This decision was reached despite the higher growth rates occurring in the Outer Islands. Bali's geographic position directly to the east of Java and its population density were the major reasons for its inclusion in the original program. Since the 1974/75 fiscal year, the program has expanded to ten of the

twenty Outer Island provinces with the remaining ten to be included at a later date.

³The impact analysis is limited to the provinces of Java-Bali since it is only here that the NFPP has been in existence long enough to have had significant impact.

⁴Also important in the development of the TABRAP/CONVERSE model is the work of Robert Potter. For an extended discussion of the model as well as illustrative applications, see Nortman and Bongaarts (1975).

⁵All calculations are performed using female births and female population. The birth rate changes must, therefore, be stated in terms of a female crude birth rate.

⁶Abstinence is adjusted for by considering only women in a conjugal union and estimating births by age-specific marital fertility rates. Sterility is accounted for by adjusting the age-specific marital fertility rates downward.

⁷The attrition rate used is assumed to take account of any reason for discontinuation including accidental pregnancy. As such, these reasons need not be built into a model, and the attrition schedule will yield estimates of effective woman years of protection, i.e., those free from pregnancy (or more specifically a live birth).

⁸The determining parameters of this curve, "a" and "r", can best be estimated by log-regression of life table continuation rates. A program, CONTINUE, has been made available by the Population Council to carry out such a calculation. The life table continuation rates used here are all segment, age-method-province-specific rates calculated from the Indonesian Quarterly Acceptor Survey. For a full discussion of these and other contraceptive effectiveness rates, see Teachman et al. (1977).

⁹Actually, a user may postulate a proportion of required contraception that will be supplied by program sources. This is not the same as estimating contraceptive protection provided from acceptor and continuation rate data, the procedure used by CONVERSE. When PROJTARG is given a proportion of required contraception to be supplied by program sources (specific by age and method), it then calculates the number of needed acceptors by dividing the woman-years of protection required by an average duration of use for a particular method. Note that this procedure produces a biased estimate of required acceptors by allocating all the protection from a method into the year of acceptance. For a detailed analysis of this bias, see Hogan (1976: Appendix B).

¹⁰In other words, instead of calculating acceptors based on a fixed birth rate target (TABRAP), CONVERSE calculates a birth rate based on a fixed path of acceptors. Use-per-acceptor, with a certain length of use which averts births (calculated from the same attrition schedule used in TABRAP), is multiplied by number of acceptors (on an age-specific, method-weighted basis) to get births averted. It is then a simple matter to calculate the estimated female crude birth rate.

¹¹A male to female sex ratio at birth of 1.05 is used to keep track of female births. The value 1.05 is specific to Indonesia and can be changed according to the situation.

¹²In this analysis, net migration between provinces is assumed to be inconsequential during the 1971 and 1976 periods. This assumption is probably correct for all provinces except Jakarta, which experienced some growth due to net migration. No attempt was made to estimate the amount of net migration, since neither TABRAP nor CONVERSE can handle such data.

¹³Unlike PROJTAG, TABRAP does not require the terminal year age-specific marital fertility rates. Rather, those years are calculated as the result of age-specific births averted.

¹⁴Between 1971 and 1975, the Indonesian program was essentially a three-method program: pill, IUD, and condom. During this time, a few women selected foam, but their numbers are so small that they can be ignored. In fiscal year 1974/75, sterilization and injectibles were introduced but, again, their use was inconsequential. Abortion, except for medical purposes, is now allowed in Indonesia and thus does not serve as a program method of contraception.

¹⁵The values shown for older IUD acceptors are very large. They represent the average duration of use that would occur if these women continued at a rate indicated by their first years of experience and were not affected by secondary sterility. The actual duration of effective use is much shorter, of course, since these women are necessarily decremented by the onset of secondary sterility.

¹⁶The number of acceptors reported by the program are adjusted downward using method-specific rates of overreporting estimated from the Indonesian Quarterly Acceptor Survey (see Nurhayati, Parson, and Teachman, 1977). CONVERSE calls for calendar year (midyear input) estimates of acceptors. Since the Indonesian fiscal year runs from April to March, calendar year estimates are calculated as .25 of one year plus .75 of the next. For instance, calendar year 1973 acceptors would be .25 of the 1972/73 acceptors plus .75 of the 1973/74 acceptors.

¹⁷Thus, they are not yet the true indicators of program input.

¹⁸Calculated from estimated ASFR's output by CONVERSE and TAB-RAP.

¹⁹The size of the reductions follows an east-west axis with the eastern provinces experiencing the largest declines in fertility.

²⁰Arguments can be made for assuming both higher and lower fertility than the general population.

²¹To prove equation 3, first note that BA (births averted) between time 1 and time 2 is equal to:

$$\begin{aligned} \text{BA} &= [B_1(\text{WYP}_2 - \text{WYP}_1)]/\text{FEW}_2 \\ &= (B_1\text{WYP}_2 - B_1\text{WYP}_1)/\text{FEW}_2 \end{aligned}$$

where BA = births averted between time 1 and time 2
 WYP₂ = woman years of protection provided in time 2
 WYP₁ = woman years of protection provided in time 1
 FEW₂ = fecund, exposed women in time 2 .

This follows if one accepts the fact that births averted at any time is equal to births to fecund, exposed women multiplied by WYP (see Nortman and Bongarts, 1975). Thus, if $B_1/\text{FEW}_1 > B_2/\text{FEW}_1$, the difference must be due to births averted as defined above, or:

$$\begin{aligned} B_2/\text{FEW}_1 &= [B_1 - (B_1\text{WYP}_2 - B_1\text{WYP}_1)/\text{FEW}_2]/\text{FEW}_1 \\ &= B_1/\text{FEW}_1 - (B_1\text{WYP}_2 - B_1\text{WYP}_1)/(\text{FEW}_1\text{FEW}_2) \end{aligned}$$

When written, equation 3 becomes:

$$\begin{aligned} B_2/\text{FEW}_1 &= B_1/\text{FEW}_1 - (B_1/\text{FEW}_1)[(\text{WYP}_2 - \text{WYP}_1)/\text{FEW}_2] \\ &= B_1/\text{FEW}_1 - [(B_1)(\text{WYP}_2 - B_1\text{WYP}_1)/(\text{FEW}_1\text{FEW}_2)] \\ &= B_1/\text{FEW}_1 - (B_1\text{WYP}_2 - B_1\text{WYP}_1)/(\text{FEW}_1\text{FEW}_2) \end{aligned}$$

thus proving the equality. It should be realized that fertility decline as used here is measured as the difference between B_2/FEW_1 and B_1/FEW_1 , i.e., using the same base of women so that the difference between the two must be due

to births averted. Any real change in fertility is actually due in part to births averted and changes in FEW. Equation 3 will not strictly hold if fertility is measured at time 2 as B_2/FEW_2 . The bias introduced however, will be small to the degree that FEW_1 is similar to FEW_2 .

²²According to equations 3 and 4, fertility and WYP are linearly related without effect from age-method mixes. Another way of saying this is that a woman-year of protection has the same effect on the birth rate no matter the age of the woman or the method she uses. That method has no effect is self-evident: a year of effective protection is the same no matter what its source. For age, consider the fact that $BA = WYP(B/FEW)$; by age, this is:

$$BA = \sum_{i=1}^N WYP_i (B_i / FEW_i) .$$

The crucial assumption is that B_i/FEW_i is the same for all age groups so that:

$$BA = B/FEW \sum_{i=1}^N WYP_i = (B/FEW)WYP .$$

Bogue, Edmonds, and Bogue (1973) argue that B/FEW is indeed the same for all age groups (estimated to be 500 births per 1,000 fecund, exposed women). An alternative perspective has been put forward that forms an integral part of the TABRAP/CONVERSE. In this view, births averted are equal to WYP multiplied times potential fertility (nine months later). The true difference between this and the above formulation is that potential fertility is not measured as births to fecund, exposed women, but rather as the age-specific marital fertility rate adjusted for sterility. This view holds that most of the women who accept family planning would in other circumstances normally reduce their fertility below the 500 births per 1,000 FEW most often used as an estimate of B/FEW . As such, the potential fertility of acceptors is held to be equal to that measured in the general population. One result is that births averted is, to some extent, dependent on the age structure of acceptors (i.e., the degree to which the adjusted age-specific marital fertility rates are differentially weighted) although method would again have no effect. To date, no solid evidence has been put forward showing the differences that can result from using the two assumptions on the same data. Table 5-20, however, shows that the linearity assumption is not greatly violated by the TABRAP/CONVERSE calculations in the analysis here. This is expected, since the age distribution of acceptors over time is assumed to be constant. This assumption necessarily yields fertility reductions that are a linear function of WYP (again, see Table 5-20). However, the births averted which are estimated under this procedure may differ (in a constant amount over time) from those calculated under the alternative procedure.

²³Again, when the age distribution of acceptors over time does not change, TABRAP/CONVERSE should yield linear fertility reductions with respect to WYP.

²⁴These calculations are carried out assuming no net migration. The values presented are thus assumed free of growth from this factor.

²⁵The distribution between methods is the same for the high and low program estimates since the low program estimate is a uniform reduction of 25 percent in the high program acceptors.

²⁶See also work on the micro level.

²⁷Current per capita GNP figures are higher but probably do not represent an improved standard of living since most of the GNP increase comes from the sale of crude oil.

²⁸Income data are not reported for Java-Bali alone. Later results will show that Java's per capita income is more likely lower than reported for the nation as a whole.

²⁹Trade positions are often no more than those of very small-scale middleman operations. Manufacturing is defined as any group of five or more employees working to produce a finished product.

³⁰In 1971, the average income per employed person was \$340 (U.S.). Using the total population as base, the per capita income was in the \$100-110 (U.S.) range. These are very low figures even if they represent 20 percent gains over the 1960-1970 decade. With such a small initial base, even relatively large percentage gains do not translate into improved standards of living and greater purchasing power.

³¹It is doubtful that the massive supplies made available to the NFPP would have been supplied by foreign donors to the private sector.

³²Currently, a system of village supply is being set up. The goal is to make each community self-sufficient in the distribution of contraceptive supplies.

References

- Adelman, I., and C. Morris. 1966. "A Quantitative Study of Social and Political Determinants of Fertility." *Economic Development and Cultural Change* (January): 129-157.
- Bell, C. 1976. "Fertility, Mortality, and the Standard of Living." Mimeo, World Bank.
- Bogue, D. 1971. *Demographic Techniques of Fertility Analysis*. RFFPI Manual No. 2. Chicago: Community and Family Study Center, The University of Chicago.
- _____, S. Edmonds, and E. Bogue. 1973. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Status on Birth Rates*. RFFPI Manual No. 6. Chicago: Community and Family Study Center, The University of Chicago.
- Colombian Working Committee for the Study of the Impact of Family Planning on the Demographic, Economic, and Social Structure of Colombia. 1976. "An Estimate of the Direct Impact of Family Planning Programs on the Birth Rate of Colombia." Unpublished monograph. Chicago: Community and Family Study Center, The University of Chicago.
- Davis, K. 1949. *Human Society*. New York: Macmillan.
- Ekanema, I. 1972. "A Further Note on the Relation Between Economic Development and Fertility." *Demography* 9: 383-398.
- Heer, D. 1966. "Economic Development and Fertility." *Demography* 3:423-444.
- Hogan, D. 1976. "An Evaluation of the Demographic Impact of the National Family Planning Program of Thailand." Unpublished monograph. Chicago: Community and Family Study Center, The University of Chicago.
- Janowitz, B. 1973. "An Econometric Analysis of Trends in Fertility Rates." *Journal of Development Studies* (April): 413-425.
- Kasarda, J. 1971. "Economic Structure and Fertility: A Comparative Analysis." *Demography* 8: 307-317.
- McDonald, P., M. Yasin, and G. Jones. 1976. *Levels and Trends in Fertility and Childhood Mortality in Indonesia*. Jakarta: Lembaga Demografi, Fakultas Ekonomi, Universitas Indonesia.
- Missen, G. 1972. *Viewpoints of Indonesia: A Geographical Study*. Melbourne: Nelson.
- Nortman, D., and J. Bongaarts. 1975. "Contraceptive Practice Required to Meet a Prescribed Crude Birth Rate Target: A Proposed Macro-Model (TABRAP) and Hypothetical Illustrations." *Demography* 12:471-489.
- Notestein, F. 1945. "Population: The Long View," in T.W. Schultz (ed.), *Food for the World*. Chicago: The University of Chicago Press.
- Nurhayati, J. Parsons, and J. Teachman. 1977. "Possible Sources of Error and Bias in the Indonesian Quarterly Acceptor Survey." Mimeo, Indonesian National Family Planning Coordinating Board.

- Potter, J. 1977. "The Rapid Decline in Colombian Fertility." *Population and Development Review* 3/4: 509-528.
- Ravenholt, R., and J. Brackett. 1976. "Impact of Family Planning Program on Fertility in Developing Countries." Paper presented at the Population Association of America meetings, Montreal, April.
- Sinquefield, S., and B. Sungkono. 1977. *Fertility and Family Planning in Java and Bali Based on the 1976 Java-Bali Fertility Survey and other Sources*. Preliminary Report on the 1976 Intercensal Survey. Lembaga Demografi, Fakultas Ekonomi, Universitas Indonesia.
- Soetedjo, and J. Parsons. 1977. "Recent Trends and Achievements in the Indonesian National Family Planning Program." NFPCB mimeo.
- Teachman, J. 1977. "Estimates of Postpartum Amenorrhea on Java." Paper prepared for the Indonesian National Family Planning Program.
- _____, D. Hogan, and D. Bogue, 1978. "A Components Method for Measuring the Impact of a Family Planning Program on Birth Rates." *Demography* 15: 113-129.
- _____, J. Parsons, S. Haryono, and Rohadi. 1977. "Preliminary Estimates of Contraceptive Use-Effectiveness on Java." Mimeo, Indonesian National Family Planning Coordinating Board.
- Thompson, W. 1946. *Population and Peace in the Pacific*. Chicago: The University of Chicago Press.
- White, B. 1976. "Population, Involution and Employment in Rural Java." *Development and Change* 7: 267-290.

Chapter Six

AN ANALYSIS OF THE IMPACT OF ORGANIZED FAMILY PLANNING EFFORTS ON KOREAN FERTILITY

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I

Introduction

There is no evidence which suggests the existence of a popular antinatalist movement at any time in Korea's history prior to the late 1950s. In that era, under the conservative leadership of President Syngman Rhee, a commoner's ideas about reducing fertility were still best left unspoken, or at least kept within a limited circle of sympathizers. It was not until the 1960s that legal sanctions against contraception were removed, and the melting away of cultural and normative resistance to birth control could begin.

This change in attitude came in the wake of accelerating population growth. It was not the result of demographic change alone, however, but was also due to concomitant pressures of changing social, political, and economic conditions which eventually resulted in the emergence of a population control policy in the Republic.

Urbanization is one particularly noticeable trend which reflects both demographic and economic change. The percent of the population living in administrative areas of 20,000 or more grew from 9.2 percent in 1935 to 16.0 percent in 1940 (Kwon et al., 1975). Since the end of the post-Korean War period of resettlement, urbanization has been proceeding at monotonically increasing rates. In 1955, about 24 percent of the population was living in Korea's cities. That value increased to 28 percent in 1960, 34 percent in 1966, 41 percent in 1970, and 48 percent in 1975 (ESCAP, 1975; Nortman and Hofstatter, 1976) with most of the growth being in the cities of Seoul and Pusan.

Economic growth has shown equally impressive gains since the truce of 1953. For the first eight years, economic growth was matched by population growth, so there was no significant reinvestment of capital for development. It took a series of five-year plans starting in 1962 to begin Korean development. During the first five-year plan, growth exceeded 8 percent per year, a rate of which any developing country could be proud. The rates continued to climb, however, raising the average for the second five-year plan (1967-1972) to a lofty 11.4 percent per year (ESCAP, 1975).

In October, 1961, the Korean government announced its support of family planning in a directive to the Ministry of Health and Social Affairs. This ministry was given responsibility for the implementation of policy; it responded with the organization of the Korean National Family Planning Program (KNFPP) which began to function at a limited level in 1962 (the structure of this organization will be discussed in a later section). Since the inception of the KNFPP, the total fertility rate (TFR) has been reduced by nearly one-half from a level of 6.1 in 1960 to a low of 3.4 in 1975; the crude birth rate (CBR) has plummeted from an estimated 42 in the period from 1960 to 1965 to an unprecedented low of 24 in 1975 (see Table 6-1); and population growth rates have slid from 3.0 percent per year in 1960 to 1.8 percent in 1975.

How much of the reduction in fertility and in the rate of population growth in Korea can be attributed to the activities of the organized family planning program? The data support the conclusion that the reduction of fertility experienced in Korea between 1966 and 1975 would have been difficult to achieve without the benefit of well-organized family planning, supported by international as well as national resources.

II

Historical View

The growth of the nation's population was slow and fluctuating throughout the eighteenth and nineteenth centuries with estimates of population size over this period ranging from 5.9 million in 1702 to 7.4 million in 1789, and back down to 6.8 million in 1864 (ESCAP, 1975). The onset of steady, rapid growth did not occur until the era of Japanese domination (1910-1945) when the crude death rate (CDR) declined from an estimated high of 33.4 in 1910-15 to a low of 19.5 in the period from 1940 to 1945. This drop in CDR, accompanied by no significant change in the CBR, sent Korea into the "demographic gap."

In addition to declining mortality, the pronatalist Japanese colonialists did much to encourage high fertility. In their informative study, Kim et al. (1975: 10) highlight some of the factors which encouraged and discouraged high fertility in those 35 years:

Encouraging Factors

1. Early, universal marriage
2. Extended family system; emphasis on sons
3. Relative absence of contraception/abortion
4. Concubinage

Discouraging Factors

1. Separation of couples due to migration (approx. 2.1 million persons from 1925 to 1950)
2. Mortality among parents
3. Prohibition against remarriage for widows.

To complete an understanding of the course of population growth in the first half of this century, it is necessary to comprehend these and other factors; however, it is beyond the scope of this examination to make such an expansive attempt.

The period from 1940 to 1955 was marked by one social disturbance after another. First, there were great demands made of the labor force by the Japanese during World War II. In general, conditions were not favorable for population growth during these years. The end of the war brought independence, and with it a massive repatriation and immigration movement transpired. Kwon et al. (1975) estimate that there were over 5 million repatriates and migrants into South Korea during the period from 1945 to 1949. This phenomenon inflated population growth to an artificially high 4.4 percent per year during this time period. Third, the Korean War (1950-1953) displaced much of the population, breaking up many families and leaving behind an estimated 1.3 million casualties. Due to the war and other events of the period, the rate of growth dropped to an average of 1.0 percent per year from 1949 to 1955, when the population totaled 21.5 million.

Like the United States, Korea rebounded impressively from the hardships of war with a "baby boom" of its own. In the five-year period from 1955 to 1960, the average annual CBR has been estimated at levels from 43 to 45 per thousand, with a high of 47.3 for 1958. The TFR in this period was in excess of 6.0 and may have been as high as 6.3 if Kwon et al. (1975: 12) are correct. According to census figures, the total population reached 25.0 million in December, 1960.

The degree to which this populace was prepared for a change in childbearing behavior in the years following 1960 is described by Kwon et al. (1975: 110):

. . . the readiness of the Korean people for the acceptance and practice of contraceptives seemed to be fairly matured in the early 1960s and at the same time the socioeconomic conditions became favorable for the family planning program, compared to other developing countries. Korea had a very low illiteracy rate which is largely attributed to the

people's strong motivation for higher education. Korea encountered no religious or ethnic obstacles of family planning, and the mass-media system... was well developed. Urbanization and secularization spread to some extent and, more than anything else, aspiration for economic development and a better life prevailed among all the strata of the Korean people. However, the deeply rooted traditional attitudes toward the family and the desired number of children remained almost intact. This is the setting which greeted the implementation of Korea's official family planning program in 1962.

III

Family Planning Policy and Recent Demographic Change

Initially, the Ministry of Health and Social Affairs had very few resources to work with. Its first modest effort toward service delivery in 1962 concentrated on setting up a network of health centers and on coordinating plans with other agencies, both national and international. In September, 1963, the Economic Planning Board assumed financial responsibility for the program. In a sense this marked the real beginning of the official program's role as provider of contraceptive commodities and services on a scale sufficient to achieve the goals of the Ministry.

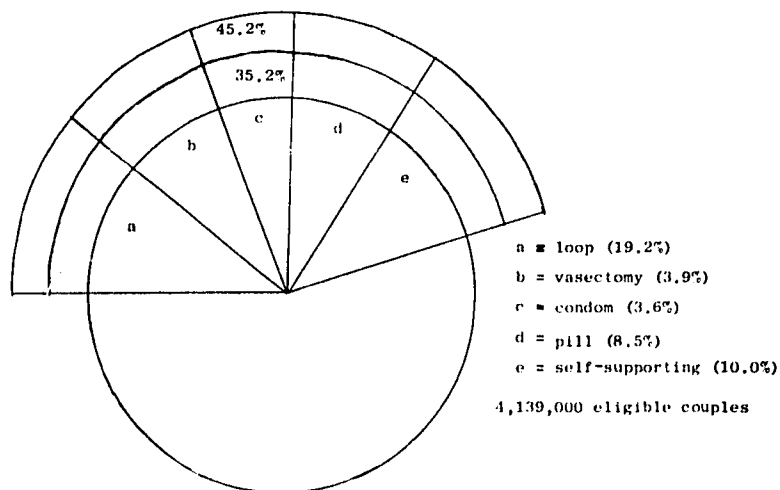


Figure 6-1. PERCENTAGE OF MARRIED COUPLES AGED 20-44 WHO SHOULD PRACTICE FAMILY PLANNING IN 1971, BY METHOD.

Those goals, considered an integral component of economic growth, were published separately from the First Five-Year Plan for Economic Development and became known as the "Ten-Year Plan for 1962-1971." Figure 6-1, reproduced from Kim et al. (1975: 194), encapsulates the *revised* contraceptive use goals of the program as they were written in the Ten Year Plan in 1963. In more familiar terms, the 45 percent level of contraceptive use was assumed equivalent to the amount of contraception required to bring annual population growth down to a level of 2.5 percent by 1965, and 2.0 percent by 1971, or a decline of about 0.1 percent per year. Table 6-1 depicts the trends in total fertility rate, crude birth rate, crude death rate, and population growth rate which actually occurred between 1966 and 1975. These data show that the objectives of the program were very nearly met at every juncture. These changes, especially the 0.8 percent drop in the growth rate in the face of a 1.52 drop in the death rate, are even more impressive when viewed in terms of the changes in contraceptive practice that had to be achieved to accomplish them. The analysis which follows will consider this change in greater detail.

Before turning to a brief overview of the analytical model used and a subsequent analysis of the contribution of organized family planning to fertility

Table 6-1. VALUES OF OBSERVED AND INTERPOLATED TOTAL FERTILITY RATE, CRUDE BIRTH RATE, CRUDE DEATH RATE, AND GROWTH RATE: 1966 TO 1975.

Year	Total fertility rate (a)	Crude birth rate (b)	Crude death rate (c)	Growth rate
1966	4.804	33.34	7.52	2.58
1967	4.676	32.49	7.26	2.52
1968	4.548	31.65	7.05	2.46
1969	4.419	30.80	6.86	2.39
1970	4.291	29.95	6.68	2.33
1971	4.113	28.76	6.49	2.23
1972	3.935	27.57	6.34	2.12
1973	3.758	26.38	6.21	2.02
1974	3.580	25.19	6.13	1.91
1975	3.402	24.00	6.00	1.80

(a) TFR estimates for 1966, 1970, and 1975 are obtained from observed age-specific fertility rates (see Table 2). Values for other years are obtained by interpolation.

(b) CBR estimates for 1966 and 1970 are found by dividing PROJTAG estimates of births by actual population census counts. The value for 1975 was taken from R.T. Ravenholt, L.C. Chao, and J. Brackett (1977), World Fertility Patterns: Age-Specific Fertility Rates and Other Demographic Data for Countries and Regions of the World, Washington, D.C.: Office of Population, U.S. Agency for International Development. Values for other years are found by interpolation. The CBR and TFR estimates are consistent with Bogue-Palmore regression estimates of each other.

(c) The 1966, 1970, and 1975 values are based on female CDR found by applying stable population life table to projected female population. Values of e^0 used are 64.6 in 1966, 67.0 in 1970, and 69.0 in 1975. These are based on data found in Economic and Social Commission for Asia and the Pacific (1975), Population of the Republic of Korea, Country Monograph Series No. 2, Table 177. Values reported here have been adjusted upward to account for higher male mortality.

declines, a few changes in the emphasis and the goals of the KNFPP must be observed, since they bear significantly on the interpretation of levels of program activity. After substantial growth of the program between 1963 and 1970, a five-year plan was prepared by the Ministry of Health and Social Affairs. By this time the program was in full swing. A new goal was set to reduce the growth rate to 1.5 percent per year by 1976. While this did not represent a change in the trend, the means by which that goal was to be achieved were significantly altered. Instead of focusing attention on the distribution of contraceptives through the national organization, the policy called for more reliance on private inputs, with a stepping-up of ancillary efforts such as education and communication. These shifts are recorded in the government's 1972 report on the program (Ministry of Health and Social Affairs, 1972). In the report, the following objectives are listed, among others:

- to strengthen information and education activities in order to incorporate family planning as a part of the "New Community Movement"
- to expand the program not only through the health service networks, but through the general hospitals, private clinics, and all public organizations in communities
- to educate the younger generation to recognize the need of family planning by including population problems in teaching materials, thus encouraging voluntary participation in family planning
- to transform the national family planning program into a private program by the year 2000 and to continue as such thereafter.

Clearly, the first two statements were intended to deal with the rising demand for information and service, a problem that was anticipated to continue. The third statement is a product of the government's keen awareness of the large cohorts of baby-boom children approaching the reproductive ages at the time of the plan's preparation and can be seen as spreading responsibility for growth rates between the Health and Education Ministries. It is the last of these statements which points most directly to the government's changing involvement with fertility control in Korea.

Three pieces of evidence strongly support the contention that this policy has been taken seriously. First is the acceptor targets provided for field workers and staff. The target proportion of self-supporting contracepting couples relative to all eligible couples was raised by 40 percent from 0.22 to 0.31 for 1976. Second is the increased quantity of contraceptive sales in the private market. The figures on such sales first became available for 1972. Since nearly all medical contraception (sterilization and IUD insertion) is done under the auspices of the program, there is no "marketing" sector for these methods. Of the 242,611 persons supplied with condoms per month in 1972, however, an estimated 56.2 percent were supplied by private sources; similarly, 28.9 percent of the 301,052 women supplied with oral pills in the average month of

1972 received these from outside-program services. By 1976, though, these figures had increased to 63.2 percent and 43.2 percent, respectively. Third, the popularity of induced abortion, the only major source of birth control not firmly incorporated into this analysis, was boosted by its legalization in 1973. The increasing popularity of abortion had a direct effect on the number of contracepting couples enrolled in the national program and who used modern means of contraceptive prevention.

In view of these important factors, it could be expected that the organized program's contribution to declining fertility through the provision of conventional family planning services would have dropped some time after 1970. It would reflect the precision of the analysis to detect a relative change in program activities in the assessment of the contribution of the program to declining birth rates over time.

IV Analysis Strategy

The research goal is to estimate as closely as possible the contribution of Korea's organized family planning program to the achievement of observed fertility declines between 1966 and 1975. This period coincides with both significant fertility decline and the full implementation of the family planning program. An adequate specification of the role played by organized family planning in accomplishing Korea's rapid fertility decline is not only of academic interest; it also has significant policy implications concerning the effectiveness of family planning programs in general.

The analysis was carried out in two basic steps. First, woman-years of protection (WYP) needed to meet the observed CBR declines was calculated on a year-to-year basis using PROJTARG (for a thorough description of the PROJTARG methodology see Chapter One of this volume). Second, WYP provided by the program was calculated for each year using CONVERSE (see Nortman et al., 1978, for a formal description of this computer model). The impact of the program can then be estimated by comparing required contraception with that provided by the program.

In order to compute the WYP provided (given the observed reduction in CBR from 1966 to 1975), PROJTARG was supplied with age-specific values for the size, percentage married, and fertility of female population in child-bearing ages at the initial, pivotal, and terminal years.¹ The data and the corresponding sources are presented in Table 6-2.

As seen in Table 6-2, the proportion married declined among the younger age groups, but grew in the older age groups. The slight decline in these rates in the age groups from 15 to 34 illustrates the rising age at marriage in Korea,

Table 6-2. POPULATION SIZE, PROPORTION OF FEMALES MARRIED,
AND FERTILITY RATES FOR AGES 15 to 49:
KOREA, 1966, 1970, AND 1975.

Year and parameter	Age of woman						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1966							
Population size (a) . . .	1,308,035	1,096,472	1,128,900	983,807	818,323	686,881	557,151
Proportion married (b) . . .	3.8	47.7	89.8	93.9	89.2	82.7	75.2
Fertility rate (c) . . . .	.0217	.2047	.3003	.2207	.1380	.0653	.0100
1970							
Population size (d) . . .	1,639,291	1,218,983	1,116,525	1,080,987	937,836	783,355	638,787
Proportion married (b) . . .	2.8	42.3	88.4	94.6	92.0	84.8	76.9
Fertility rate (c) . . . .	.0167	.1777	.3040	.2030	.1090	.0420	.0057
1975							
Population size (d) . . .	2,137,096	1,622,204	1,223,779	1,112,363	1,054,586	928,090	760,882
Proportion married (b) . . .	2.8	42.3	88.4	94.6	92.0	84.8	76.9
Fertility rate (c) . . . .	.0095	.1543	.2685	.1546	.0653	.0256	.0026

(a) The 1966 population size values come from the Economic Commission for Asia and the Pacific (1975), Population of the Republic of Korea, Country Monograph Series No. 2, Tables 28 and 32, pp. 39, 44. Note that this is a three-year, moving average centered on 1966.

(b) The proportion-married values for 1966, 1970, and 1975 are taken from T.H. Kwon, H.Y. Lee, Y. Chang, and E. Yu (1975), The Population of Korea, The population and Development Studies Center, Seoul National University, Table III.4, pp. 48-49.

(c) The 1966 ASFR's are found in source (a), Table 185, p. 190. The 1970 ASFR's for 1975 were taken from F.H. Choe and S.K. Kong, Changing Fertility and Contraceptive Behavior of Korean Women: Preliminary Findings from the Korean National Fertility Survey, 1974, Korean Institute for Family Planning, 1977.

(d) The 1970 and 1975 population projections are from PROJARG. While not exactly reproducing observed population totals, these estimates are fairly accurate reconstructions of Korean population growth.

a trend which has slowed since the earlier postwar years and is not expected to continue much longer. The increase in the proportion married among the older women is partly explained by the declining rate of mortality. Because both men and women are living longer, fewer marriages end in the death of a husband during a woman's childbearing years.

Due to the unavailability of data, the age-specific proportions married in 1970 are assumed constant through 1975. Although there are obvious disadvantages to a simplification of this nature, it is a more conservative procedure than extrapolating the change between 1966 and 1970 to 1975.

The age-specific fertility rates show a decline throughout the ten-year period in every age group except for 25- to 29-year-old women, who experienced virtually no change between 1966 and 1970. The average annual rate of decline in these rates during the second half of the analysis period is greater than that found in the first half in all groups except women aged 20 to 24 and those aged 40 to 44. Overall, there was a decline of 0.128 children per woman per year in the earlier period, and a decline of 0.178 in the later period—evidence which confirms the acceleration of fertility reduction in the later years of the program.

V CONVERSE Inputs

In order to generate empirical evidence for the amount of woman years of protection provided by the program, it was necessary to specify a number of input parameters for the CONVERSE program. These parameters include the number of program acceptors broken down by method and year, and their age-method distribution. In addition, data were included for each method on the proportion of those acceptors not immediately discontinuing, their annual rate of discontinuation, and their average duration of use.

Table 6-3 examines the number of program acceptors and percent distribution by method and year. The most frequently adopted contraceptive methods in 1965 were the IUD, 45.3 percent of all program acceptors, and other (condom, diaphragm, etc.), 51.2 percent of all program acceptors, with total adopters at approximately 375,000. Only 3.5 percent of family planning adopters in 1965 opted for sterilization. The peak for IUD acceptance occurred in 1966, comprising approximately 61 percent of all new program acceptors. From 1966 until 1968, the number of new IUD acceptors declined to a low of 197,000, yet its percent distribution of acceptance relative to the other three methods bottomed out between 1969 and 1971 with 33 percent of new program acceptors in 1970. However, the number of IUD acceptors increased throughout the remaining four years to a plateau of about 250,000, averaging 43 percent of all new program acceptors.

Table 6-3. PERCENT AND NUMBER OF PROGRAM ACCEPTORS
BY METHOD AND YEAR.

Year	Total		Method							
			IUD (c)		Pills		Sterilization		Other	
	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
1965 (a)	100.0	375	45.3	170	0	0	3.5	13	51.2	192
1966	100.0	483	60.9	294	0	0	4.1	20	35.0	169
1967 (b)	100.0	414	58.5	242	0	0	4.8	20	36.7	152
1968	100.0	422	46.7	197	18.0	76	3.8	16	31.5	133
1969	100.0	632	34.0	215	40.0	253	2.5	16	23.4	148
1970	100.0	669	33.0	221	40.1	268	2.5	17	24.4	163
1971	100.0	597	37.0	221	32.7	195	3.4	20	27.0	161
1972	100.0	537	43.0	231	23.5	126	4.3	23	29.2	157
1973	100.0	593	42.7	253	22.8	135	4.9	29	29.7	176
1974	100.0	590	45.1	266	18.8	111	6.6	39	29.5	174
1975	100.0	603	41.6	251	16.1	97	9.6	58	32.7	197

(a) The 1965 and 1966 values come from the Economic and Social Commission for Asia and the Pacific (1975), Population of the Republic of Korea, Country Monograph Series No. 2, Table 204.

(b) The 1967-1975 values were obtained from D. Nortman and E. Hofstatter (1972), "Population and Family Planning Programs: A Factbook," Reports on Population/Family Planning, 4:2.

(c) Values reported here are three-quarters of those reported in order to account for reinserction.

Note: Number reported in thousands.

The reason for the plateauing of IUD acceptors between 1969 and 1971 was the introduction of the pill into the Korean Family Planning Program in 1968. The relative frequency of acceptance in its first year was 18 percent of the total acceptors. The actual number of pill acceptors in its first year was 76,000, a value almost equal to the decline in the number of acceptors of the other contraceptive categories, thus indicating that the pill's introduction drew new acceptors away from the other three methods. Kwon et al. (1975) noted that in 1967 the pill was added to the national program with the intention of providing services for women who were discontented with the IUD. When this policy was changed in the summer of 1969, the pill became available to all women who wished to use it, and subsequent increases in the number of new acceptors opting for the pill occurred immediately and persisted through 1970. After 1970, when there were 268,000 new pill acceptors (40 percent of all new acceptors), there were rapid declines in its popularity until 1975 when the number of new acceptors dropped to 97,000 or 16 percent of all new acceptors.

The frequency of new program acceptors choosing sterilization (column 3), although increasing slowly until 1973, had a constant relative distribution (excluding only those two years during which the pill was most popular) until 1973. At that point 29,000 new acceptors chose sterilization (4.9 percent of all new acceptors) with its frequency and percentage distribution rapidly increasing through 1975 to values of 58,000 or 9.6 percent of all new acceptors.

Other contraceptive methods were preferred by 192,000 program acceptors (51.2 percent of all new acceptors) in 1965, but the following four years saw the percentage of new acceptors choosing such methods decline to 23.4 percent. The preference for such methods remained low along with a declining interest in sterilization and the IUD during the two most popular years of pill use in 1969-70. In 1971, however, the percent of total new acceptors choosing other methods increased (although the frequency of acceptance remained about the same at 160,000) primarily because of a waning interest in the pill and a significant drop in the number of total new acceptors. Up through 1975, the frequency of other method acceptors increased 22.4 percent over 1971 in spite of the fact that the total number of new program acceptors increased only 1 percent from 587,000 in 1971 to 603,000 in 1975.

The trends in total number of new program acceptors are given in column 5 of Table 6-3. The data indicate that there were 375,000 new acceptors in 1965, a rapid increase to 483,000 the following year due to a 73 percent increase in the number of IUD acceptors, a decline to 414,000 in 1967 because of waning interest in IUD and other methods, and a rapid increase in new acceptors to a peak of 669,000 in 1970 because of the introduction of the pill in 1968. Following 1970, however, the number of new acceptors rapidly declined to 537,000 in 1972. Although part of the decline might be explained

by significant reductions in new pill acceptors (a 50.2 percent decline since 1970), it is also possible that the second five-year plan in Korea which stressed a stimulation in private sector family planning services might have drawn acceptors away from the national program. In spite of this, the total number of program acceptors between 1972 and 1975 actually increased 12.3 percent (but was still 66,000 acceptors short of the 1970 peak).

The age distribution of program acceptors by method (Table 6-4) allows one to examine patterns of method-specific acceptance according to the age of the acceptor. From the available data, it is apparent that of those women accepting family planning, approximately 80 percent do so between the ages of 25 and 39. Moreover, the age group in which the largest percentage of adopters accept each method is 30 to 34.

More salient, perhaps, is the fact that women between the ages of 15 and 24 (columns 1 and 2) make up 15 percent of all IUD acceptors, 11 percent of all pill and other acceptors, and 1 percent of all sterilization acceptors. As previously noted, the IUD and other methods accounted for close to 97 percent of all new acceptors in 1965 followed by a dramatic increase in IUD acceptance and a decline in other methods in 1966-67. In observing the patterns of program acceptors by method and year in Table 6-3, one can conclude that the contracepting population of Korea has been IUD dependent. This might account for the relatively high rate of IUD use at the younger age groups when compared to many other national programs. Finally, the distribution of sterilization as an accepted method of contraception by age indicates, as would be expected, that younger women (15 to 24) have almost no interest in this form of contraception while older women, particularly between the ages of 30 and 39 (columns 4 and 5 of Table 6-4), make up 70 percent of all those opting for this form of contraception. The relative infrequency with which sterilization occurs at the younger ages and its clumping in the 30 to 39 age categories along with the growth in the popularity of the method (Table 6, column 4) indicates that women who have reached their desired family size are more frequently choosing sterilization as a method of contraception than in previous years.

Table 6-4. AGE METHOD DISTRIBUTION OF PROGRAM ACCEPTORS.

Method	Total	Age of acceptor					
		15-19	20-24	25-29	30-34	35-39	40-44
Pill	100,0	3,0	8,0	22,0	32,0	25,0	10,0
IUD	100,0	5,0	10,0	26,0	30,0	21,0	8,0
Sterilization	100,0	0,0	1,0	18,0	38,0	32,0	11,0
Other	100,0	3,0	8,0	22,0	32,0	25,0	10,0

Note: Source is unofficial estimates kindly provided by the Population Council.

Table 6-5 is an examination of the proportion of acceptors not immediately discontinuing, their annual rate of discontinuation, and their average duration of use in years by method and broken down by age. The proportion not immediately discontinuing (column 1) and the annual rate of discontinuation (column 2) are derived assuming an exponential decay curve calculated from the percent continuing contraceptive use along a monthly progression of time. Average duration of use (column 3) is derived by dividing column 1 by column 2.

The age categories with the greatest proportion of acceptors not immediately discontinuing fall between the ages of 25 and 39 for pill and other acceptors with proportions just above 0.79. For IUD acceptors, the proportion not immediately discontinuing increases consistently with age to its highest proportion at 0.92 for women 40 to 44. For women choosing sterilization as a contraceptive method, columns 1 and 2 represent the proportion of successful and unsuccessful sterilization procedures, respectively (rounding errors prevent them from adding to 100).

The annual rate of discontinuation is the proportion of women who, once they have accepted a contraceptive method, will discontinue its use during the following year. The discontinuation rates for the pill and other category consistently go down between the ages of 15 and 39 from 0.82 to 0.66, with a slight increase in the 40 to 44 category to 0.71. The discontinuation rate for the IUD maintains its decline throughout the entire 15 to 44 range from a high of 0.71 for 15- to 19-year-olds to a low of 0.21 for 40- to 44-year-olds. This indicates that younger women have a greater tendency to discontinue the use of the pill, the IUD, and other methods than do older women.

The average duration of use is a value which states how long, on the average, a woman of a particular age will use and be protected by a specific contraceptive. For example, when the duration of use equals 1.0 for women aged 44 to 44 using the pill, this means that on the average, these women will tend to use the pill and be protected by it for a period of one year. It should be noted that the duration of use values for sterilization mean that, for women 15 to 19, sterilization could offer 98 years of protection for those who remained exposed and fecund for that period of time. The values simply mean that sterilization will protect them throughout the remainder of their exposed fecund years.

These values clearly indicate that for users of the pill and other methods, the longest duration of use and protection is for those women 30 to 39 with an average of 1.2 years of use. This falls to about one year of use for older women 40 to 44. Younger women 15 to 24 who use the pill and other methods have a duration of use at about 0.91 years, 51 percent lower than women 30 to 39. More significant, however, is the fact that women of all age categories using the IUD have a tendency to use it longer than women using either the pill or other methods, and this tendency is even more pronounced among

women 40 to 44 where duration of use is 4.38 years, 3.38 years longer than women of the same age using the pill or other methods.

The values in Table 6-5 provide important information on the customary practices of contracepting Korean women with respect to their age and the type of contraceptive used. For example, the fact that the annual rate of discontinuation (column 2) consistently declines by age, and average duration of use (column 3) increases with age, indicates that older Korean women put much more of an effort into preventing conceptions than do women of younger ages. The longer average duration of use that occurs among Korean women in later childbearing years is due not just to spacing, as is the case for younger women, but simply to the desire to have no more children.

Table 6-5. PROPORTION OF ACCEPTORS NOT IMMEDIATELY DISCONTINUING, ANNUAL RATE OF DISCONTINUATION, AND AVERAGE DURATION OF USE, BY METHOD.

Age	Proportion not immediately discontinuing	Annual rate of discontinuation	Average duration of use
Pill			
15-19 . . . . .	.650	.820	.793
20-24 . . . . .	.670	.810	.827
25-29 . . . . .	.790	.770	1,026
30-34 . . . . .	.790	.640	1,234
35-39 . . . . .	.800	.660	1,212
40-44 . . . . .	.710	.710	1,000
IUD			
15-19 . . . . .	.650	.710	.918
20-24 . . . . .	.670	.700	.957
25-29 . . . . .	.810	.570	1,421
30-34 . . . . .	.820	.550	1,491
35-39 . . . . .	.840	.430	1,953
40-44 . . . . .	.920	.210	4,381
Sterilization			
15-19 . . . . .	.980	.010	98,000
20-24 . . . . .	.975	.020	48,750
25-29 . . . . .	.970	.030	32,333
30-34 . . . . .	.965	.040	24,125
35-39 . . . . .	.960	.050	19,200
40-44 . . . . .	.955	.060	15,917
Others			
15-19 . . . . .	.650	.820	.793
20-24 . . . . .	.670	.810	.827
25-29 . . . . .	.790	.770	1,026
30-34 . . . . .	.790	.640	1,234
35-39 . . . . .	.800	.660	1,212
40-44 . . . . .	.710	.710	1,000

Note: Source is unofficial estimates kindly provided by the Population Council.

VI

Decomposition of Sources of Korean Fertility Decline

Table 6-6 represents the number of women protected from the risk of childbearing by source of protection and different states of exposure for the years 1966 to 1975 as calculated by PROJTARG. The number of Korean women in their childbearing ages increased from over 6.5 million in 1966 to 8.8 million in 1975, a 34.3 percent increase. If one were to calculate the age-specific population size increases between 1966 and 1975, one would find a 55.7 percent increase in the number of women 15 to 24, a 10.8 percent increase in women 25 to 34, and a 33.5 percent increase in women 35 to 49. Moreover, the women 15 to 24 in 1966 made up 36.5 percent of all women in their childbearing ages, while women 25 to 34 made up 32.1 percent, and women 35 to 49 made up 31.3 percent. This is compared to 1975 where women 15 to 24 made up 42.5 percent of all women in their childbearing ages (an increase of 16.4 percent), women 25 to 34 declined 18.1 percent to a value of 26.3, and women 35 to 49 remained the same as the 1966 percentage at 31.3 percent. These data clearly indicate that the number of women in their childbearing ages increased 34.3 percent from 1966 to 1975, with the greatest proportion of that increase occurring among women 14 to 24.

With this in mind, one might expect that, due to the much lower and declining marriage rate among women 15 to 19 (see Table 6-2), there would be significantly larger increases in unexposed fecund women between 1966 and 1975 when compared to exposed fecund women. As shown in Table 6-6 (column 2), the number of fecund women in 1966 was just below 5.3 million, and increased to over 7.1 million in 1975, a 34.7 percent increase. During the same time period, the number of unexposed fecund women rose 56.6 percent while exposed fecund women went up 20.7 percent. This confirms the fact that while the total number of fecund women in their childbearing ages increased rather dramatically from 1966 to 1975, a good portion of that increase was due to an expansion in unexposed fecund women. This does not detract from the fact that the number of fecund women actually increased 671,000 between 1966 and 1975. Thus, the observed decline in the crude birth rate occurred just at a time when significantly increased amounts of contraception would have been needed just to have held the birth rate constant. Moreover, with such a rapidly growing number of unmarried fecund women reaching their early childbearing ages (over 94 percent will eventually be married and exposed to the risk of childbearing), the next few years will be a severe test of program and outside-program family planning services.

Finally, columns 5, 6, and 7 of Table 6-6 examine different states of exposure to the risk of childbearing by breaking down fecund women into those protected by nonexposure and contraception, those protected by nonexposure, sterility, and pregnancy, and those who need not be protected (calculated by subtracting column 5 from column 2). These three columns depend

Table 6-6. NUMBER OF WOMEN PROTECTED FROM THE RISK OF CHILDBEARING,
BY SOURCE OF PROTECTION: 1966 TO 1975.

Year	Women in childbearing ages	Fecund women					Need not be protected
		Total	Unexposed	Exposed	Protected by nonexposure and contraception	Protected by nonexposure, sterility, and pregnancy	
1966 . .	6579.6	5293.4	2055.9	3237.6	3291.3	4252.1	2002.1
1967 . .	6761.8	5435.1	2145.0	3290.2	3434.3	4375.1	2000.8
1968 . .	6962.2	5592.9	2249.6	3343.3	3590.5	4515.0	2002.4
1969 . .	7180.4	5766.8	2368.9	3397.9	3760.3	4671.1	2006.4
1970 . .	7415.8	5955.7	2500.6	3355.0	3943.8	4842.2	2012.1
1971 . .	7677.6	6170.4	2640.1	3530.4	4168.7	5012.8	2001.7
1972 . .	7953.9	6397.8	2785.8	3612.0	4408.3	5192.9	1999.5
1973 . .	8241.7	6635.3	2933.9	3701.4	4661.1	5378.6	1874.2
1974 . .	8537.9	6880.0	3080.0	3800.0	4925.3	5565.3	1954.6
1975 . .	8839.0	7128.8	3220.2	3908.6	5199.3	5748.7	1929.5

Note: All values are in thousands of woman-years.

Table 6-7. ESTIMATES OF WOMAN YEARS OF PROTECTION REQUIRED TO MEET THE OBSERVED CRUDE BIRTH RATE PATH AND PROTECTION PROVIDED BY THE PROGRAM: 1965 TO 1974.

Year	Woman years of protection						
	Needed to reach observed crude birth rate	Provided by the program		Required percent provided		Provided by outside program sources	
		High estimate	Low estimate	High estimate	Low estimate	High estimate	Low estimate
1965	1,235,417	129,169	96,971	10.455	7.849	1,106,248	1,138,446
1966	1,289,319	335,872	251,904	26.050	19.538	953,447	1,037,415
1967	1,340,850	463,131	347,348	34.540	25.905	877,719	993,502
1968	1,391,442	524,099	393,577	37.666	28.286	867,343	997,865
1969	1,442,725	629,741	472,409	43.649	32.744	812,984	970,316
1970	1,528,660	748,068	561,576	48.936	36.736	780,592	967,084
1971	1,622,472	801,388	601,907	49.393	37.098	821,388	1,020,565
1972	1,727,204	801,277	601,737	46.392	34.839	925,927	1,125,467
1973	1,845,354	814,934	612,460	44.161	33.189	1,030,420	1,232,894
1974	1,979,034	849,717	638,817	42.936	32.279	1,129,317	1,340,217

upon the observed CBR declines actually being reached. Although fecund women protected by nonexposure and contraception increased from 3.3 million in 1966 to 5.2 million in 1975 (up 58 percent), and women protected by nonexposure, sterility, and pregnancy increased from over 4.2 million in 1966 to 5.7 million in 1975 (up 35.2 percent), the number of fecund women who did not need protection declined by 3.6 percent. Such a decline is what one might expect given an annual decline in CBR. (One should note here that columns 5 and 6 overlap unexposed fecund women and thus account for similar patterns of decline.)

Table 6-7 is an estimation of the woman-years of protection (WYP) within an exposed fecund state that are required to meet the observed CBR path and the protection provided by the program under two different assumptions between 1965 and 1974.² PROJARG determines how much contraception was needed within the exposed-fecund state by estimating the WYP needed to obtain the observed fertility declines once age composition and mortality are controlled for (column 1). The WYP provided by the program (columns 2 and 3) are estimated by CONVERSE. Although the input parameters for CONVERSE are thought to be estimated in a consistent and accurate fashion, it is still quite possible that various factors could cause the estimates to vary. For this reason, two sets of parameters (high and low) are used in estimating program WYP. While the high estimate can be assumed to be the "best" estimate, the low estimate accounts for potential errors by decreasing the numbers of estimated program acceptors by 25 percent. Finally, the high and low estimates of the percent of required WYP provided by the program (columns 4 and 5) are derived simply by dividing columns 2 and 3, respectively, by column 1.

As shown in Table 6-7 the WYP required to account for the observed CBR decline increased from 1.2 million in 1966 to just under 2.0 million in 1975 (a 60.2 percent increase). This can be partially attributed to the 20.7 percent increase in the number of fecund exposed women over the same period of time (Table 6-6, column 4). At the same time, under the high program impact estimates, the number of WYP provided by the program increased from 129,000 (10.5 percent of WYP required to reach the observed CBR decline) in 1966 to just under 850,000 (42.9 percent of required WYP) for 1975. The low program estimates are 97,000 (7.8 percent of required WYP) in 1966 and 639,000 (32.3 percent of required WYP) for 1975. Thus, the amount of program WYP in 1966 as a percent of WYP required to reach the observed CBR decline was 10.5 under the high estimate and 7.8 under the low estimate. Following 1966, however, program effort dramatically stepped up its WYP so that it peaked in 1972 at 49.4 percent of required WYP under the high estimate, and 37.1 percent under the low estimate. Following 1972, the WYP dropped to 42.9 percent of required WYP in 1975 (32.3 under the low estimate).

Had the WYP provided by the program remained at a level similar to that which occurred in 1966 through the observed nine-year time period, the percentage of required WYP provided by the program would have declined substantially. For example, under the assumption in the high estimate, the 129,000 WYP provided by the program in 1966 was approximately 10.5 percent of that required to meet the observed CBR decline. Had the program effort of 129,000 remained the same until 1975, the percent of required WYP provided by the program would have been 6.5 percent. Instead, the program effort not only kept up with the yearly expansion of fecund-exposed women, it also expanded its success in providing WYP. Although the program WYP as a percent of required WYP declined after 1972 on a yearly average of about 4.55 percent, over the period from 1966 to 1975 the WYP provided by the program increased about 32.5 points.

The effects of an expanding Korean National Family Planning Program, as evidenced in Table 6-7, may be examined more closely if one observes a specific measure of fertility and how it was differentially affected by program and outside-program sources of contraception. Table 6-8 does this by decomposing CBR declines into program and outside-program sources.

The CBR under no new program contraception (column 1) refers to what would occur to the CBR if the 1965 program acceptors were the last cohort to receive program contraception and that outside-program contraception was sufficient to hold age-specific marital fertility rates at their 1966 levels. The observed CBR (column 2) is what actually occurred to the CBR over the time period. The CBRs under a high and low program effort (columns 3 and 4) are what would occur had outside-program efforts remained sufficient to hold age-specific marital fertility rates at their 1966 levels, and program efforts were allowed to vary according to their observed path (under the two assumptions). The CBR decline of the no new contraceptive path under the high program effort (column 5) indicates the difference between columns 1 and 3, and refers to the decline in the CBR (in this case, a positive value refers to a decline) under the high program effort (the best estimate of program effort) in relation to what would have occurred had no new contraception been introduced by the program since 1966. Again, this assumes that outside-program effort was sufficient to hold age-specific marital fertility rates at their 1966 levels. The CBR decline under the outside program effort (column 6) is calculated by subtracting column 2 from column 3, and refers to what would occur to the CBR given the fact that no new program contraception was introduced after 1965, and outside program efforts were allowed to vary. The total CBR decline (column 7) is calculated by adding columns 5 and 6, and refers to the year-to-year observed CBR declines that actually occurred due to the yearly influences of program and outside-program efforts. Finally, it should be noted that since the WYP provided by the program each year determines the CBR the following year, the 1966 estimates have to be omitted for columns 3 through 7.

Table 6-8. DECOMPOSITION OF CRUDE BIRTH RATE DECLINES INTO PROGRAM AND OUTSIDE-PROGRAM SOURCES.

Year	Crude birth rate						
	Under no new PGM contra-ception	Observed	Under high PGM effort	Under low PGM effort	Decline below no new contraceptive path		
					High PGM effort	Outside PGM effort	Total
1966	33.34	33.34	--	--	--	--	--
1967	33.12	32.49	30.43	31.15	2.69	-2.06	0.63
1968	32.91	31.65	29.60	30.43	3.31	-2.05	1.26
1969	32.71	30.80	29.19	30.12	3.52	-1.61	1.91
1970	32.40	29.95	28.46	29.39	3.94	-1.49	2.45
1971	32.60	28.76	28.05	29.29	4.55	-0.71	3.84
1972	32.71	27.57	28.26	29.39	4.44	0.69	5.13
1973	32.71	26.38	28.57	29.70	4.14	2.19	6.33
1974	32.81	25.19	28.77	29.81	4.04	3.58	7.62
1975	32.81	24.00	28.77	29.81	4.04	4.77	8.81

As evidenced in the table, it is immediately apparent that the observed CBR declined by over 28 percent from 33.34 in 1966 to 24.0 in 1975. Under the assumptions for high program effort outlined for column 3, the CBR would have declined from 30.43 in 1967 to 28.77 in 1975; under the low estimate the decline would have been from 31.15 in 1967 to 29.81 in 1975. More significant, though, is the fact that for a CBR decline below the no new contraceptive path (columns 5 through 7), the differential effect of program and outside-program sources has often impressed opposite effects on the CBR declines. For example, if in 1967 the outside-program effort was the only force acting upon Korean fertility, the CBR would have actually increased 2.06 points (a negative value implies a CBR increase). On the contrary, had the high program effort been allowed to affect Korean fertility with outside-program efforts holding age-specific marital fertility at 1966 levels, the CBR would have declined 2.69 points. The conjoint effects of program and outside-program sources on the population, as evidenced by their yearly effects, indicate that outside sources taken alone through 1971 actually work antagonistically to CBR declines below potential.

Column 6 of Table 6-8 demonstrates that outside-program sources acting alone under no new program contraception would actually become less able to handle the onslaught of women in their childbearing ages through 1968. However, following 1968 the negative values of outside-program effort begin to decline rapidly (although still negatively affecting CBR) to the point where in 1972 outside-program efforts acting alone could actually serve to decrease CBR. From 1972 to 1975, the force of outside-program efforts increased almost sevenfold, while program efforts declined 9 percent with respect to its contribution to the total CBR decline.

As outside-program efforts were working antagonistically to CBR declines, the observed CBR (column 2) experienced annual declines (column 7) that increased in magnitude from year to year. As evidenced in column 5, the effect of the program effort (using the best estimate) was great enough to initiate the annual CBR declines. It should be noted at this point that the family planning program increased its efforts on a yearly basis until it peaked in 1971-72, just when outside-program sources were making the transition from a negative effect on CBR to a positive one. During earlier years when program effort was substantially greater than outside-program sources of contraception, it is likely that the organized family planning program was drawing acceptors away from the private sector (probably due to the economic advantage of cheaper contraceptives). Following 1971, however, the contracepting population began to rely more heavily on outside-program sources. From 1972 to 1975, the separate effects of high program and outside-program efforts would have resulted in a CBR that was annually lower than the CBR which would have occurred had no new contraception been introduced. During 1970-71, the CBR began to show its most rapid declines (1.2-1.3 points

Table 6-9. DECOMPOSITION OF GROWTH RATE DECLINES INTO PROGRAM AND OUTSIDE-PROGRAM SOURCES.

Year	Growth rate						
	Under no new program contraception	Observed	Under high program effort	Under low program effort	Decline below no new contraceptive path		
					High program effort	Outside program effort	Total
1966	2.58	2.58	--	--	--	--	--
1967	2.59	2.52	2.32	2.39	0.27	-0.20	0.07
1968	2.57	2.46	2.26	2.34	0.31	-0.20	0.11
1969	2.59	2.39	2.23	2.33	0.36	-0.16	0.20
1970	2.57	2.33	2.18	2.27	0.39	-0.15	0.24
1971	2.61	2.23	2.16	2.28	0.45	-0.07	0.38
1972	2.64	2.12	2.19	2.31	0.45	0.07	0.52
1973	2.65	2.02	2.24	2.35	0.41	0.22	0.63
1974	2.67	1.91	2.26	2.37	0.41	0.35	0.76
1975	2.68	1.80	2.28	2.38	0.40	0.48	0.88

per year) with similar yearly declines continuing through 1975. In spite of the fact that outside-program efforts improved every year since 1967, it is still evident that their tendency to increase the CBR through 1971 had to be checked by family planning programs that were not only capable of countering the negative effects of outside-program efforts, but also capable of providing enough protection to account for annual CBR declines.

Since the CBR is used to calculate the growth rate (GR), it is possible to examine the relative importance of program and outside-program contraceptive sources on changes in population growth. Table 6-9 does this by decomposing GR declines due to changes in the CBR into program and outside-program sources.

Under the assumptions that no new contraception was introduced by the Korean Family Planning Program after 1965, and that outside-program efforts were sufficient to keep age-specific marital fertility at 1966 levels, the GR would have remained fairly constant at about 2.58 from 1966 to 1970. From 1971 through 1975 the GR under these assumptions would have increased slightly to 2.68 in 1975. What is apparent from Table 6-9 is that the observed GR (column 2) actually declined on a yearly basis from 2.58 in 1966 to 1.8 in 1975 (a 30.2 percent decline). Under changing high program effort alone (column 3), the GR would have declined at an even faster rate than was observed until 1971 when it increased slightly to 2.28 in 1975. Since the differences between the GR under no new program contraception and the GR under high and low estimates control for death rates, they must be due solely to variations in the CBRs. For example, the GR decline below no new contraceptive path (columns 5 through 7) under the assumption of (high) program effort acting alone shows annual GR declines that increase from 0.27 in 1967 to as high as 0.45 in 1971-72, and then a leveling off at about 0.41 from 1973 to 1975. These changes are directly attributable to the CBR declines that would have occurred under a high program effort and outside-program contraception at a level sufficient to hold age-specific marital fertility at 1966 levels. Had the outside-program effort been allowed to vary with no new program contraception since 1965 (column 6), one would find an increasing GR that again corresponds to the CBR increases due to outside sources mentioned in Table 6-8. The total GR declines (column 7) between 1966 and 1971 are a direct result of the stepped-up effort to reduce CBR by the organized program. Following 1971, however, the GR declines were a result of a synergistic relationship between program and outside-program sources of CBR decline. It should be noted that while the GR declines due to a high program effort waned during the last three years from 1973 to 1975, outside-program efforts played an increasingly larger role in reducing the GR, particularly during 1975 when the effort by outside programs actually exceeded the effort by program sources in reducing the GR.

Finally, it should be emphasized that while fertility declines were already occurring in Korea during the late 50s and early 60s, the impact of the organ-

ized family planning program as a distinctive influence on the rapidly declining birth rate is made apparent by the above analysis. Just seven years after its inception in 1963, close to 3 million women accepted family planning services. While the organized family planning program flourished through 1970, following that year there was a distinctive shift away from organized family planning services in the direction of outside or private sources of contraception. While part of this result might be attributed to the more effective dissemination of contraceptive information by outside sources, it is probable that a shift in the emphasis of federal funding in the direction of private sources, as outlined in Korea's second five-year plan, played a more significant role. In spite of this later emphasis on outside-program sources by the government, however, the Korean Family Planning Program continued to serve close to 60,000 new acceptors each year through 1975.

VII The Role of Abortion

The above analysis has ignored induced abortion as a means of birth prevention because of two conditions. First, until quite recently, the organized family planning program in Korea did not offer induced abortions as one of its services. Thus, the demographic effects of abortion are calculated as a residual within outside-program sources of WYP. Second, reliable statistics regarding abortion in Korea are very difficult to obtain, making it hard to estimate its impact adequately. However, acknowledging the fact that abortion has traditionally become a significant means of birth control among nations moving from high to low fertility regimes, it would prove fruitful to examine at least briefly information about abortions in Korea.

In the late 1930s, abortions were limited by law to situations in which there was a danger to maternal health. During the early 1950s, though, numerous South Korean women who were pregnant became widows due to the hostilities with the North. Many of these women requested abortion services, and despite their illegality, such demands were often met by physicians and ignored by the government (Hong, 1972). This trend toward nonenforcement of the abortion law continued through 1972 until abortion was legalized in 1973. Data from the 1971 Fertility and Abortion Survey indicate that in 1966, 48 percent of all pregnancies to women age 35 to 39 were terminated by abortion, a figure that had risen to 78 percent by 1971. Between 1966 and 1977, the percentage of repeat abortions (i.e., abortions to women who had previously deliberately aborted a birth) rose from 11 to 26. Similarly, by 1971, 60 percent of the women 15 to 49 indicated that they would resort to abortion in case of an unwanted pregnancy.

It is quite clear, therefore, that much of the outside-program protection must have come from abortion. Nortman and Hofstatter (1976) estimated the

number of induced abortions performed at 327,000 in 1971; 375,000 in 1972; 390,000 in 1973; 408,000 in 1974; and 416,000 in 1975. Assuming one WYP per abortion (cf. Bogue et al., 1973), these figures would mean about 21 percent of required WYP between 1971 and 1974 was provided by abortions. Prior to 1974, all of this protection could be attributed to private sources. In 1974, however, subsidized abortions were included in the annual family planning budget. It is quite likely, therefore, that abortion has become an increasingly important method of program birth prevention. Indeed, subsequent analyses of the demographic impact of Korea's organized family planning program should bear this point in mind.³

VIII

Summary and Conclusions

Between 1965 and 1974, 15,402,477 WYP were required to reduce and keep Korean fertility below natural levels. Of this required protection, 6,097,396 WYP or 40 percent was provided by organized family planning efforts (this is according to the best estimate; under the low estimate, about 30 percent of this protection was provided by the program). Although these calculations cannot be considered as exact, they show significant program impact on fertility and growth rates.

Between 1963 and 1971, the program expanded from providing no contraceptive services to the provision of nearly one-half of the required protection. During this same eight-year period, the organized program was providing sufficient contraception to reduce birth and growth rates while outside-program efforts were lagging. Subsequent to 1971, the Korean Family Planning Program has declined in relative importance with respect to outside program sources of protection. Still, the organized program has continued to grow in absolute size, and by 1974 was contributing 40 percent of required contraception. It should be noted that the timing of the decline in the program's relative importance coincided with the conscious decision on the part of the Korean government to emphasize outside-program sources of contraception.

In comparison to other national programs (i.e., Thailand or Colombia), the Korean National Family Planning Program has not provided as much required contraception (see Teachman et al., 1978). This should not detract from the achievements of the Korean program, although it might when given the Korean government's policy decision just outlined. Additionally, the rapid pace of Korean social and economic development would raise expectations of a greater role for outside-program contraceptive sources (see the introductory section of this report).

Before concluding, it should be emphasized that a demographic question has been answered in this report: to what extent have organized family plan-

ning programs in Korea contributed to *observed* fertility declines between 1966 and 1975? No attempt has been made to estimate what the birth or growth rates would have been without such a program. Undoubtedly, there have been substitution effects between program and outside-program sources of contraception. Given the rapid development of social and economic conditions in Korea over the time spanned by this report, outside-program sources of contraception most certainly would have been greater than that which was actually observed. The extent of such a gain cannot, of course, be known with any degree of accuracy. It is unlikely, however, that nonprogram contraception would have experienced the growth required to have generated nearly two million WYP by 1974. Rather, it is through the sustained efforts of the organized program to recruit family planning acceptors and supply them with inexpensive contraceptives in conjunction with nonprogram contraception and birth prevention (especially abortion) that has allowed Korea's birth rate to achieve its low level.

Notes

¹The PROJTAG program was fitted to two time periods, 1966-1970 and 1970-1975. Since PROJTAG assumes a linear change in birth rates between any two time points, the fitting of two such periods allows for a nonlinear change in fertility over the entire time.

²Recall that the objective is to specify the impact of Korea's organized family planning program over the period 1966-1975. The figures in Table 6-7 refer to 1965-1974. This occurs because fertility in a specific year is a function of contraception provided in the previous year.

³It is probable that the failure to include abortion as a method underestimates the extent of program protection provided after 1973. The lack of adequate information on abortions provided by the program, however, prevents an estimate of such protection. Consequently, the program protection provided in these years might be best interpreted as protection provided by conventional means of family planning.

References

Bogue, D., S. Edmonds, and E. Bogue. 1973. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Status on*

- Birth Rates*. RFFPI Manual No. 6. Chicago: Community and Family Study Center, The University of Chicago.
- Economic and Social Commission for Asia and the Pacific. 1975. *Population of the Republic of Korea*. Country Monograph Series No. 2.
- Hong, Sung Bong. 1967. "Induced Abortion in Seoul, Korea." *Korean Journal of Obstetrics and Gynecology* 10:21-30.
- Kim, Taek Il, John Ross, and George Worth. 1972. *The Korean National Family Planning Program*. New York: The Population Council.
- Kwon, Tai Hwan, Hai Young Lee, Yunsik Chiang, and Eui-Young Yu. 1975. *The Population of Korea*. Seoul: The Population and Development Studies Center, Seoul National University.
- Moon, Hyun-Sang, Seung-Hyun Han, and Soon Choi. 1973. *Fertility and Family Planning--An Interim Report on the 1971 Fertility Abortion Survey*. Seoul: Korean Institute for Family Planning.
- Nortman, D., and E. Hofstatter. 1976. "Population and Family Planning Programs: A Factbook." *Reports on Population/Family Planning*.
- Nortman, D., R. Potter, S. Kirmeyer, and J. Bongaarts. 1978. *Birth Rates and Birth Control Practices*. New York: The Population Council.
- Teachman, J., D. Hogan, and D. Bogue. 1978. "A Components Method for Measuring the Impact of a Family Planning Program on Birth Rates." *Demography* 15: 113-129.

