BIBLIOGRAPHIC DATA SHEET

1. CONTROL NUMBER
PN-AAK-689

2. SUBJECT CLASSIFICATION (695)
PC00-0000-0000

3. TITLE AND SUBTITLE (240)
Cost-effectiveness analysis as an evaluation technique in family planning programs

4. PERSONAL AUTHORS (100)

5. CORPORATE AUTHORS (101)
Pa. State Univ. Dept. of Economics

6. DOCUMENT DATE (110)
1971

7. NUMBER OF PAGES (120)
214p.

8. ARC NUMBER (170)

9. REFERENCE ORGANIZATION (130)
Pa. State

10. SUPPLEMENTARY NOTES (500)

11. ABSTRACT (950)

12. DESCRIPTORS (920)
cost analysis
family planning
evaluation
benefit cost analysis
comparison
Korea
India
Pakistan
Colombia
socioeconomic factor
economic analysis
statistics

13. PROJECT NUMBER (150)

14. CONTRACT NO.(140)
AID/csd-1884

15. CONTRACT TYPE (140)

16. TYPE OF DOCUMENT (160)

AID 590-7 (10-79)

PN-AAK-689

Cost-Effectiveness Analysis as an Evaluation Technique in Family Planning Programs

A Report on Phase III of the
Penn State-USAID Population
Research Project
(Contract AID/csd-1884, as amended)

June 1971

The Pennsylvania State University

University Park, Pennsylvania 16802

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CHAPTER I

SCOPE OF THIS REPORT

Introduction 1

This is the report on Phase III of the Penn State - USAID Population Project (Contract AID/csd-1884 as amended). Phase I, completed in December 1968, presented a review of applications of economic analysis to the question of what may be said to constitute the economic benefits of reduced fertility. (A condensed version of this report was published, with USAID permission, in the Population Council periodical Studies in Family Planning, for March 1969.) The Phase I report also presented a critical analysis of this earlier literature and suggested a modified, somewhat more disaggregative benefit - evaluating model for possible future use.

Phase II of this Project was reported on in December 1969. It constituted a detailed review and analysis of program inputs and also performance for six USAID - aided population programs - Chile, Tunisia, Pakistan, India, Taiwan and Korea. The report also attempted a comparison of the costs and performance of the six programs using a common set of cost categories and a common index of performance - the Couple-Years of Protection developed by Wishik. Appendices attached to the Report dealt at length with the sources of data for the programs covered, with the problems associated with evaluating program "outputs" and also

presented a suggested "ideal" set of cost categories for program record-keeping such as to make cost analysis easier.

In sum, Phase I reviewed cost-benefit models and approaches, while Phase II presented cost-effectiveness analyses of six country programs and made some comparisons there among.

The Scope of Phase III

The terms of reference of the present report on Phase III are as follows:

> Phase III work falls into three logical parts. The Contractor will first generate a detailed, geographically and functionally disaggregated* analysis of the pattern of cost difference within the family planning programs in no less than four of the countries dealt within the original project, and general analysis for no less than four countries not involved in the original project. The disaggregation* incorporate such factors as contraceptive methods offered, incentive payments, socio-economic setting, promotional campaigns, program and service structure, etc. The degree of disaggregation will be subject to the constraints imposed by data availability. The Contractor will then combine the individual country studies into a global picture of the relationship of various socio-economic and program factors to the effectiveness of family planning programs. The conclusions reached should be practical in a program oriented sense.
>
> The objectives of Phase III are:
>
> a. A more detailed cost-effectiveness analysis of no less than four countries would be made. Cost per unit variations within countries would be analyzed with respect to program and socio-economic environmental factors. Additionally, the role and

---

* As used in this Amendment, the terms "disaggregated" and "disaggregation" refer to the analysis of the components of a system along lines which are meaningful in understanding the workings of that system.

effectiveness of transfer payments in on-going programs would be studied.

b. General cost-effectiveness analyses will be done for four countries not covered in the original project.

c. These individual country studies will be systemsized into a global picture of what family planning costs under different socio-economic conditions and program approaches.

As a result, the methodology involved in this type of detailed cost-effectiveness analysis will be developed and many of the variables crucial to the success of family planning programs will be pinpointed and linked analytically to the program outputs. Policy implications of general utility would be expected from this effort. Further the usefulness of such analyses will be demonstrated to the countries involved and their capability in this area enhanced.

Results of the Phase

These specific objectives have been fulfilled but with varying success. Five new country programs have been analyzed - Colombia, Hong Kong, Singapore, Malaysia and Thailand - and we feel our results for all are reasonably reliable. Detailed, disaggregated studies for four programs are also presented - Colombia, Korea, Pakistan and India. We feel that the first two of these four are major contributions to our understanding of the economic and social inter-relationships of family planning programs. The third - Pakistan - is also valuable but has to some extent been anticipated by other studies and also suffers from continued uncertainty regarding the basic integrity of the family planning statistics in Pakistan. The fourth disaggregated country case-study, India, is the weakest of the lot due to our inability to pursue our

original research plan. For reasons which remain obscure to us, we were in fact not allowed to collect the data required and thus have had to make do with secondary sources and already published data.

Finally, our over view of program cost and performance now includes 15 country programs and some 60 annual observations, a number large enough for us to attempt some modest statistical analysis of the relationships involved. It seems clear that there still remain very large and troublesome problems in this type of cross-national survey. We feel we have gone about as far with this particular analytical approach as is presently possible or fruitful. The results of this part of the report are undoubtedly of interest and value but the limitations must also be kept clearly in mind.

To sum up regarding Phase III, we feel that we have made a real start towards spot-lighting the crucial economic and social variables associated with program cost-performance achievements. Further, we have demonstrated that, for most programs, cost-effectiveness analysis is possible using existing program statistics. The practical program value of such analysis has, we hope, been demonstrated anew if indeed this was necessary.

Organization of This Report

Including this introduction, the report covers nine chapters. Chapter 2 presents basic methodological and conceptual approaches and considerations. It deals, in passing, with several of the comments we have received on the methodology of our Phase II Report, especially the questions of the "Couple-Years of Protection Index." Chapters 4, 5,

6, and 7 are the detailed disaggregated country case-studies of Korea, Pakistan, India, and Colombia. Chapter 3 presents our four new case-studies. Chapter 8 presents our enlarged sample of many country programs, together with a quantitative and also qualitative comparison of their costs and performance. It also includes in the analysis the four new national case-studies called for in the terms of reference.

Finally, in Chapter 9 some overall conclusions and a summary are presented. In this chapter we have tempered our enthusiasm over our positive results with candor concerning those approaches which were less rewarding and those findings which were less significant. An appendix on sources concludes the report. The major author of Chapters 1, 2, 3, 5, 6, 8 and 9 was the project directors, Warren C. Robinson. Chapter 4 is the work of John Riew, Chapter 7 that of William Kahley. David Horlacher contributed to the analysis of Chapters 5, 6 and 8 and in numerous other ways throughout the entire study.

Acknowledgments

Once again we wish to express our gratitude to the many persons and groups who assisted us in our studies. None of these persons are, of course, in any way responsible for our analysis or our conclusions. This list includes:

India. Mr. D. N. Chaudhri; Dr. S. N. Agarwala; Miss Vena Soni; Dr. Richard Newcombe.

Pakistan. Dr. Mrs. Nafis Sadek; Mr. Wajhiuddin Ahmad; Mr. Khalil Siddiqui; Dr. Harold Pedersen; Col. S. A. Jafary.

Korea. The officials of the National Family Planning Center of Korea, especially Mr. Lee Byung-Moo; The Planned Parenthood Federation of Korea; Dr. Hahn Dae Woo, of the Ministry of Health; Dr. Walter Watson; Dr. George Worth; Dr. John Ross; Mr. Ku Hu-Il, director of our Bureau of Planning, EPB, Korea.

Colombia. Dr. Gullermo Lopez Escobar; Dr. Alcides Estrada E; Dr. Fernando Tamayo; Dr. Gonzalo Etcheverry; Dr. Alberto Rizo Gil; Mr. Francisco Cifuentes; Mr. Rafael Peña; Dr. William Gil; Dr. Donald W. MacCorquodale; Dr. Harold C. Gustafson.

Malaysia. Dr. Ariffin Marzuki; Mr. A. Ghazzali; Mr. Tan Boon Ann; Mr. Omar Abdullah.

Singapore. Dr. V. M. S. Thevathasan; Dr. Wan Fook-ke.

Hong Kong. Mrs. Peggy Lam.

Thailand. Dr. Winich Asavasena; Dr. Charoon Limcharean; Dr. Sasichan Vimuktanon; Mr. Bruce Carlson; Dr. Gavin Jones; Dr. Sultan Hashmi; Dr. Allen G. Rosenfield.

We are also indebted to numerous persons in the Populcation Council's New York Office and in USAID Washington for their continued help and encouragement. Out greatest debt is finally, to the late Dr. Harald Frederiksen, first chief of evaluation and analysis of the Population Service of AID. This entire project is largely the outgrowth of his interest in innovative, quantitative approaches to the field of family planning evaluation and whatever merit it may possess is thanks in large measure to his early guidance.

CHAPTER II

SOME METHODOLOGICAL CONSIDERATIONS

Introduction

Many of the conceptual and theoretical underpinnings of the application of cost-effectiveness analysis to family planning programs were discussed in the Phase II Report of this project. There is little point in merely repeating this earlier discussion. However, in the course of the research and analysis undertaken as a part of this phase of the project, several issues have come a little more clearly into focus and some new approaches, or at least new modifications of old approaches, developed. We turn to this matter now.

The Logic of Cost-Effectiveness

Cost-benefit analysis aims at comparing present value of all benefits expected to be generated by a program with its present costs. The benefit-to-cost ratio is in effect a measure of the total "returns" per dollar spent. Such analysis has gained much favor in recent years for analyzing and comparing alternative public investment projects, and some preliminary attempts to apply the logic to family planning programs have been made as well.

The two greatest stumbling blocks to cost-benefit analysis in practice are: (a) the quantification in monetary terms of the benefits, many of which are likely to be indirect and difficult to measure; (b) the

question of how to weigh future benefits against present benefits; or, more precisely, whether a discounting procedure is to be employed and, if so, what discount rate is appropriate. Cost-effectiveness avoids these difficulties by, in effect, assuming the benefits and then looking at the relationship between program inputs and program performance. Cost-effectiveness, in other words, asks only: "How much does it cost to obtain each unit of the benefit-creating program output and what explains variations in this unit cost?" The same approach is sometimes referred to as "Program and Performance Budgeting and Review" - PPBR - or just Performance Budgeting and, as such, has been tried at least experimentally in numerous U.S. government agencies in recent years. Thus, cost-benefit can select among various programs all of which generate some type of social benefits. Cost-effectiveness can select among various approaches to the achievement of any given program. For purposes of our analysis of national family planning programs, the benefits are assumed and we are measuring and analyzing the costs of creating these assumed benefits.

Logic of This Study

The purpose of the overall project is to: (1) establish the per unit cost of delivering different types of family planning services under various circumstances; (2) to explain, insofar as it is possible, variations in these costs per unit in terms of social, economic and administrative factors inside and outside the delivery program itself; (3) to do this by disaggregated units with country programs and also to do it comparatively for various countries.

Thus, we may say that our working hypothesis is in symbolic terms:

$$CPU = f\ (S_p,\ CM_p\ DS_p,\ Y,\ U,\ L,\ T,\ M,\ PG,\ \alpha)$$

where

CPU	=	Cost per unit of family planning service
S_p	=	Scale (volume) of the program
CM_p	=	Contraceptive mix (type of contraceptive method) employed in the program
DS_p	=	Delivery service (type of distribution network) employed in the program
Y	=	Income per capita of the population
U	=	Percent urban of the population
L	=	Percent literate in the population
T	=	Index of level of transport/communications
H	=	Index of health/well-being of the population
PG	=	Percent rate of population growth
α	=	Residual factors

The above list by no means covers all the possible relevant variables, but whatever list is employed, the econometric problem is simply estimating the strength of the relationship between the dependent variable, CPU, and the various independent variables. Standard regression techniques can be employed to accomplish this. This process will then make it possible to select those variables which have statistically significant impact, singly or jointly, on the CPU.

Next, the significant variables can be regrouped into those subject to some degree of program control and those which reflect the socio-economic setting, and are thus, largely outside the control of the program. Thus:

$$CPU = f\ (PV,\ N\text{-}PV,\ \alpha)$$

It must be noted that this formulation is in terms of the cost-function of the program. An alternative approach would be in terms of the production function itself, in which physical inputs were related to physical outputs. We could, for example, state our problem equation as

$$CYP's = f\ (FPW,\ C,\ MU,\ \alpha)$$

in which:

CYP's = Couple-Years of Protection

FPW = family planning workers

C = clinics

MU = mobile units

α = residual factors

Some of what were called "program-related" variables (contraceptive mix, delivery system) above would affect us by giving us a different function for each such combination. Thus, each production function for CYP's implies a certain technology which in turn implies a certain contraceptive mix and delivery system and so forth. The remaining program-related variable - scale - would simply depend upon the general shape of the production function (or functions) involved.

The non-programs variables (income per capita, etc.) would not affect production but would affect the demand for CYP's.

Thus, demand for CYP's would be a function of total eligible clients, their accessibility, plus their receptivity to the family planning message. The list of non-program variables presented above would bear on accessibility and receptivity.

In actual practice our CYP totals represent both supply (or production) and demand and we cannot estimate separate demand and supply functions. Our preference of working in terms of the average cost function follows from this fact. For the cost per unit may be seen as deriving from the factors affecting both demand and supply.

Definition and Measurement of Costs and Inputs

The inputs into a family planning program consist of resources expended - the services of personnel (both full and part-time, skilled and unskilled), the use of capital equipment (clinics, vehicles, medical and publicity equipment), and the direct commodities and supplies used (IUD's, condoms, oral pills, etc.). These are in the terminology of economics, exhaustive expenditures since they are resource - using and preclude the use of the same resources for any other purpose. There may also be transfer expenditures which involve the raising and spending of funds but do not use up resources. Bonuses or fees paid to clients (but not doctors or midwives) are good examples. Funds are taxed or borrowed away from the general population and then paid to a certain group in exchange for their agreement to participate in the program. The clients have larger money incomes, the other taxpayers slightly less. Resources,

however, have not been reallocated. (Of course, to the extent that the receiving group has a different expenditure pattern than the paying group, an impact on relative prcies and resource allocation may in fact he felt. But this is incidental to the transfer and, in any case, probably slight.)

The list of inputs to the family planning program will it seems clear, be a long and heterogeneous one: some of the time of highly-skilled medical people or top government administrators, the services of a semi-skilled jeep driver, the production cost of [illegible], the incentive payment paid to a man having a vascetomy. There will also be resources flowing into the program from foreign donors - governmental and private - which must be added to local expenditures. Similarly, the program will typically include local private groups - family planning associations, for example, as well as official program operations. The national family planning budget may not include funds raised and spent at the provincial or local levels. There is, furthermore, a "joint-cost" problem at all levels.

In other countries family planning is merely part of a more general maternal and child-health or rural public health program. In the latter case (and inevitably to some extent also in the former case) "joint-cost" problems arise. When field workers or clinics are doing family planning as well as general MCH work, how much of the cost of such workers and clinics should be allocated to family planning alone?

Similar problems arise for administrative and other overhead expenditures which support many programs, only one of which is family planning. An especially difficult case is that of the handling of research and evaluation. Very frequently expensive, highly sophisticated

research projects are undertaken in conjunction with a family planning action program. There are "spillovers" for the program, but the major output of the research spending may be a product called "research," not a product called "family planning," however this latter is measured.

The Problem of Timing of Expenditures

Knowing the budget allocated for family planning - total funds and resources allocated or earmarked for the program - is only the beginning. These funds may or may not all be spent in the given period. They may be spent quickly - in the main early in the accounting period - or there may be a bunching of actual payment of bills late in the period in which the liabilities are incurred. This is the familiar budgetary problem of disbursements vs. accruals and it sets limits on our ability to deal with the shorter-term time periods - months, for example - rather than quarters or years. There is the related but still different problem which arises from the lag between program expenditures (however figured - cash or accrual) and actual accomplishment or performance. The "pipe line" for supplies or services may be long, and money spent today may generate output several months from now. In general, we must be concerned with units of input when these actually enter into or are used up by the program and have taken "actual" expenditures rather than authorizations or allocations.

Direct Versus Indirect Costs

The most commonly-used distinction made among various types of costs in economic analysis is "indirect" (or "fixed") versus "direct" (or

"variable"). The former category is also called "overhead costs" and refers, in general, to costs which are not directly related to the level of program activity or intensity. Such costs as rent, administrative salaries or capital equipment are relatively fixed once the general scope and scale of the program have been decided upon. Other costs, such as field expenses, contraceptive supplies, transport, and so on, vary as does the level of the program's intensity and output.

It can be argued that the distinction between direct and indirect costs may not be important in practice. Fixed costs may be also planned on the basis of a given target and that such fixed costs increase roughly in proportion to the target set - or, in other words, "there are negligible economies of scale." Within variable costs, a further distinction between "initial" costs, and "time-dependent" costs exists. The former are costs which are uniquely associated with reaching or supplying one particular client. These costs will not be related to how long the client remains in the program. "Time dependent" costs are outlays which occur and recur as a client stays with the program and which would end upon the client's departure. These "initial" costs would be exemplified by the IUD insertion fee, and "time-dependent" costs by the monthly outlays to resupply females on pills.

This logic suggests that should the program either fall short of or substantially exceed its target then costs per unit of achievement would be much higher or lower than planned. Thus, the relationship between "initial" costs and output could vary and could result in the familiar U-shaped cost curves per unit of output for the program. The "initial" costs thus become a special type of fixed cost.

A more concrete, empirically-meaningful program problem is related to this. Most program inputs are recurring in the sense that they represent a payment which must be made periodically so long as the service or input is required. Nearly all personnel, and all commodity supplies fall into this category. However, other expenditures once incurred create a capital asset or stock which then emits a type of input for the program stretching over some several time periods. A vehicle, or audio-visual equipment or building are examples of such non-recurring expenditures. It can be argued that for accounting and also for economic analysis such non-recurring expenditures should be established as assets, their estimated life of useful service computed, and an annual amount of value-contributed to the program estimated. Only this amount (which can be called depreciation) would then be charged off in any single year and the total expenditure would be reflected only over the course of the asset's entire useful life to the program. This distinction may also be put as capital versus current spending.

Now, while desirable, such an approach to non-recurring costs is difficult for several reasons: (1) Considerable uncertainty exists as to the "useful life" of many of the assets involved. Western-based depreciation tables are no guide to the useful life of such capital equipment under conditions encountered in developing nations. (2) The difference between "non-recurring" (capital) items and others is not always very clear cut in practice. How would one handle uniforms for field workers, bicycles, billboard posters, or the training of staff? Also in a very real sense, few expenses are truly "non-recurring"; it is durable over some time period and must then be replaced or renewed.

But the same can be said of the so-called "recurring" expenditures too. Field workers are paid once a month and having been paid need not be paid again for a month. Thus, the essential difference between the two types of expenditures is one of degree and length of the appropriate time period, nothing more. (3) The percent of total spending represented by this "non-recurring" is likely to be small in any case since only building, vehicles and specialized equipment are clearly and relatively unambiguously non-recurring.

On balance, we feel that the distinction between Direct and Indirect costs is still meaningful. The initial versus time-dependent distinction suggested is useful primarily as a way of analyzing still farther the indirect costs but cannot replace the basic categories of direct and indirect. The recurring versus non-recurring distinction would cut across the direct-indirect categories (some direct costs are recurring, some non-recurring, etc.) and would represent a desirable refinement.

Measuring Outputs

The problem of what constitutes "output" for a family planning program is related to, but not identical with, the problem of how to measure the "success" of a program. On this latter point a substantial literature has grown up. It has been suggested that the "success" of a program can be judged: (a) administratively by asking questions such as: are officials in place and doing as they are supposed to; is money being spent; are reports accurate and timely, etc. - or (b) operationally by looking at whether some final "output" being generated? These two

indexes are related but not necessarily coincident. A scheme could be an administrative success but be so poorly designed or so ill-fated as to have little operational impact. Cost-effectiveness analysis obviously is concerned with the second kind of "success," although the conclusions it reaches will be valuable for the first type of evaluation also.

Even within the second, or operational, sort of "success indicator" there are several possibilities. First, success can be in terms of some measure of the actual fertility reduction which can be attributed to the program. Allowance must be made for whatever change might have occurred even without the program, and this can be difficult statistical exercise. Second, outputs can be measured in terms of the specific units of the services generated by the program - IUD's inserted, sterilizations performed, and so on. In the terminology of economics these are really intermediate goods supplied by the program to the clients who then actually "produce" the true final output - births prevented. Now, for some types of contraceptive methods - sterilizations especially - the relationship between the intermediate services generated by the program and final services can be ascertained rather accurately once age, parity, marital status, mortality expectation, and other details about the clients are known. For IUD's this is less easily the case, due to uncertainty about retention rates, but it is still possible. However, for "conventionals" - condoms, foam, and so on - the "use-efficiency" factor looms so large that, even if the actual number of couples employing the technique is known, the relationship to births prevented is still difficult to estimate. Moreover, in most programs the statistics on conventionals will refer to total supplies distributed or sold, and the other crucial

elements - number of couples actually using these supplies and frequency of use per couple - are not known.

The "Substitution Problem"

More fundamental yet is the problem arising from the fact that a program may in practice end up incorporating or "substituting" for a previously - existing family planning effort by private households. The matter can be generalized as follows: (1) In a typical population some groups will be contracepting even in the absence of any publically-supported program. These groups may be using everything from relatively-inefficient "folk" methods such as coitus interruptus to sophisticated biological and chemical methods such as the pill, purchased through commercial channels. Thus, there will already be a "program" but it will be a totally decentralized, unplanned program whose effect on fertility is unknown. (2) When a public program is launched it almost certainly will have the effect of "substituting" for some of this previous private effort. That is, the most likely candidates for IUD's or sterilizations will be couples already contracepting by less-effective means. Similarly couples using conventionals can now obtain supplies more cheaply through participation in the program. The limits to this process are when the program accomplishes no net increase in actual family planning effort - that is, all the apparent program "output" is simply "substitution"; or when the program reaches an entirely different group and is entirely a net addition to previous family planning efforts - where in other words there is zero "substitution." One may assume that the typical situation in a developing country will fall between these extremes. That is, even

before the public program some groups will have fertility below average and perhaps overall rates will have begun to fall thanks to private efforts. The public program then will "substitute" to some extent but probably also will increase contraceptive efficiency of even long-time contraceptors as well as reaching some new groups. On both these scores the impact of the program will be to accelerate the fertility decline.

The "substitution" problem can be ignored only if by "output" we mean the specific and narrow accomplishment by a program of certain quantitative objectives. These accomplishments will be intermediate services rather than final or ultimate "success" (births prevented). These are the specific "outputs" of the program and perhaps the most relevant ones since it is the efficiency of the administrative program we are interested in evaluating.

This relationship of public to private sectors, and final to intermediate services, can be visualized as shown in Figure 1.

In fact, we do not have to choose between final and intermediate performance measures. Outputs for cost-effectiveness analysis of family planning should be defined as those specific services or supplies generated which can be directly related to the inputs used in the process. These outputs will be IUD's inserted, sterilizations performed and so on. Using such disparate output measures, however, raises questions as to how to combine them into a single output index. One solution is the widely-known "Couple-Years of Protection" concept developed by Dr. Samuel Wishik.

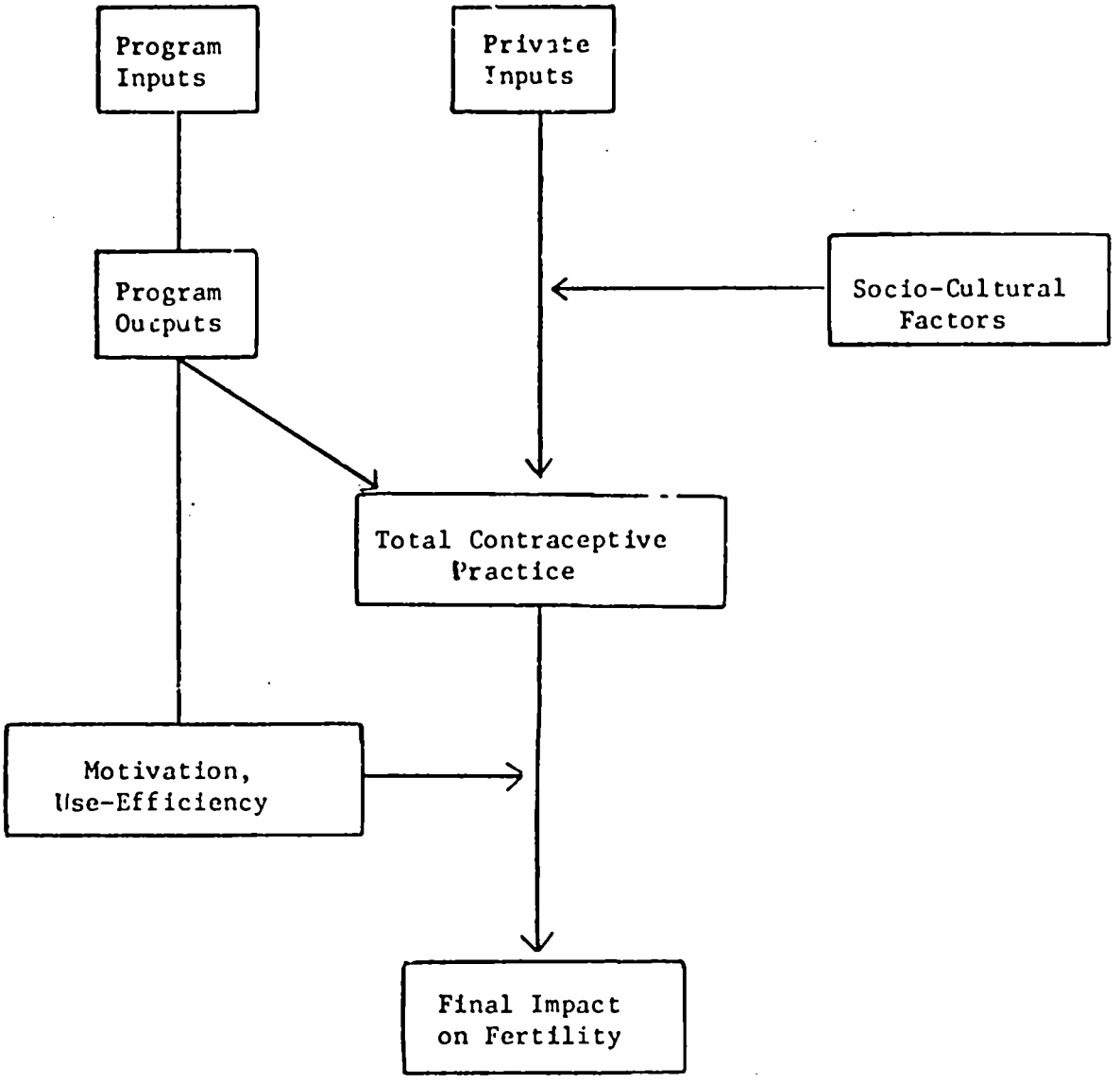

Figure 1

Relationship of Public to Private Sectors in Family Planning Programs

The Couple-Years of Protection Index

The concept of the Couple-Years of Protection Index was developed by Dr. Samuel Wishik in connection with the Pakistan family planning program. This measure was designed to make possible a district-level comparison of performance even when the "mix" of the various methods differed from district to district.

The method, to summarize quickly, is to allow one couple-year of protection for: (1) every 12-months lived by a fecund, currently-married male or female who has been sterilized; (2) every IUD in place for one year; (3) each total of conventionals (condoms, foam, etc.) and orals distributed which (given coital frequency) would be enough to provide contraceptive protection for one calendar year. The "CYP" index can then be computed for districts or other sub-national areas. In discussing the Index Wishik notes the following limitation:

> It is obvious that the number of couple-years did not indicate the number of different couples involved, but was merely the sum total of <u>time</u> of contraceptive practice of all couples who practiced at all, whether for shorter or longer periods. It must also be emphasized that the Couple-Year of Protection Index focuses on the <u>assumed period of practice</u> of contraception and in no sense carries implication concerning the use-effectiveness of the contraceptive practices or the number of births prevented by those practices. Those are matters for further derivation with the help of CYP data that will be the subject of another paper, built around the concept:
>
> $$P \cdot e \cdot F \rightarrow B$$
>
> A given amount of contraceptive practice (P), as measured in CYP's, of certain levels of use-effectiveness of the contraceptive methods used (e) among women of certain fertility expectations in the absence of contraception (F) will lead to

the number of births prevented (B) by that amount of contraceptive practice.

For our purposes, then, we compute our Achievement Index (Couple-Years of Protection) as:

$$(1) \qquad CYP_n = \frac{C_n}{100} + .0769\ O_n + (V_n + TL_n)\ 7.5 + I_n 2.5$$

In which: C is total conventional contraceptives distributed; V is vasectomies; TL is tube-ligations; O is oral pill cycles distributed; and I is IUD's inserted. The parameters assumed are: coital frequency of 100 per year; the average number of years an IUD is retained by a married, fecund female (allowing for reinsertions) as 2.5; the average number of fecund years remaining to a woman before she dies, is widowed, or reaches menopause after she or her husband has been sterilized is assumed to be 7.5 years; since it requires 13 cycles of oral pills per calendar year, the total of oral cycles distributed must be divided by 13 to reach "couple-years" and this is the same thing as multiplying by .0769.

This technique assumes that the use-effectiveness of IUD's is 100 percent. As Wishik explains in assuming that 100 condoms or 13 oral cycles equal one CYP the same assumption of 100 percent effectiveness is being made. The justification for such an assumption is, as indicated above, that our measure is of intermediate output, with this "output" then being filtered through "use-effectiveness" to reach "prevented-births."

An important distinction must also be made between current achievement and current prevalence as measured by this approach. For conventionals, achievement and prevalence are virtually the same thing, but not so for IUD's or sterilizations for which there is a substantial carry-over from period to period.

Our Index is a measure of current achievement of the program, including that achievement which will be realized in the future. It is not a measure of the current level of protection being afforded to the population (or prevalence in Wishik's terminology) which must take into account carry-over of past achievements into the present as well as some part of the current achievement. The Prevalence Index would be computed, for example, as:

$$(2) \qquad P_n = .5\left[\frac{C_n}{100} + .0769\ O_n + (V_n + TL_n) + I_n\right] + \Sigma_o^n\left[(V + TL)\ (m)\right] + \Sigma_o^n\left[(I)(m)(A)\right]$$

In which: A is an annual survival rate for IUD wearers from attrition by reason of pregnancy, expulsion and removals; m is the probability of a female who has been inserted or sterilized or whose husband has been sterilized surviving as a currently-married fecund female from the year of the operation or insertion to the present; year t_o is assumed to be the start of the program, and this can be any number of years in the past; current insertions and so on are assumed to be spread out evenly over the present year so that prevalence by reason of current achievement is equal to current sterilizations,

insertions and conventional plus oral usage times .5. This formula, then, gives an approximation of the current prevalence as contrasted to current achievement.

Note that current achievement measures changes in prevalence during the period in question but it also includes changes in future prevalence as well. The relationship between prevalence and achievement may be seen conceptually as a matrix with time of insertion, sterilization or contraceptive distribution along the vertical axis and time during which the couple is protected along the horizontal axis. Summing row-wise gives achievement in each year (row) while summing column-wise gives prevalence of protection in each year (column). Thus, achievement in Year 1 would include elements of protection extended in Years 1 through n, while prevalence in Year 3 would include some part of the achievements of Year 1 through 3.

Thus, our Index of achievement measures total output future as well as present and is thus more meaningful in assessing cost per unit than a prevalence index which would treat a sterilization as being the same "output" as supplying a couple for a year with condoms. On the other hand, since an accomplishment is partly unrealized as yet, we can make any easy comparison with the total target population of the program. Out CYP cannot, in other words, be expressed as a proportion of Couple Years at Risk in the present year. However, should such an exercise be thought useful our data and Equation (2) above would make it a simple matter.

Alternatives to the CYP Index

The Couple-Years of Protection Index has been much-discussed and also widely-criticized. It very obviously best handles the clinical methods such as IUD's and sterilizations. The treatment of the condoms and other conventionals in the Wishik formula is less satisfactory. The difficulty is that in the case of Pakistan, where the Index was developed, there were only distribution figures for these non-clinical methods, not use figures. In the case of other programs, indeed many of the ones we shall be dealing with in this report, the number of clients practicing contraception using the various non-clinical means is known. In this case, the data on contraceptives distributed become superflous and what can be substituted instead in the CYP formula is number of females protected by various methods. In other words, the expression becomes:

$$(3) \qquad CYP_n = (V_n + TL_n)\ 7.5 + I_n\ 2.5 + CL_c + CL_{op} + CL_{ao}$$

in which V_n, TL_n and I_n are, as before, vascetomies, female sterilizations and IUD's inserted, and:

CL_c = Clients regularly using condoms

CL_{op} = Clients regularly using oral pills

CL_{ao} = Clients regularly using any other method

Other alternatives to CYP for program evaluation are also occasionally suggested and these include: (a) total visits or consultations at clinics; (b) total clients or patients; (c) new acceptors.

The first of these is too vague and loosely-defined to be of any real value. Total clients or new acceptors may be meaningful measures of output. Both, however, treat the patient who receives a supply of condoms as basically equal to the woman who undergoes a sterilization. In other words, it is even more arbitrary than the CYP Index, albeit in a different way. Worse, however, such crude measures of output fail to make use of all the program information we usually have at our disposal.

Such measures are, however, of interest and in this report we analyze program performance in terms of both CYP's and clients/acceptors.

Actual Data Required

The program outputs which are required for program cost evaluation include:

(a) IUD's inserted, by months (first insertions and reinsertions)

(b) Male and female sterilizations performed by month

(c) Oral pill cycles distributed

(d) Units of conventional contraceptives distributed

(e) Estimates of number of clients or couples reached by the program via each of the major methods used

(f) Estimates of the total number of couples contracepting independent of the program by type of method employed

Finally, to make possible the step from program intermediate outputs to births averted, as much detail as possible on the characteristics of the contracepting population - the clients - in terms of age of wife and husband, previous childbearing, length of marital union, and so on - is

needed. Estimates of the "normal," no - contraception age-specific fertility rates are also required.

Once the cost and also output series are dealt with, the cost per unit of performance of the programs can be calculated. The remaining conceptual and statistical problems have to do with defining the various independent variables in terms of which we propose to explain variations in CPU.

Program-Related Variables

The determination of which, if any, of the program-related variables are significant in structuring CPU will be part of our findings and can only be hypothesized about for the moment. Nevertheless, certain variables do seem logical candidates for regression analysis. These include:

(a) Program scale or volume as measured by the units of output produced, the target population of clients or households, and the clients or households actually reached.

(b) Contraceptive methods employed where the "mix" as among IUD's, sterilizations, conventionals and other, varies either with time or among sub-units of the program.

(c) Delivery system employed by the program where, for example, fixed clinics and mobile units are both employed, or where the stress is on clinical - medical approaches in some areas as against less-technical, more voluntaristic, market-based delivery systems in other areas.

(d) Expenditure patterns may also vary even where overall budgets are the same and certain types of expenditures stressed -

propaganda, incentive payments, piece-rate fees to doctors - may prove significant in explaining performance variations.

Non-Program Variables

A large number of "setting" variables of a socio-economic sort will influence the CPU of the program and, in general, these can be thought of as working in two ways: (1) Certain objective geographical, structural and climatic factors may tend to complicate delivery of family planning services and make for a higher CPU. Examples are the lack of transport and communications in the rural areas of many countries, the Monsoon rains in East Pakistan, the long, heavy winter snows in Central Turkey, and so on. (2) It is a plausible assumption that many socio-economic factors are correlated with the populations readiness or eagerness for family planning services. Indeed, the generalizations from Western experience suggest that a literate, urban, healthy industrial population will almost inevitably chose lower fertility. Thus, an unhealthy, illiterate, rural, agricultural population is likely to be hard to motivate to family planning. The CPU for a program in such a setting is likely to be high.

Now both the above factors overlap and interact and they may not be separable empirically. But, in any case, the most obvious socio-economic setting variables for inclusion in our analysis include:

(a) Income per capita of the population together with whatever measures of distributional dispersion or concentration may be available.

(b) Percent urban of the population with urban broken down into at least several categories.

(c) Age and sex distribution of the population, particularly since sharp differences among regions will change the size of the target group of the program.

(d) Absolute population size and also density in relation to total land and also orable land.

(e) Percent literate of the total and also adult population.

(f) Mortality of the population, including the level of infant and child mortality separated out from the best summary index of overall mortality and morbidity.

(g) Health services available measured by physicians, clinics, hospital beds and the like per 1,000 population.

(h) Indexes of accessibility of the population including such measures as miles of paved road, radios, or newspaper circulation per 1,000 population.

This list is also far from exhaustive. It may vary from country to country and we need not insist on a set of these factors (or any of our other factors) being common to all our study areas. The best statistical measure for each of the dimensions touched upon may be different from country to country. Only after we actually undertake collection and analysis of the data will we be able to judge fully these matters.

Conclusion

Our goal then is to determine as accurately as possible the cost per unit of family planning services in our study areas for the major geographical sub-divisions of the national programs and to then explain any differences in cost per unit which emerge in terms of program - related and non-program - related social, economic and administrative factors. The project is fairly clear-cut conceptually, but many statistical problems will undoubtedly arise in each area.

CHAPTER III

FOUR SELECTED ASIAN COUNTRY PROGRAMS

This chapter contain a macro analysis of our country programs - Hong Kong, Singapore, Malaysia and Thailand. All have in common the fact that they have met with some success in their early stages; all also have considerable similarity in general economic and social levels of development. As will be seen they present some interesting contrasts with the country programs of India and Pakistan on the one hand, but also with Taiwan and Korea on the other.

(A) Hong Kong

Introduction

Hong Kong refers to the British Crown Colony adjacent to the Southeastern Mainland of China and comprising the Island Hong Kong, a number of small islands, but also the Kowloon Peninsula and the New Territories lying on the mainland itself. The total land area is just under 400 square miles but because of the hilly terrain less than one-fourth of this is used either for cultivation or residential and commercial purposes. The colony exists almost completely from trade and it especially in recent years has become a major gateway for trade with mainland China. Some light manufacturing has also grown up and tourism provides some income.

The population in 1970 was roughly 4 million, making Hong Kong one of the most densely populated area of the world. Population growth has however, been declining. The crude birth rate has fallen from a high in the low 40's in the mid-1950's to about 20 in 1970. The death rate has also fallen but, even so, the rate of natural increase has been cut in half during this period. Some of both declines is attributable to age-distributional effects but it was estimated that at least 50 percent of the apparent fertility decline has been a real change in the total fertility rate.

Background of Programs

Private efforts at an organized family planning movement in Hong Kong go back to even before World War II. The present association dates from 1950, was affiliated with IPPF in 1952 and received governmental recognition and financial subsidy in 1955.

The program has worked through its own clinics but also through the MCH clinics of the government hospitals. A very large percentage of total births take place in these institutions and thus the post-partum aspects of the program have been significant.

It continues as a private association with a large representative governing body. Foreign assistence has been minor except for some recent work on research and evaluation.

The program has followed the "cafeteria" approach with a variety of methods being offered. In general, conventionals were the mainstay of the program during its early years, the IUD achieved an important

but temporary role in the mid-sixties, and orals have more recently emerged on the dominent method. Sterilizations have played a small but growing, role and abortions no role at all.

Resources

The program is financed from: (1) A governmental subvention (grant); (2) Fees charged the clients; (3) Grants and donations from local persons. The budget of the association does provide a reasonably accurate overall picture of the resources flowing into the program. Table I summarizes these data.

Program Outputs

The question of how to measure outputs has been discussed at length in Chaper II of this report. Table II presents the basic data for Hong Kong on both methods and also number of visits and the two summary indexes, couple-years of protection and total visits. The CYP's have been arrived at using the procedures which were also outlined in our earlier methodological discussion. Briefly, this involved weighting the IUD's inserted and the sterlization performed with constants to indicate the average number of years of contraceptive protection each would eventually provide and summing this with the average numbers of females estimated to be on oral pills and couples using any other method during the year. This is a measure of performance, not current protection. Total current users would presumably be roughly indicated by summing new cases and old cases, for total active cases.

TABLE I

Total Expenditures on Family Planning
in Hong Kong, 1963-1968

	In Hong Kong Dollars	In U.S. Dollars
1963	884,694	147,449
1964	950,689	158,448
1965	1,195,275	199,212
1966	1,250,964	208,494
1967	1,412,189	235,300
1968	1,639,298	273,210

TABLE II

Measures of Output of
Hong Kong Family Planning Program

	IUD's	Sterilizations	Women on Oral Pills	Users of Condoms and Conventionals	Total Couple-Years of Protection Implied
1963/64	418	186	1,706	34,200*	37,881
1964/65	9,574	196	2,430	32,400*	59,765
1965/66	29,651	356	2,795	31,018	109,721
1966/67	14,112	417	3,725	32,079	73,169
1967/68	8,681	750	8,464	31,902*	65,819
1968/69	7,360	721	25,338	17,020*	64,363

	New Cases	Old Cases	Revisits	Total Attendance
1963	14,318	21,941	53,151	89,410
1964	21,369	23,909	69,363	114,641
1965	35,268	30,468	76,665	142,401
1966	23,031	46,926	76,325	146,282
1967	19,292	47,373	77,008	143,673
1968	26,588	47,157	131,182	204,927

* Estimates

Even this is a bit ambiguous since the old cases can include IUD cases coming for a checkup but will exclude the sterilization cases which do not require checkups. In any case, as can be seen the total of new plus old cases is consistently slightly below the total of CYP's, a result which is to be expected in view of the projective aspect of the CYP as a measure of output.

Costs per Unit

Combining our estimates of financial inputs and the several measures of outputs, we arrive at estimates of costs per output unit and these are shown in Table III.

These costs also are very much in line with the costs per CYP for similar programs in Taiwan, Korea and elsewhere. In per capita terms the program is spending some 12 cents U.S. per year, slightly higher than some of the other programs, but well below others.

(B) Singapore

Background

The Republic of Singapore lies at the tip of the Malay Peninsula in the Center of the Southeast Asian region. Located entirely on an island of 224 square miles, it has a population of some two million, 75 percent of whom are Chinese by ethnic background, with Malays comprising 14 percent, and Indians and Pakistanis 8 percent. It is a highly cosmopolitan nation which lives largely by trade thanks to its strategic position. Schooling, through not compulsory, is universal and

TABLE III

Costs per Output Unit of Family Planning in Hong Kong

	Expenditures (in Hong Kong Dollars)	CYP's	New Cases	Total* Cases
1963	884,694	37,881	14,318	36,259
1964	950,689	59,765	21,369	45,278
1965	1,195,275	109,721	35,268	65,736
1966	1,250,964	73,169	23,031	69,957
1967	1,412,189	65,819	19,292	66,665
1968	1,639,298	64,363	26,588	73,745

* New plus old cases.

Costs per Unit (in Hong Kong Dollars)

	CYP's	New Cases	Total Cases
1963	23.35	61.79	24.40
1964	15.91	44.49	20.99
1965	10.89	33.89	18.18
1966	17.10	54.32	17.88
1967	21.46	73.20	21.18
1968	25.47	61.66	22.23

(in U.S. Dollars

1963	3.89	10.30	4.07
1964	2.34	7.41	3.50
1965	1.81	5.65	3.03
1966	2.85	9.05	2.98
1967	3.50	12.20	3.53
1968	4.25	10.28	3.70

literacy is high compared to most Southeast Asian nations. Income per capita is over 500 dollars U.S. which is also well above most other nations of the region. Singapore has been described as an enclave of North Asian pragmatism and industry in the heart of Southeast Asia.

In spite of these relatively favorable economic indicators, the population density of Singapore is some 9,000 persons per square mile. This marks an increase over a third since the mid-fifties and in turn stems from the rapid rate of population increase which has marked the post-war period in the Nation. The death rate has declined steadily and had reached a low of about 6 per thousand population by the late 1960s, with infant mortality amounting to only 25 per thousand live births. Both these rates compare very favorably with rates from even highly developed nations of the West. The birth rate at the beginning of the sixties was about 40 per thousand population and the resulting rate of natural increase reached a figure as high as 4 percent per year, making it probably the most rapidly growing population in the world. Against this background, the family planning effort was launched in the mid-fifties.

The Family Planning Program

Organized efforts to deal with the growth in population began in Singapore in 1949 with the founding of the Singapore Family Planning Association. This effort received encouragement from the government and also an annual subsidy beginning in the late fifties. The government also donated a valuable tract of land on which the Associations

headquarters was subsequently constructed. The Ford foundation made a large grant to the Association to cover most of the building costs and this building subsequently also became the headquarters for the South-east Asian Region of the International Planned Parenthood Federation, with which the Singapore Association affiliated in 1952.

In 1965, following the recommendations of a government "white paper" report, the Government assumed full responsibility for family planning and established the Singapore Population and Family Planning Board. The private association continued to exist, largely to provide service to its previous acceptors, but its subsidy was sharply reduced and it no longer exercised any coordinating or supervisory functions. The SFPA was finally taken over altogether by the NPFPB in 1968. Private medical practicioners have also played an important role in the overall effort and an effort is made by the Government Board to take into account their accomplishments as part of the evaluation.

The Board has broad powers covering the promotion and dissemination of family planning information, the initiation and control of programs, the stimulation of demographic research and awareness, and to keep the government advised on all such matters. It functions as an inter-Agency group with representatives on the Board from several ministries, from the Universities, from the private associations and from the general public. The Board reports to the Prime Minister and to the Parliament.

In terms of methods being stressed the program has gone from a "menu card" approach in which various methods were offered with no

attempt being made to influence the potential acceptors choice. In the early period both the IUD and the Oral were favored, but over time the Oral has emerged as the overwhelming choice of the females involved. This parallels the experience of other countries in this region. The IUD and also the condom do continue to play a role however. Both sterilizations and abortions are also expected to play a growing role in the future after new legislation, clarifying their legal status, took effect in 1969.

Financing the Program

The budget picture is relatively uncomplicated. The Singapore Family Planning Association Budget constituted the programs inputs prior to 1965 with only the need to add in certain non-monetary government inputs. Foreign inputs have also been relatively modest: The Ford Foundation building grant in connection with the new headquarters already noted above; some IUD's from the Population Council; an IPPF grant to establish cytology facilities; and more recently oral contraceptives from the Swedish Development Authority, supplied at a subsidied price.

As noted above, the private SFPA coexisted with the Government SPFPB between 1965 and 1969. No direct data on the SFPA expenditures in this period are available and due to administrative confusion arising at the time of the demise of the private group no copies of these financial reports are to be had. Our estimates are thus based on rough extrapolations. The expenditures of the government group are known with

certainty and represent chiefly the annual government appropriation of 200,000 dollars Singapore and also the income from the sale of the contraceptives, especially the orals, to the clinic patients. Since the Board is able to purchase these supplies at well below market price, it is thus in a position to earn a profit on its distribution which it then applies to cover the costs of its operations. In their annual reports the NPFPB reports only the net profit on sales, but we have adjusted the total expenditures upwards so as to reflect gross expenditures on contraceptive supplies not just the net profit thereon.

Generally speaking the financial activities of both the SFPA and SPFPB have been conservative and in most years the actual expenditures have fallen short of the total funds flowing into the program. This does not mean, however, that the program has necessarily been economical or low-cost. This can be judged only in relation to some measure of output. Table IV presents our estimates of the resources employed in the scheme.

The above estimates include all foreign inputs which are, in any event, negligible. Some joint costs - the use of government hospital facilities - are probably under-reported but these also seem minor.

Measuring the Program Output

The output of the program can be looked at in several ways. The most widely used official index is "new patients" and "revisits" to the clinics. New patients is evidently fairly unambiguous, but revisits can clearly mean the same person many times if they revisit the

TABLE IV

Expenditures on Family Planning
in Singapore (in Singapore Dollars)

	SFPA*	SPFPB	Total (Singapore Dollars)	Total (U.S. Dollars)
1963	132,899	--	132,899	44,277
1964	160,751	--	160,751	53,650
1965	175,000	--	175,000	58,333
1966	55,000	277,582	332,582	110,860
1967	25,000	343,686	368,686	122,895
1968	20,000	600,420†	620,420	206,807
1969	20,000	691,213†	711,213	237,071

* Includes estimates for separate IPPF clinic operations

† Includes gross cost of contraceptive supplies

clinic repeatedly during the year. Thus, total visits can be looked at some measure of utilization of the clinics, but not really of output or of impact of the program on a target population. Table V summarizes these attendance data.

Table VI breaks down the "new patients" by method. These data bear out the fact that orals and condoms play the most important role among the methods currently being offered by the clinics. IUD's have not been a major factor and are evidently declining in importance.

Another somewhat more concrete way of looking at output is in terms of the actual physical accomplishments and contraceptive devices distributed. Table VII presents these data on IUD's, sterilizations, abortions, and oral cycles and condoms distributed. As noted above the sterilizations and abortions were highly controversial until recent legal changes and they have not been a part of the main program, occurring instead in the hospitals under highly particularized conditions. Yet, as can be seen, they are not an insignificant fraction of the programs output. Building on these measures of output we now move to Table VIII which computes the implicit couple-years of protection generated by the program. (The concept of CYP has been discussed in earlier sections of this report and we will not retrace these steps now.)

Each IUD inserted is assumed to generate 2.5 CYP's, each sterilization 5 CYP's; the number of patients "under control" by orals is estimated by the official SPFPB reports; total condoms distributed were divided by 100 to reach CYP's; "all other methods" estimated at 1%

TABLE V

Total Family Planning Clinic
Attendance, in Singapore, 1963-1969

	SFPA		SPFPB		Totals		
	New Patients	Revisits	New Patients	Revisits	New Patients	Revisits	Total Visits
1963	8,429	51,765	--	--	8,429	51,765	60,194
1964	9,339	69,029	--	--	9,339	69,029	78,368
1965	9,845	94,141	--	--	9,845	94,141	103,986
1966*	3,585	32,150	30,410	66,886	33,995	99,036	133,031
1967	2,038	30,603	30,935	169,716	32,973	200,319	233,292
1968	1,451	24,041	35,338	272,879	36,789	296,920	333,709
1969	1,000**	20,000**	35,643	358,983	36,643	378,983	415,626

* Includes IPPF clinics
** Estimates

TABLE VI

New Patients to Singapore Family Planning Clinics by Methods*

	Orals	IUD	Condoms	All Others
1963	568	40	4,907	2,914
1964	1,883	200	4,308	3,148
1965	3,248	1,083	3,571	1,943
1966	13,985	2,784	8,062	4,215
1967	18,874	267	9,650	1,760
1968	19,403	3,703	10,076	1,779
1969	18,265	1,299	14,054	1,989

Total

1963	8,429
1964	9,339
1965	9,845
1966	29,046
1967	30,551
1968	34,961
1969	35,607

* 1963-1965 are SFPA; 1966-1969 are SPFPB

TABLE VII

Physical Measures of Output of
Singapore Family Planning Program

	IUD's Inserted	Sterilizations Performed	Oral Cycles Distributed	Abortions Performed	Conventionals Distributed
1963	40	575	10,000*	--	N.A.
1964	200	557	N.A.	--	N.A.
1965	1,083	542	N.A.	--	N.A.
1966	5,563	477	86,000	4,008	147,000
1967	764	653	233,408	3,327	407,400
1968	3,956	1,049	390,223	2,922	582,168
1969	1,358	1,500*	400,000*	4,000*	600,000*

N.A. - Not available
* Estimated

TABLE VIII

Couple-Years of Protection
Generated by Method of Contraception

	IUD's	Sterilizations	Orals	Condoms	All Others
1963	80	--	568	5,000	3,000
1964	300	--	1,883	4,000	3,000
1965	2,788	--	3,248	3,500	2,000
1966	13,908	2,385	6,000	1,500	238
1967	1,910	3,265	14,000	4,000	232
1968	9,890	5,245	32,359	5,800	538
1969	3,395	7,500	60,000	6,000	769

	Abortions	Total
1963	--	8,648
1964	--	9,183
1965	--	11,536
1966	4,008	28,039
1967	3,327	26,734
1968	2,922	57,254
1969	4,000*	81,664

of total CYP's from other methods; abortions were given a weight of one CYP each.

Costs per Output Unit

Combining our estimates of program inputs and outputs we can now arrive at estimates of per unit costs as presented in Table IX. The trend indicate that while cost per new patient is rising, cost per CYP is declining because of the growing role of clinical methods.

The program is thus, using 2 million as a base population, spending roughly 12 cents U.S. per capita. All these indications put Singapore well within the range of the other established programs (Korea, Taiwan, India, etc.). And, in terms of her own stated objectives of bringing some 180,000 married women into the scheme by 1970, the program is judged to be successful. The impact on the birth rate has also been undeniable, and the total fertility rate has fallen by some 25 percent since the inception of the SPFPB.

(C) Malaysia

Background

Malaysia is a country of some 10 million people on the South-eastern tip of the Asian mainland on nearby islands. It is divided between West Malaysia, comprising the former British territory of Malaya, and East Malaysia, made up of the territories of Sabah and Sarawak on northern part of the island of Borneo. It is an independent, democratic monarchy with the sovreign elected every five years and with

TABLE IX

Measures of Unit Costs of
Family Planning in Singapore

	Total Expenditures (in U.S. Dollars)	Total New Patients	Total Visits	Total CYP's
1963	44,277	8,429	60,194	8,648
1964	53,650	9,339	78,368	9,183
1965	58,333	9,845	103,986	11,536
1966	110,860	33,995	133,031	28,039
1967	122,895	32,973	233,292	26,734
1968	206,807	36,789	333,709	57,254
1969	237,071	36,643	415,626	81,664

	Cost per New Patient	Cost per Visit	Cost per CYP
	(All in U.S. Dollars)		
1963	5.25	.74	5.12
1964	5.74	.73	5.84
1965	5.93	.56	5.06
1966	3.26	.83	3.95
1967	3.72	.52	4.60
1968	5.62	.89	3.61
1969	6.47	.57	2.90

effective political and administrative power in the hands of a prime minister and other parliamentary ministers. These territories first achieved their modern independence in 1957; the merger of Malaya and Sarawak and Sabah took place in 1963; and in 1965 the island of Singapore left the Union and became an independent republic.

Demographically Malaysia is fairly typical of many other nations of the South and Southeast Asia. Its people are mainly rural or small-town (some 80 percent), mainly agricultural and have high fertility. The present growth rate is estimated to be 2.8 percent, being a balance of 35.2 birth rate and a 7.5 death rate per thousand. The mean age at first marriage for females is about 17 years, over 45 percent of the population is under age 15 and there is an average of six persons per household in the country.

In spite of the rapid population growth, the country remains relatively prosperous and progressive. Its agriculture, based on rice, is productive and the country is 70 percent self-sufficient in food. Its major export crops are rubber, tin, palm oil, together with copra and coconut oil. The government is firmly committed to increasing programs of social welfare and education and public health have received considerable attention in past budgets. The relatively high literacy rate - some 60 percent - and low death rate - 7.5 - testify to this concern. The overall per capita income is about 300 dollars U.S. and, while it has not fallen over the past decade, it seems clear that it has not risen as rapidly as it might have due to the large annual increments to the population.

The Family Planning Program

Organized family planning in Malaysia dates back to at least 1953 when the first private association was formed. By 1962 associations existed in all eleven states of the Union, and a nationwide Federation of Family Planning Association formed with full membership in the International Planned Parenthood Federation. Official governmental concern dates from 1964 when the cabinet voted to adopt family planning as a national policy. In June 1966 the National Family Planning Board came into existence as an inter-ministerial organization having considerable powers and autonomy, and reporting directly to the Prime Minister. The NFPB has the final authority but it has encouraged the private Family Planning Associations to continue their operations and provides "overhead" logistical support, especially supplies of oral pili cycles and IUD's, and undertakes educational and training programs to be benefit of both the public and private programs. The program data from the private operations are submitted to the central evaluation unit of the NFPB and, for all practical purposes, the coordination appears to have been very good. Although some clinics have operated in the rural areas from the very beginning of the private associations, the primary emphasis of the official program in the first years has been the larger urban areas. The second phase saw the program extending its activities to the regional centers and the district hospitals. In Phase III the main health centers and sub-centers in smaller urban areas were to be included and in the last phase, still underway, the remaining areas of the country were to be covered by the use of mobile units, midwifery clinics and also training the village midwifes in family planning techniques. As may be

seen the program has worked primarily through clinics and hospitals and the existing health network. It has proceeded also in a systematic fashion, beginning with the most extensive and gradually moving out to the less densely settled areas. The overall national health network is reasonably good and this approach seems to have paid off. However, the fact also remains that some one-third of the total larger population lives in the small town and rural regions and thus remained uncovered by the Phases I through III.

The method stressed by the program, public and private, has been the oral contraceptive pill, with several different variaties being used. Some IUD's have been inserted and condoms and other conventionals are also available but these have not emerged as important. There is also a growing commercial sale of orals through regular commercial channels and these are all presumably in addition to the flow from the program. Success with this method and in consequence the continuation rates appear to have been surprisingly good.

Foreign advisors and foreign aid have played a significant if still minor role in the development of the program. The original 1964 cabinet decision was perhaps facilitated by a report on the economic and demographic implications of further population growth in Malaysia prepared by the Ford Foundation and the Foundation has subsequently financed an extensive fertility survey in West Malaysia which provided valuable baseline data for the family planning program. It has also attached advisors to the evaluation unit within the NFPB, provided training fellowships for Malaysian personnel, and generally assisted in strengthening the research and evaluation capacity of this unit of the

Board. Other foreign inputs have been mainly in the form of supplies and commodities. The Swedish International Development Authority has provided oral pills and also some vehicles and equipment. The U.S. Agency for International Development, although it has no operating mission in Malaysia, has supplied virtually all the orals distributed by the private associations, channelling them through the International Planned Parenthood Federation. UNICEF has also provided some funds for the training of midwives.

Total Resources of the Program

Since the official program dates from mid-1966, we shall consider that 1967 is the first real year of the program operation. There are, as noted above, two chief components of the program; the official NFPB and private FFPAM. There is the slight additional complication that most of the individual State Family Planning Associations raise and spend funds on their own above and apart from the funds of FFPAM which flow to them. Let us consider each of these parts in turn:

(A) The National Family Planning Board. The funds are from a regular appropriation by the Government of the Nation. The amounts budgeted and actually spent are shown in Table X. Actual expenditures have differed from these allocations due to the inevitable lags in obligating and disbursing funds in a new program. These budget and expenditure figures include the foreign aid components discussed above amounting to the following (in thousands of Malaysian dollars):

TABLE X

Budgeted and Actual Expenditures on Family Planning in Malaysia

	(in thousands of Malaysian Dollars)	
	Budgeted	Expended
1966*	249	133
1967	900	766
1968	1,600	1,631
1969	2,000	2,193
1970**	2,216	2,400

* Six months
** Estimated

	1967	1968	1969	1970
UNICEF	--	--	67.	--
Ford Foundation	--	75.6	--	--
SIDA	--	393.	431.	138.*

* First 9 months

All these amounts are reflected in the NFPB budgets presented above. They indicate that in 1968 and 1969 the share of the total program being covered by foreign aid was on the order of 20 to 25 percent.

In addition to these figures on foreign aid, the Ford Foundation has also made several grants to the Center for Population Policy, University of Michigan, U.S.A., for evaluation and training dealing with the Malaysian program. Advisors have been stationed in Kuala Lumpur and some substantial "spillovers" from these dollar expenditures have undoubtedly been realized. From 1966 to 1970 these grants have totaled $581,000 U.S.

Finally, there is also some "joint-cost" input to the NFPB program arising because of its use of the hospitals and health centers which are financed by the regular health budget. However, the fact that the program is mainly an orals program means, one can argue, that this problem is minimal. Were IUD's, sterilizations, or other clinical methods being stressed, then indeed, the use of facilities and equipment would be important. However, an orals program in any facility requires very little equipment. Its chief inputs are personnel costs and commodities and these are paid for by the NFPB budget.

(B) The Federated Family Planning Associations of Malaysia. The FFPAM receives an annual subsidy of 200,000 Malaysian dollars from the Ministry of Social Welfare. These funds come from the proceeds of the National Lottery and are totally separate from the budget of the National Family Planning Board. Beginning in 1967 the FFPAM also have made a modest profit from the sale of oral contraceptives to their affiliated state associations when these contraceptives have come to the program from IPPF (indirectly from USAID) at no cost. The FFPAM also receives some private donations. Taken altogether, the total expenditures estimated are as follows (in thousands of Malaysian dollars):

1966	1967	1968	1969	1970*
200	258	336	357	528

* Estimate

As noted the FFPAM also derives some operating income from purchase and sale of orals. Thus, in 1969 some 250,000 oral cycles were purchased by the FFPAM at a cost of roughly 40 cents Malaysian per cycle. These were subsequently resold to the state affiliates at cost. However, the gross receipts of the program are thus 100,000 dollars Malaysian higher than the apparent spending shown in the FFPAM reports in which the oral transactions are ignored altogether. Similar estimate, for 1967 and 1968 result in increases of 30,000 and 90,000 Malaysian dollars respectively.

(C) State Family Planning Associations. Each of the eleven states of the West Malaysian Union operate associations. These associations receive an operating grant from the overall FFPAM and also are supplied by their parent group with the oral contraceptives at prices well below the regular commercial channels, and, in some cases, free. These state associations have typically been charging their clients for the orals a price much closer to the true market value and have thus realized a "profit" on the operation. These "profits" have then been used to cover their other operating costs and to, in some cases, purchase orals from commercial outlets in order to supply all the potential demand. Thus, in 1969 some 400,000 oral cycles were distributed by the state associations. If we assume these costs then an average of 40 cents Malaysian (which the price charged by the FFPAM) and that they then charged an average 1.60 Malaysian, then a profit of 1.20 per cycle was created and this would mean revenues of some 480,000 dollars Malaysian. This amount then represents funds generated by the State associations not reflected in the budgets of either the FFPAM or the NFPB. Similar adjustments must be made to the other years. Comparable estimates for 1967 and 1968 result in figures of 300,000 and 425,000 Malaysian dollars.

Summing up, then the total funds evidently deployed by the FFPAM and also the State Family Planning Assocaitions, are apparently as follows (in thousands of Malaysian dollars):

	1967	1968	1969	1970*
FFPAM	288	396	457	648
State Associations	300	425	480	600
Total	588	821	937	1,248

* Estimated

These estimates square fairly well with earlier estimates of the total spending by the entire private effort and also with the known fact that the local associations have raised some 50 to 60 percent of the total resources of the program.

(D) Grand Total. Summing up the several parts then, our estimated total spending on family planning in Malaysia is as follows (in thousands of Malaysian dollars):

	1967	1968	1969	1970
NFPB	766	1,631	2,193	2,400
All private efforts	588	821	937	1,248
	1,354	2,452	3,130	3,648

Output of the Program

Output of the Malaysian program is typically expressed in "acceptors" which can be read to mean "new acceptors." These as indicated by official reports are as shown in Table XI.

TABLE XI

Measures of Output of Malaysian
Family Planning Program

	New Acceptors	Couple-Years of Protection Generated			
		Orals	IUD's	Sterilizations	Total
1967*	20,726	16,666	2,226	3,130	22,022
1968	74,935	37,467	2,946	13,045	53,458
1969	115,400	57,700	3,200	15,000	75,900
1970**	148,500	74,250	3,500	17,000	94,750

* First six months
** Targets

The breakdown of these by method has remained fairly consistently 92 percent orals, 2 percent IUD, 3 percent sterilization and 3 percent all others. It is thus possible to compute also "Couple-Years of Protection" by merely making some plausible assumption about numbers of oral cycle required to generate one CYP. Since they are usually sold we assume minimum wastage and that 15 oral cycles generate one CYP. This apparent total of CYP's was then adjusted in the light of the number of acceptors by method reported by the program. Table XI presents these data too.

We can now proceed to the last step of our analysis, the calculation of cost per unit of amily planning services. Table XII does this, in terms of U.S. dollars as well as Malaysian dollars. A falling unit cost trend is indicated in terms of both indexes of output.

The cost per unit would seem at first glance high as compared to other programs reviewed in this chapter. But it must be remembered that the Malaysian program finances itself from fees and actual sales of contraceptives to its clients to a far greater degree than any other program we have examined. Thus, the cost per unit figure is a better approximation of a true value of service with a large share of the unit cost coming from the product of the direct beneficiary.

(D) Thailand

Background

Thailand is a large, relatively prosperous country located in Southeast Asia. Its present population is about 36 million, its birth

TABLE XII

Costs Per Unit of Family Planning in Malaysia

	Cost per CYP		Cost per New Acceptor	
	(Malaysian Dollars)	(U.S. Dollars)	(Malaysian Dollars)	(U.S. Dollars)
1967	61.48	20.46	65.33	21.80
1968	45.80	15.26	32.72	10.90
1969	41.24	13.75	27.12	9.04
1970	38.50	12.80	24.57	8.19

rate about 41 and its death rate about 10. It is thus a rapidly growing population, with a growth rate of about 3.1 percent per annum. Thanks to relatively low densities of settlement historically and also to a rich, high-yielding agriculture, outward manifestations of population pressure are not as clear in Thailand as they are in, say, East Pakistan or Java.

Nevertheless, it seems clear that such rapid growth of population does complicate all efforts at social and economic betterment in Thailand and this recognition has led to the slow growth of a positive governmental population policy. Three "National Population Seminars" have been sponsored by the National Research Council, the Prime Minister and the King have spoken out publically on the need for family planning, and the Cabinet, in 1970, announced a National Population Policy and created the National Family Planning Project (NFPP) within the Ministry of Public Health (MOPH). From an unofficial research - cum-action program in one district (Potharam, Ratchaburi Province) begun in 1964, the "project" had grown to an official nationwide program by mid-1970.

Organization

In the main the family planning activities come under the NFPP of the MOPH. The actual work proceeds through two Departments in the Ministry. The Department of Health supervises and coordinates the 71 Provincial Public Health Offices which are responsible for the administration of the some 200 first class health centers and the over 3,000 second class and midwifery centers. These health centers do family

planning as well as general preventive and curative medicine and constitute the main line of attack in the rural areas. The Department of Medical Services supervises the activities of 84 Provincial and several Bangkok hospitals which also engage in family planning work. In 1968, the MOPH quietly began a three year project to train its staff and to open family planning clinics throughout the country, without waiting for an official population policy.

The Maternal and Child Health Division, also of the Health Department, acts as a coordination, administration, training, research and evaluation, and public information secretariat for the "Project." It has no direct supervisory powers over the health personnel but does train the workers and see to logistics and administration of the family planning efforts. The central office has the direct responsibility to evaluate the project through the analysis of service statistics and the conducting of various operational research projects. Similarly the central office is responsible for the development of a public information program.

There are also family planning activities outside the Ministry of Health including several university and other government hospitals, private institutions private physicians and a growing commercial importation and sale of contraceptives. The very large clinic at Chulalongkorn Hospital in Bangkok comes in this category.

Financing the Program

Foreign aid has played a substantial role in the development of family planning activities from the beginning. The Potharam project was

Population Council supported, as were many of the Bangkok-based hospital activities. The Population Council has also furnished medical and social science advisory staff, provided local currency support to the Ministry for a wide range of family planning activities, awarded training fellowships to Thais, and helped create an Institute of Population Studies at Chulalongkorn University to train students and to conduct demographic research. The Council's involvement goes back to 1963, and has grown steadily.

Since 1968 U.S.A.I.D. has also been deeply involved in FP. They, too, furnish some advisors and also offer participant training, but commodity supply has been their chief input. More particularly, they have supplied oral pill cycles free to the Ministry of Public Health which distributes them to virtually any reputable public or private group or institution which requests them.

A host of other foreign agencies have played minor roles, including IPPF, UNICEF, ECAFE, WHO Pathfinder, Ford Foundation, Rockefeller Foundation, World Education, Inc., and the University of Carolina Population Centre (through Mahidol University in Bangkok). The Royal Thai Government (RTG) has contributed explicitly only since 1968 when the "Project" was created. The direct salaries of key people in the "secretariat" (in MCH Division) are paid but, for the most part, the input of the RTG comes in the form of personnel doing regular MCH and rural health work being given FP as a part of their duties. Thus, there is no separate budget for FP but, instead, one must allocate some of the regular MOPH

budgets to FP, both for the Health Department and the Medical Services Department.

An explicitly - family planning input does come, however, in the form of Thai funds used as a counterpart to the USAID assistance (there are no PL480 funds generated by A.I.D. programs, as exist in many other countries; rather the Thai Budget Bureau allocates a specific amount of money each year to be used as counterpart to USAID assistance). These funds have been used for a wide range of local currency costs, particularly related to the training of health personnel. This budget is administered by the "secretariat" in the MCH Division.

At the present time, a consolidated and reorganized family planning program has been launched and a 5 year plan of activities submitted to the National Economic Development Board for inclusion in the next Five Year Social and Economic Development Plan, 1972-1976.

Estimates of Financial Inputs

Since the program was, in reality, only launched in 1968, we begin our analysis with that year. There have been three major and several minor sources of financial support for the Program. These are: the Government of Thailand, the U.S.A.I.D., the Population Council, Inc., and, to a lesser extent, the International Planned Parenthood Federation, UNICEF and other United Nations agencies.

Let us review briefly each of these in turn.

(A) Government of Thailand. As noted there was no separate family planning program as such. There was a "Family Health Project" coordinated

by the Maternal and Child Health Division of the Department of Health, proceeding in actual practice through the Rural Health Division of the same Department; the Provincial Hospital Division of the Department of Medical Services; and several University-affiliated Hospitals and private clinics. Thus, the main government financial support is difficult to separate out from among the multi-purpose activities of the Departments of Health and Medical Services. The budgeted amounts for these three components plus new construction are shown (in thousands of Baht) below.

	Department of Health		Dept. of Med. Ser.	Construction of Hospitals and Health Centers
Year	Division	Rural Health Division	Provincial Hosp. Division	
1968	19,508	69,122	145,386	63,490
1969	21,730	95,365	163,271	59,840
1970	33,362	113,164	185,401	109,373
1971	31,400	130,716	191,113	132,588

Informed estimates suggest that beginning with mid-1968 about 5 percent of the MCH Budget; 2 percent of the Rural Health Budget; 0.5 percent of the Provincial Hospitals Budget and 1 percent of construction costs were allocated to the family planning effort. My mid-1969, these percentages had risen to 12 (MCH), 5 (rural health), 1 (provincial hospitals), and 1 (construction) and by mid-1970 to 15 (MCH), 8 (rural health), 1.5 (provincial hospitals), and 1 (construction). These assumptions would result in the following family planning expenditures (in thousands of Baht):

Year	MCH Division	Rural Health Division	Provincial Hospitals	Construction	Total Thous. of Bhat	Total Thous. of U.S. $
1968	980	1,382	727	635	3,724	179
1969	2,607	4,768	1,633	598	9,606	462
1970	5,004	9,053	2,781	1,093	17,931	862
1971	4,710	10,457	2,867	1,326	19,360	931

It must be understood that the percentages given can only be very rough estimates and are subject to much variation. In some provinces relatively little attention was given to family planning, while in others a significant amount of the time of the personnel was spent on activities in this field. Much depended on local situation and initiative.

It must also be mentioned that in many parts of rural Thailand, health services, particularly in the three classes of health centers, tend to be underutilized. In such areas, the introduction of family planning services has probably not resulted in significant reductions in the activities previously conducted, but rather in fuller utilization of personnel time and health center facilities. In other words, the "opportunity cost" of adding family planning services in such cases is very low, and our cost estimates would exaggerate the opportunity cost of providing family planning services.

The government Family Health Project has also had at its disposal certain funds in Baht provided from the government budget as a counterpart to USAID assistance (In Thailand counterpart funds, as mentioned, are not generated from payments received from U.S. government assistance).

The following amounts (in thousands of Baht) are estimated to have been utilized for the family planning program and represent a net addition to the regular budgeted resources yielding the new total also shown:

Year	Counterpart Funds	Indirect Costs	Grand Total Thous. of Bhat	Grand Total Thous. of U.S.$
1968	300	3,724	4,024	193
1969	547	9,606	10,153	488
1970	1,940	17,931	19,871	955
1971	2,492	19,360	21,852	1,051

(B) The Population Council, Inc. The Population Council is a private, non-profit research and education foundation based in New York, specializing in population and family planning programs. It has operated in Thailand since 1963 and has supported a wide variety of activities. Its financial support to the family planning program, direct and indirect, falls into four general categories: direct support to the "NFPP"; the Post-Partum IUD program; direct services of advisors and consultants; training fellowships, travel grants, support of educational seminars and meetings, and other miscellaneous activities. The below table shows reported allocations for each of these four general categories 1968 to 1970 (in U.S. Dollars):*

*These estimates are approximate and exclude the grants made for what can be judged as purely demographic research. Thus, the costs of support to the Institute of Population Studies at Chulalongkorn University, to the National Research Council, and to the National Economic Development Board have been excluded.

	1968	1969	1970	1971
Support to Family Health Program	55,000	59,000	70,000	73,000
Post-Partum Program	33,000	80,000	95,000	95,000
Advisors and Population Council Office	59,000	69,000	54,000	54,000
Travel Grants, Seminars, etc.	26,000	20,000	20,000	20,000
Total	173,000	228,000	239,000	242,000

(C) U.S. Government. Through the USAID office in Bangkok substantial inputs of commodities and equipment have flowed into the family planning program. The figures below indicate the best available estimates of these inputs (in U.S. Dollars):

	1968	1969	1970	1971
Commodities and Equipment	453,400	482,200	520,000	
Oral Contraceptives	175,000	240,800	567,000	
Participant Training	21,000	69,500	79,150	
Advisory Staff	-	20,000	25,000	
Total	647,400	812,500	1,191.150	

(D) Other Foreign Groups. These include IPPF, UNICEF and token amounts from a variety of other private and international groups totalling as follows (in U.S. Dollars):

1968	1969	1970
$43,385	$88,460	$90,600

These are primarily local currency grants plus fellowships and exclude bio-medical research and the general public health-related activities of WHO, Rockefeller and others. Major assistance including local currency support is expected from the UNFPA beginning in late 1971.

(E) Grant Total. Summing the above inputs (all expressed in U.S. Dollars) the indicated total allocations to family planning in Thailand between 1968 - 1970 are as follows (in thousands of U.S. Dollars):

1968	1969	1970
$1,056	$1,528	$2,385

These totals may seem, at first glance, high for a country of 36 million people. The amounts allocated from the several RTG agencies are undoubtedly arbitrary. However, no consolidated budget exists and we are thus left with no choice except to make such estimates. It is worth noting that early drafts of the proposed reorganized and consolidated program for 1972-1976 indicated a level of financing for 1972 of between three to four million dollars U.S., including RTG and foreign inputs. Since some joint cost items - overhead and the shared rural health facilities - are almost certainly unstated in this 1972 projected total, our 1970 of 2.3 million dollars is plausible after all.

Program Performance

Program statistics were not compiled in any systematic way until 1968 and most activity prior to that time was outside the official health network. Table XIII summarizes this early experience.

Of these, nearly half were in the Bangkok-Thonburi area reflecting the great impact of the programs at several Bangkok hospitals. There were also numerous private users, primarily in urban areas. Oral contraceptives are sold commercially without a prescription and in 1969 and 1970 there were an average of 250,000 cycles sold per month. In addition, IUD's in an unknown number are inserted by physicians in their private practice. It does not appear that other methods - condoms, foam, etc., - are significant factors in either public or private programs in Thailand.

The National Family Planning Project of the Ministry of Public Health reports the following tables showing results for 1969 and 1970 together with the cumulative results since 1965. It is estimated that there were a total of 65,000 acceptors in 1968, the first year of the Ministry's program, but accurate breakdown is not available. Table XIV presents a summary of acceptors by method for 1968-1970 plus the cumulative totals from 1965 onward, and also gives a breakdown of acceptors by organization for 1969-1970.

"New acceptors" is only one of several possible ways of looking at the output of the program and not necessarily the best way. Drawing on a report by a working committee of the Ministry (including Thai experts and foreign advisors from ECAFE, Population Council and USAID)

TABLE XIII

Family Planning Acceptors in Thailand
by Agency and Method, 1965-1968

	IUD's	Pill	Sterilization		Total
			Male	Female	
Dept. of Health (rural centers)	22,104	3,667	26	330	26,127
Dept. of Med. Serv. (prov. hosp.)	31,698	6,899	401	22,409	61,407
Other (University, mission, and other hospitals and clinics)	66,249	7,210	384	21,018	94,861
Total	120,051	17,776	811	43,757	182,395

TABLE XIV

New Acceptors by Year and by Method

	IUD's	Pills	Sterilization	Total
1968	40,300	12,000	13,000	65,300
1969	54,496	60,459	15,264	130,219
1970	74,404	132,387	18,648	225,439
Cumulative (1965-1970)	250,358	210,707	81,486	542,551

New Acceptors by Organization, 1969-1970

		Department of Health	Department of Medical Services	Outside MOPH	Total
IUD	1969	18,086	20,932	21,441	60,459
	1970	32,500	28,211	13,693	74,404
Pill	1969	34,842	9,871	15,746	60,459
	1970	101,509	12,720	18,158	132,287
Sterilization	1969	1,029	7,595	6,630	15,264
	1970	2,503	10,021	6,124	18,648

we also can deal in terms of "Woman-Years of Protection," generated by the several methods. These are shown in Table XV.

It should be understood that these "outputs" all refer to current "prevalence" rather than actual present and future "accomplishment." The difference between these two concepts of output is fundamental. It may perhaps be better visualized by thinking of the program output as a flow over time: inserting IUD's or sterilizing females today will generate birth prevention next year, but also for several more years after that. This year's "accomplishment" is thus a stream beginning now and extending forward until the last currently-inserted IUD is removed or the last currently-sterilized female dies, is widowed or reaches menopause. This year's "prevalence" is that part of this year's "accomplishment" which protects females in the same year plus similar portions of all earlier year's accomplishments. In a relatively new program "accomplishment" is sure to be more than "prevalence," where both are measured in Woman-Years of Protection.

If we assume that each IUD inserted will, on the average, remain <u>in situ</u> for two and a half years, that each new acceptor of orals will remain with the program for two years and that each sterilization protects a couple for seven years (allowing for age of the wife at the time of the operation, risk of death to either she or her husband, and other related factors), then we can convert "prevalence" outputs to "accomplishment" outputs, as shown in Table XV also.

TABLE XV

Measures of Output by Methods of
Thai Family Planning Program

	IUD	Oral Pills	Sterilizations	Total
	(A) Woman-Years of Protection in Force			
1968	59,644	5,504	35,360	100,508
1969	70,845	11,739	42,587	125,171
1970	89,285	73,950	69,184	232,419
	(B) Woman-Years of Protection Generated			
1968	100,750	24,000	91,000	215,750
1969	136,250	120,918	106,848	364,016
1970	186,000	264,674	130,536	581,210

These figures are, it should also be noted, conservative since the "weights" for the IUD's orals, and sterilizations are lower than most evidence for Thailand would suggest.

Analysis of Program Results

Using the cost estimates derived above and the several measures of output already described, it is now possible to analyze the cost-per-unit of "results" of the program. Table XVI does this.

Another dimension by which the programs performance can be evaluated are that in 1970 there were some 4.5 million currently-married females aged 15-44 in Thailand. The 200,000 plus Woman-Years of Protection achieved thus amounts to about 5 percent of the total "target" population. The total allocations to family planning of 2.4 million dollars U.S. in 1970, however, amounted to less than 0.5 percent of the total Budget of the Government of Thailand of 1.4 billion dollars U.S. in the same year. On a per capita basis, the entire program was costing about 7 cents U.S. in 1970, which compares to the figure of 6 to 8 cents per capita for programs in Korea, Taiwan and elsewhere in their early, formative stage. Evidence on the last index, cost per Woman-Years of Protection suggest a "normal,efficient" figure of $3.00 to $6.00 per unit. The Thai Program is well within this range.

TABLE XVI

Cost per Unit of Family Planning Output
in Thailand, 1968-1970

	1968	1969	1970
Total financial allocation (Thous. of U.S.$)	$1,026	$1,528	$2,385
Total new acceptors	57,300	120,694	225,439
Cost per acceptor (U.S.$)	$17.91	$11.69	$10.60
Total Woman-Years of Protection in force	100,508	125,171	232,419
Cost per Woman-Years of Protection in force (U.S.$)	$10.21	$12.21	$10.26
Total Woman-Years of Protection generated	215,750	364,016	581,210
Cost per Woman-Years of Protection generated (U.S.$)	$4.76	$4.34	$4.10

CHAPTER IV

SOME FACTORS ASSOCIATED WITH THE COST OF FAMILY PLANNING IN KOREA

The family planning program in Korea has been known as one of the more successful national programs aimed at fertility control.[1] Study of the Korean experience can serve a dual purpose of improving the program in that country and of providing insights for other countries in their plans.

The present study attempts to identify various socio-economic-demographic factors associated with the cost of the program. In the process, it also delves into the relationship between the program performance and various factors that are possibly relevant. The study involves cross-sectional analyses based on the observation of 184 Health Centers in Korea for the year 1969 (the Health Center is located in each of the 169 counties and the 15 boroughs in the two special cities).

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[1]With its population of about 30 million, the total operating budget for the family planning program in Korea was W587 million in 1969 (W300=$1). Of this amount, 48.5 percent constituted the costs for materials, fees, bonuses, and subsidies directly related to contraceptive programs and the remainder, 51.5 percent, went for more indirect expenditures, mainly the salaries for family planning workers. The total number of family planning workers scattered over the 184 Health Center areas was 2,246 (as of July 1, 1969) of which 1.728 were field workers in the rural towns and villages. The number of family planning workers in each Health Center area whose qualifications vary widely ranged from 2 to 26, the mean being 12.2.

The Analyses of Achievement

The achievement is measured in terms of the Couple-Years of Protection (hereafter to be referred to as CYP) based on the Wishik formula.[2] Revisions perhaps are needed in the use of the specific coefficients employed in the formula to suit individual countries. When information becomes available, which may lead to more plausible figures for the coefficients, the present study can readily adopt itself to the change.

Included in the explanatory variables of our achievement function are (1) degree of urbanization (percent of non-farm population to the total population; (2) physicians per 10,000 persons; (3) radios per 100 households; (4) percent of women (20-44) to total population; (5) ratio of child (0-4) to women; (6) family planning worker per 10,000 persons.

The urban variable was to test the hypothesis that, given personnel input (the family planning workers), greater geographical proximity in urban areas would allow more efficient execution of the program and favorably affect the average achievement (CYP per 1,000 persons). The second variable, "physicians," is to tell us whether they are complementary or competitive. The vasectomy operation and IUD insertions are done in most cases by physicians who perform the work on fees. Thus, they could be a positive influence on the achievement of the <u>public</u> family planning program. On the other hand, the achievement registered

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[2] CYP = 2.5 IUD + 7.5 V + C/100 + O/13, where IUD = Intra-Uterine Device, V = Vasectomies, C = Conventional contraceptives (or condoms), O = Oral contraceptives. See Chapter II of this report for a full elaboration.

by the Health Center can be negatively affected by the possibility that people turn to physicians directly at their own expenses.

The third variable, "radios," is the most common mass media in Korea. As such, its relationship with the achievement would be expected to be positive. But, this variable can also serve as a proxy for income for which the data is not available for individual counties. If we take this as a proxy for income its relationship with the program achievement is more difficult to predict.

The "ratio of women" is expected to have a positive relationship with the performance. If we had used CYP per 1,000 women as dependent variable, we would not have needed this women-population ratio variable. But CYP per 1,000 persons as the achievement measure was considered more appropriate since not all women in the relevant (i.e. child bearing) ages are married.

Inclusion of the child-women ratio variable is to test the possible relationship between fertility which this variable is expected to reflect, and the aspiration for birth control and thus the receptivity to the family planning program. The last variable, the family planning workers per 10,000 persons, is expected to play a significant role in the achievement function as the most important item of input in the program.

The Findings

In the first regression in Table I, we observe how each of these variables is related to the average achievement as measured by CYP per 1,000 persons. The achievement is associated positively with the degree

TABLE I

Regression Analysis of Korean Family Planning Program Performance with Selected Socio-Economic Variables

Dep. Variable	Constant	Percent Urban	Physicians per 10,000 Persons	Radios per 100 Households	Percent of Women (20-44) to Pop.	Percent of Child (0-4) to Women	Family Planning Workers per 10,000 Persons	R^2
1. CYP per 1000 persons =	6.289	+ .101** (.040)	- .327** (.142)	+ .072 (.059)	+ .197 (.655)	+ .109 (.072)	+13.277** (1.547)	.332
2. CYP-IUD per 1000 persons =	-12.820	+ .047 (.032)	- .293** (.111)	+ .058 (.047)	+ .927* (.515)	+ .144** (.057)	+ 4.056** (1.216)	.138
3. CYP-PILL per 1000 persons =	8.523	+ .008 (.010)	- .023 (.035)	- .005 (.015)	- .311* (.163)	- .030* (.018)	+ 2.766** (.384)	.324
4. CYP-COND per 1000 persons =	5.541	+ .025** (.011)	- .009 (.039)	+ .013 (.016)	- .195 (.179)	- .007 (.020)	+ 4.835** (.422)	.445
5. CYP-VAS per 1000 persons =	5.044	+ .021** (.010)	+ .002 (.034)	+ .005 (.014)	- .223 (.159)	+ .002 (.018)	+ 1.620** (.376)	.086

* Significant at 10 percent level
** Significant at the one percent or 5 percent level

of urbanization and the relative personnel input (the number of family planning workers per 10,000 persons) and negatively with the availability of physicians. Their correlations are statistically significant at the one percent or 5 percent level. For detailed analyses, the same set of explanatory variables are related to the achievement by category of program. These analyses by category permit us a better understanding of the overall picture.

(A) IUD (Intra-Uterine Device). First, the achievement in the IUD program is shown (in the second regression in Table I) to be associated positively with the child/women ratio and the relative size of family planning personnel and negatively with the availability of physicians. Less significantly (at the 10 percent level), it is also related positively with the women/population ratio.

Higher child/women ratios may be linked to a greater desire for people to undertake family planning and thus to a greater receptivity to the program. It may also reflect the general policy and practice of the program. The IUD program weighs most heavily in the family planning program in Korea (CYP attributed to IUD makes up for 54.4 percent of the total CYP) and typically is the form of contraceptive that is first urged. The likelihood that women in relatively younger ages are associated with the higher child (0-4)/women ratio and that these women are the favorable objects for the family planning workers to approach reinforce the hypothesis.

The relationship between the relative size of family planning personnel and the achievement is not difficult to explain. The negative

relationship between the number of physicians and the achievement seems to suggest that physicians are more competitive to the Health-Center-directed family planning programs than they are complementary. Physicians offer alternative (private) approach for those who seek family planning. Since they are more concentrated in the cities where incomes are relatively high, the supply of their services are effectively met by the demand.

The positive correlation between the women/population ratio and the achievement is as expected. Consider, once again, the policy which places emphasis on the IUD program and the fact the women/population ratios are higher in the cities where there are relatively larger concentration of women in younger ages (for job and other opportunities), the favorable objects for the family planning worker.

(B) Pills. The achievement in the oral contraceptives is correlated positively with the relative size of the family planning personnel, as in the case of IUD, and negatively (though less significantly at the 10 percent level) with the child/women ratio and the women/population ratio. The negative correlation involving the child/women ratio would seem puzzling if we view the ratio as a measure bearing on the receptivity to the program. If, on the other hand, we regard this ratio as a proxy variable for the average age of women we may reason that under the general policy and practice (referred to earlier) of first urging IUD, the women in younger ages who are most likely associated with the higher child/women ratio would have lesser chance for being exposed to other programs including that of oral contraceptives.

Higher women/population ratios are found in major cities. Women in various ages find job opportunities in these cities. They are economically better off than those in rural or less urbanized areas and would tend to rely more on pills purchased at the stores. The fact that a relatively larger proportion of women in the cities represent those in the younger ages (likely to be timid on such matters) seems to make this hypothesis plausible.

(c) Condom. In addition to the personnel input, the urban characteristics exhibit a high correlation with the achievement. There is room for question about this positive correlation. "If we argue that the people in more urbanized areas are willing and capable of procuring pills on their own, why don't they do likewise with condoms?" it may be asked. The explanation here would require some knowledge of how the program is executed. In urban areas, especially in the larger cities, where there are many business firms, government, educational, other public and private establishments, the family planning workers are able to distribute a fairly large number of condoms without consuming as much time as they would in other areas. The delivery can be made more readily without the kind of caution required in the distribution of pills (the pills, because of their possible adverse effect on diabetes, require a test by a physician prior to their distribution). Since the recipients are largely male, furthermore, the contraceptive material is received more readily.

(D) Vasectomy. There seems to be a widespread fear of the operation. This is quite clear from the testimony by numerous field workers. Eight or nine out of ten who had gone through the vasectomy operation according to one field worker, complained of some kind of side effect having to do with loss of vigor, depreciated satisfaction from sexual relations, etc. "It may be purely psychological or imaginary from the medical standpoint, but the problems seem real to those who are involved," she added. The fact that urbanization is positively related with the performance in vasectomy may be explained in two ways. First, urbanities are more subtle and have less fear of the operation than do rural people. Second, physicians who perform the operation for fee are better equipped and more readily available in urban areas.

As in other programs, the relative size of family planning personnel is positively correlated with the achievement in vasectory. But the net regression coefficient is by far the smallest of all. This may be attributable to ineffectiveness of persuasion, the pessimism among family planning workers with regard to their success in this program (and with it the lesser effort), or both.

Summary

In final analysis, the positive correlation between personnel input and the performance is consistent for all categories. None of the methods failed to benefit in terms of the average achievement from relatively larger family planning staff. The positive association between the urban characteristics and the performance is largely attributable to

condom and vasectomy programs whereas the negative role of physicians is traceable to the situation involving the IUD program. The overall picture conceals the significant positive correlation between child/women ratio and the achievement of IUD and negative relationship between the same ratio and the achievement of pills program. The overall account, furthermore, does not reveal the positive correlation (though statistically less significant) between the women/population ratio and IUD program and negative correlation between the same ratio and the pills program.

The analysis of achievement functions helps us to better understand the various factors as they are related to the achievement in the alternative categories of the family planning program and the knowledge of these relationships enables us to formulate the more appropriate functional forms for our analysis of cost.[3]

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[3]The regression equations of Table I offer other interesting possibilities. Based on the equations, we may relate the personnel input (the family planning worker) to the output measure in CYP. Thus, if we can relate CYP in each program category to the births prevented and in turn the births prevented to their economic benefit in money terms (admittedly an involved task), we would be able to compare this benefit with the cost of hiring an additional family planning worker. Use of a quadradic form for the personnel input variable would enable us to determine the variation in the marginal contribution of the additional personnel in individual counties varying in the size of the existing staff.

Notes on Data and Specifications

(A) Infant Mortality. The age old suspicion that high infant mortality in the less developed countries is significantly associated with the high birth rate could not be put to statistical test due to the lack of data on mortality, infant or otherwise, for individual counties. The number of physicians per 10,000 perhaps can be regarded as the closest to a proxy for the death rate on the assumption that availability of medical personnel is negatively associated with infant mortality.

Thus, interpretation of the statistical results concerning the "physicians" variable is made even more complicated. This variable was to have both a negative influence as it signifies an alternative outlet for those seeking private family planning program as opposed to the public program and a positive influence by virtue of the fact that the public program depends largely on physicians for diagnosis (pills), insertion (IUD), and operation (vasectomies). In the second regression of Table I, for instance, the statistically significant coefficient for the "physicians" variable which carries the negative sign may be considered as the net result of the two forces. the competitive aspect of the physicians and the influence involving the infant mortaility, more than offsetting the positive influence of the physicians on the performance of the public family planning program.

(B) Personal Income. The question of how income affects one's attitude toward the family planning is an interesting one. Income

statistics, however, are lacking for individual counties. Even if they were available, the treatment of income would have caused a great deal of problems for interpretation. It is likely that available statistics measure money income leaving out the domestic produce that comprises a relatively larger part of real income for some (rural) areas and than that of others. If the incomes were all-inclusive, we would still need further information concerning the source of earning and especially whether it includes the earnings of the mother. Income of the woman would typically constitute the opportunity cost, and if an important part of the family income is derived from the activities of the woman, the implications of the family income are not the same as in the situation where the man is the sole breadwinner. This would suggest that inclusion of the incomes variable requires a more elaborate set of information than most of us could reasonably expect to obtain even in the developed countries.

(C) Sex Composition. The sex composition of the family is another and perhaps one of the most important variables affecting fertility in Korea. Succession of generation, security, both of the present (of having men in the family) and of the future (for the support after retirement), and other factors constitute a strong driving force for the want for boys, two at least (to insure against possible loss of one). Until the parents secure this "minimum" (perhaps a conservative one), there is often a frantic effort to achieve it with continuous child bearing.

The present model would not improve our results if it had included the sex composite variable since we are dealing with fairly large aggregates involving counties. This is something a micro-analysis of individual families can profitably undertake in a study for a similar purpose.

(D) Priorities among Programs (Targets)

To affect also the achievement, by program category or overall. is the set of priorities (or specifically the targets set for the alternative programs). There is nothing inherent about the relative differences of the net regression coefficients observed for the personnel input variable in the equations in Table I. The high figures for IUD, for instance, relative to other programs could reflect the efficiency with which the family planning workers accomplish their work in respective programs as well as the targets set for these alternative programs.

However, the targets set by the national government are apportioned among provinces according to population or some other common basis and the provinces in turn typically apportion their share of the targets among counties in the same manner. Thus, the relative emphasis on alternative programs determined at the national level, by and large, carries itself down to the county level. This would mean that the present cross-sectional analysis is not a suitable approach for estimating the effect of the "target setting" on the achievement. It ought to be emphasized, nonetheless, that the relationships observed above with

regard to achievement are all contingent on the present mix of the emphasis on alternative family planning programs. Once there is a change in this mix (for reasons involving costs or changed evaluation of the effectiveness of the programs), we would expect a change in the relationships pertaining to achievement.

(E) The Wishik Formula

While the coefficients related to IUD and vasectomies which appear in the formula involve an empiricism (7.5 for vasectomies, for instance, takes into account the ages of the women at the time of their husbands' operation and of their menopause as well as deaths and divorces) the coefficients for condoms and pills are based solely on the natural (biological) phenomena pertaining to the coital cycle and the menstrual cycle. The questions of how many of those who receive the contraceptive materials actually use them and how effectively these materials are consumed by those continuous users are not dealth with. With the coefficients for condoms and pills unadjusted, the use of the formula most likely causes an overestimation of the effect of these programs. Discussions with the field workers in Korea suggest that the proportions of condoms and pills that are distributed but either unconsumed or ineffectively used may be substantial. When an objective study provides relevant information on this matter, we would be able to use more realistic coefficients for these contraceptives.

(F) CYP and the Output

Use of the term output has been carefully avoided in the present study. The CYP measures used here are not necessarily comparable among programs as would be the measures of births prevented. The effect on births prevented of one CYP related to vasectomies would be different from that related to IUD, for instance, if the ages of women under the former program typically differ from the ages of women under the latter program since the fertility varies with ages. This has an important implication for interpretation of the achievement functions we have in Table I as well as the cost functions which appear in the following tables. Undeniably, the births prevented are what really matter. But, the study of the achievements measured in CYP offer useful information in of itself and is an important step to reaching the final assessment.

Analysis of the Cost

Included among the explanatory variables in our cost functions are those which reflect: (1) the characteristics of the population (the level of education, the child/women ratio) mainly to serve as attitudinal variables; (2) environmental conditions which are thought to affect the input requirements in the program (population density, radios per 100 households); (3) the scale of operation; (4) the program mix; and (5) the degree of deffusion of the program.

Given the differential costs of materials for alternative contraceptive programs and the varying degrees of success with which the family planning workers execute their programs, the average cost of the family

TABLE II

Regression Analysis of Cost per Unit of Family Planning in Korea with Selected Socio-Economic Factors

	Dep. Variable	Constant	Pop. per Km^2	High School Grad. Pop. (%)	Radios per 100 Hsholds	Child Women (%)	CYP	CYP^2
1	Ttl Exp[a] / Ttl CYP		.002 (.002)	-12.467 (3.295)	+3.206 (1.173)	+1.078 (1.718)	-.039 (.012)	$+(1.84)10^{-6}$ $(.56)10^{-6}$
2	b	709.311	b	b	b	b	b	b
3	b	425.264	b	b	b	b	b	b
4	b	1325.299	b	b	b	b	b	b
5	b	1594.218	b	b	b	b	b	b

TABLE II Cont'd.

	$\frac{\text{CYP-IUD}}{\text{CYP}}$ (%)	$\frac{\text{CYP-VAS}}{\text{CYP}}$ (%)	$\frac{\text{CYP-CON}}{\text{CYP}}$ (%)	$\frac{\text{CYP-PILL}}{\text{CYP}}$ (%)	$\frac{\text{Clients}}{\text{Women}}$ (%)	$\left(\frac{\text{Clients}}{\text{Women}}\right)^2$	$\bar{R}^2$
1	+7.093 (2.535	+4.253 (3.109)	+13.253 (2.427)	+15.942 (2.872)	-44.719 (39.522)	+3.465 (3.496)	.367
2		-2.840 (2.553)	+6.160 (2.591)	+8.849 (2.418)	b	b	b
3	+2.840 (2.553)		+9.000 (3.401)	+11.690 (3.997)	b	b	b
4	-6.160 (2.591)	-9.000 (3.401)		+2.689 (3.409)	b	b	b
5	-8.849 (2.418)	-11.690 (3.997)	-2.689 (3.409)		b	b	b

[a] Expenditures are measured in Won.

Standard errors of regression coefficients appear in parentheses and those statistically significant at the one percent or 5 percent level are underlined.

[b] Signifies "the same as above."

planning program may be expected to vary with different program mix. This mix, no doubt, is to be affected by targets (relative emphasis) set for respective programs, but the achievements differ from the targets in varying degrees among counties. Obviously, what we learn from the analysis of the relationship between the program mix and the costs will be of concern for the national government which sets the targets as well as for individual counties.

Degree of the program diffusion was measured in terms of the ratio of the number of women involved in the program[4] during the year (19[illegible]) to the total women in child-bearing ages and was included in the analysis to see if this measure is in any way related with the efficiency with which the family planning worker carries out his task, as it can be considered as another environmental factor.

The level of education is measured by the ratio of high school graduates to the population. The attitude toward the family planning program may be a function of one's concept of the ideal family size as well as the subtlety with which one regards and uses contraceptives. This is likely to be highly influenced by the level of education, i.e. the more educated one is, perhaps the smaller his ideal family size is and/or the more subtle he is with regards to the matters concerning

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[4]This includes the number of women whose husbands underwent vasectomy operation, the number of IUD's first inserted, and the monthly means of reacceptors of the pills. The acceptors (continuous users) of condoms were not included due to the lack of the data pertaining to the number of persons. In view of the relatively small share assigned to the condoms program, however, the effect of this omission on the overall analysis is likely to be minor.

family planning. The highly significant negative correlation between education and cost seems to lend support to this hypothesis.

High child/women ratios were first thought to have a cost-saving influence since we might view the ratio as a proxy for fertility. Though statistically insignificant, we observe a positive coefficient, contrary to expectation. It may be that the high child (0-4)/women ratio is represented by women in younger ages who more likely are not as enthusiastic about the program as those in the more advanced ages.

The density (in persons per km^2) along with the availability of radios (in numbers per 100 households) are considered relevant, the former as a measure of geographical proximity and the latter as a measure of access to mass media having an influence on attitude and receptivity to the program. Both of these two variables may be expected to have favorable effect on the cost.

The population density, however, is not significantly related with the cost. While the "radios" variable shows significant correlation, the coefficient is positive. In addition to being a mass media, the "radios" perhaps serves as a proxy for income. If we reason that high incomes are associated with more plentiful job opportunities, the competitive situation associated with the latter would call for higher wages for the family planning workers, thus causing higher costs for the program.

The "urban" variable, when initially included, beclouded the relationships which the "education" and "radios" respectively bear with the cost because of its correlation with both of the latter variables.

In the analysis of the scale-cost relationship in the present context, we run into a difficult question as to what constitutes the scale. If we were analyzing hospitals we may use hospital beds, number of doctors, or the assets which may represent the scale of operation of the hospitals. In the case of the family planning program, a labor-intentive venture, we may want to use the number of family planning workers or the number of women who were involved in the program during a given period of time, such as a year.

Use of the former (number of family planning workers) involves a complicated problem of the variation in qualifications. As long as we are unable to take into account the variation in qualifications, this approach seems unsatisfactory.[5] As for the use of the number of women in the program, we face a problem of weighting. How do we treat, for instance, a pill user (who may be a temporary or a continuous user) vis-a-vis an IUD-wearer or one whose husband underwent a vasectomy operation?

Under the circumstances, use of the Couple-Years of Protection may be a preferable alternative. This is more akin to the latter approach

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[5]Wage differential may be used as the basis for differentiating the qualifications. But prices vary among regions, especially between urban and rural areas, and the wage differences may be considered, at least in part, a corrective for local price variation. In the case of Korea, the problem is further complicated by the fact that functional responsibilities of the field workers (family planning workers operating in rural towns and villages) are often not clearcut, [illegible] performing the functions unrelated to family planning for other local officials and the latter reciprocating by participating in certain tasks of family planning workers.

which involves the clienteles in the program, but allows differential wieghting among alternative programs. An implicit assumption here is that these programs which weigh more heavily in their effects on CYP require proportionately larger effort on the part of the family planning workers. Our measure of operational scale, then, is basically in terms of the amount of effort which went into the program. It may be less than an ideal way of approaching the issue, but this measure may be accepted as an approximate indicator of personnel input adjusted for the competence (or efficiency) of the family planning workers.

Based on the usual assumption of a U-shape average cost function, a quadratic form was used for CYP in our equation to estimate its relationship with cost. The result indicates a statistically significant correlation, with the average cost X_1 falling by $[.039 - 2(.00000184)X_2]$ won with each increase in CYP at X_2 level until X_2 finally reaches 10,597.[6] Thus, other independent variables held constant, a county operating at the level of 2,000 CYP per annum, if it behaves in "average fashion," will reduce its average cost by 63.0 won by increasing its scale to the level of 4,000 CYP. With an increase from 4,000 to 6,000 CYP the expected saving in the cost per CYP would

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[6]From the first regression equation in Table II:

$$\frac{X_1}{X_2} = -.039 + 2(.00000184)X_2. \quad \text{Thus, when } \frac{X_1}{X_2} = 0$$

$$X_2 = \frac{.039}{.00000368} = 10,597$$

be 48.5 won and from 8,000 to 10,000 the expected saving would be 19.5 wom. The mean total CYP for individual counties in 1969 was 5,282.

These figures of course provide only approximations and are subject to error limitations. However, if we are concerned with an "average" county and our rationale of using CYP as the measure of scale can be regarded as an acceptible alternative, they may be considered as useful estimates.[7]

The question of what effect the different combinations of alternative programs have on the cost of the family planning program should be of great concern for the policy makers who set the targets for various programs each year.

We have measured the relative importance of each program by the ratio of CYP attributable to each program to the total CYP.[8] If we were to relate the program mix only to the differences in the cost of materials, fees, charges, and bonuses that are directly related to contraceptives, we would be able to identify relative cost advantages or disadvantages by simple computation based on differences in these direct costs. But such indirect costs as the salaries for family planning

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[7]The concept of returns to scale, as economists often refer to, deals with a given technology. Thus, in using the present analysis as the basis for future prediction, we must assume that such aspects as general practices, methods, and policies, as well as the qualifications of family planning workers largely remain unchanged.

[8]The ratios may alternatively be in terms of the number of women involved in the program. But, here again we face the problem of weighting cited earlier.

workers (which constitute 43.6 percent of the total operating expenditures (W587 million) of Korean family planning program in 1969, should also be accounted for.

The first regression equation in Table II indicates that, other programs remaining unchanged at the present level, an increase in the IUD program by one percent of the present total CYP, with an offsetting decrease in the pills program, will bring about the saving in the cost per CYP of W8.85 (=15.94 - 7.09). The identical result may be seen in the fifth equation also. Likewise, an increase in the condoms program by one percent of the total CYP, with offsetting decrease in the IUD program, would cause a rise in the cost per CYP by W6.16 (=13.25 - 7.09).

The net regression coefficient is the smallest for the vasectomies variable (in the first equation) suggesting the possibility of its cost advantages over other programs, but it is statistically insignificant.

By including the constant and allowing one of the four ratio variables to drop sequentially as in the equations 2 through 5 of Table II we find that the cost advantages that are statistically significant involve the substitution of IUD or vasectomies program for condoms or pills program and that the substitution of IUD for vasectomies and that of condoms for pills do not have statistically significant cost effects.

Interpretation of the above results, however, require few words of caution. First, while one combination of programs may involve a lower cost per CYP over another, the more meaningful measure of the cost advantage must be in terms of the births prevented. One CYP attributable

to IUD, for instance, if the women involved in the former program are in more advanced ages than those involved in the latter program due to the fertility decline with ages.

Secondly, there is nothing inherent about the cost advantage of a given program combination over another, since the relative cost of the materials, fees, and charges for alternative contraceptives are likely to vary among nations and over time within a nation. The results shown above pertain to a given nation, Korea, at a given time. Doctor's fee for vasectomy is W1,000 ($3.30) in Korea, a surprisingly low amount by American standard or, for that matter, low even by the standards of other less developed countries (the combination of low per capita income, thus low demand for medical services, on one hand, and a fairly good number of medical schools for its population, thus a relatively plentiful supply of physicians. on the other, seems to help hold down the fee at the level). Doubling or tripling of the doctor's fee or a substantial fall in the cost of IUD or condoms due to their domestic production, for instance, can easily disturb the observed cost relationships.

Thirdly, there is a question of pricing foreign aid materials. The government pays doctors fees, charges, and bonuses, and it purchases IUD and condoms from private domestic industries. But the Swedish International Development Agency provides Korea with contraceptive pills under the aid program. In the absence of an empirical basis for determining a government purchase price of the Swedish pills, the projection was made on the basis of relative retail price differential between domestically produced condoms and the Swedish pills and of the disparity

between the retail price and the government quantity purchase price for the condoms.

If we can assume that domestically produced pills are comparable to the Swedish pills in quality and that Korean women are about equally receptive to the former as they are to the latter, the more relevant cost for the pills program will have to be based on the price of the domestically produced pills.[9]

The last variable, the ratio of women involved in the program to the total women in child-bearing ages (20-44), in its quadratic form, bears the signs as anticipated, but the relationship is statistically insignificant. Had it been significant, we would have argued that the diffusion of the program entails a favorable reaction among population and becomes a force which supplements the effort of family planning workers until it reaches a point of saturation.

In Table III, we observe the relationships between the non-contraceptive expenditures per CYP and the same set of explanatory variables as used in Table II. The non-contraceptive expenditures include such indirect expenditures as salaries of family planning workers (82.5 percent of all indirect expenditures), travel expenses and supplies which make up the remainder. The total non-contraceptive expenditures constituted 51.5 percent of total operating expenditures of Korean family planning program in 1969.

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[9]The average retail prices (as of January 1971) of the domestically produced pills and the Swedish pills were in the vicinity of W200 and W300 respectively.

TABLE III

Comparative Cost per Unit for Different Methods, Korea

Dep. Variable	Constant	Pop. per Km^2	High School Grad. Pop. (%)	Radios per 100 Hsholds	Child Women (%)	CYP	CYP^2
N.C. Exp[a] / Ttl CYP		.002 (.002)	-11.567 (2.978)	+3.074 (1.060)	+.179 (1.552)	-.041 (.011)	$+(1.90)10^{-6}$ / $(.50)10^{-6}$

TABLE III Cont'd.

Dep. Variable	Constant	CYP-IUD / CYP (%)	CYP-VAS / CYP (%)	CYP-CON / CYP (%)	CYP-PILL / CYP (%)	Clients / Women (%)	$\left(\frac{\text{Clients}}{\text{Women}}\right)^2$	$\bar{R}^2$
N.C. Exp[a] / Ttl CYP		+4.628 (2.291)	-.394 (2.810)	+10.379 (2.194)	+9.033 (2.596)	-12.369 (35.721)	+1.434 (3.160)	.328

[a] Expenditures are measured in Won.

Standard errors of regression coefficients appear in parentheses and those statistically significant at the one percent or 5 percent level are underlined.

Compare the equation in Table III with the first regression equation in Table II and note that the net regression coefficients for education, CYP, and radios in both equations are highly comparable with identical signs in each case. Evidently, what is shown in the equation in Table II, namely, the negative relationships the expenditure per CYP bears with education and CYP and the positive correlation with "radios" (or whatever it serves as a proxy), largely reflect the relationships these variables bear with the non-contraceptive expenditures.

Similarly, we find that the effect of the program mix on the non-contraceptive expenditures per CYP accounts for the major part of the cost effects of the program mix shown in Table II.

Summary and Conclusions

Achieving a maximum result in the family planning program with a given resources or attaining a given objective with minimum resources requires a prior knowledge of the cost function. In the present study, a modest attempt was made to inquire how various socio-economic factors are related to the achievement and ultimately to the cost of the program. Results of the cross-sectional analyses based on observation of the 184 Health Centers in Korea indicate that the performance of the family planning program is significantly correlated with the relative personnel input, the degree of urbanization, and the availability of medical personnel. Analysis of the cost functions reveals that the cost per Couple-Years of Protection is significantly associated with the scale of operation, the program mix, the level of education, and

the availability of radios (assumed to serve more as a proxy for income than as the means of mass media).

For a better understanding of these overall pictures, some disaggregated analyses of the achievement and the cost were employed. The results observed in the present study are all contingent to the situations which existed in Korea in 1969. Relationships involving such variables as education, urbanization, or the scale of operation, may be relatively stable. But the observed cost relationships involving the program mix can be only remotely relevant as applied to other countries or even in Korea in other times.

Our measure of the cost related to CYP may not be comparable to the one related to births prevented, the ultimate measure of achievement. The study, nevertheless, provide us with useful information in of itself and is to be regarded as an important step to reaching the final assessment.

CHAPTER V

FAMILY PLANNING IN PAKISTAN

Earlier Reports on Pakistan

As part of Phase II of the present project, a fairly detailed reconstruction and examination of the cost structure of the family planning program in Pakistan was undertaken. At that time our major focus was on the total, real cost of the overall national program in relation to levels of program output. Our end product was the calculation of cost per Couple-Years of Protection, as well as an analysis of the pattern of expenditures according to final use. Tables I and II are the final result of that phase.

The present report takes up the research where it was left off then. Our purpose now is to examine the disaggregated, geographical data on program inputs in relation to outputs and also to look at the effect on this relationship of the socio-economic setting. In short, we aim at constructing production functions and also cost functions for family planning in Pakistan.

Data and Approach

The Pakistan program has generated a remarkable volume of program statistics since 1966. Monthly reports are completed at the district level and these provide the necessary inputs for our study. The

TABLE I

Spending on Family Planning in Pakistan,
by Major Types of Expenditures

		1966-67		1967-68		Total Spending 1966-67 - 1967-68	
		Thousands of Rupees	Percent of Total	Thousands of Rupees	Percent of Total	Thousands of Rupees	Percent of Total
	Direct						
(1)	Salaries and Allowances	19.447.	37.2	36,256.	49.7	55,703.	44.5
(2)	Contraceptive Supplies	12,874.	24.6	7,497.	10.3	20,371.	16.3
(3)	Vehicles and Equipment	3,438.	6.6	5,034.	6.9	8,472.	6.8
(4)	Training of Field Workers	91.	0.1	228.	.3	319.	.3
(5)	Other Field Expenses	2,062.	3.9	4,304.	5.9	6,366.	5.1
			72.4		73.1	91,231	73.0
	Indirect						
(6)	Administration	4,009.	7.7	6,801.	9.3	10,810.	8.6
(7)	Analysis and Evaluation	772.	1.5	1,532.	2.1	2,304.	1.8
(8)	Publicity, Education	1,873.	3.6	2,593.	3.6	4,466.	3.6
(9)	Research and Training	7,257.	13.9	6,458.	8.9	13,715.	11.0
(10)	All Other Indirect Costs	496.	1.0	2,179.	3.0	2,675.	2.1
			27.6		26.9	33,970.	27.0
	Total	52,319.	100.0	72,881.	100.0	125,201.	100.0

TABLE II

Output of Pakistan
Family Planning Program

	1965-66		1966-67		1967-68	
	Units	CYP's Implied	Units	CYP's Implied	Units	CYP's Implied
IUD's Inserted*	252,355	630,888	588,350	1,470,875	755,955	1,889,888
Sterilizations	5,400	40,500	48,729	365,468	266,809	2,001,068
Conventionals* Distributed	36,327,567	363,276	97,153,694	971,537	164,118,430	1,641,184
Total CYP's		1,034,664		2,807,880		5,532,140

	1965-1966	1966-1967	1967-1968
Cost	32,000,000	52,319,000	72,881,000
CYP's	1,034,664	2,807,880	5,532,140
Cost per CYP			
- Rupees	30.92	18.63	13.17
- Dollars	$6.55	$3.95	$2.79

* First Insertions
** Condoms, etc.

availability of such detailed data stretching over a considerable time period makes possible, indeed, both a cross-sectional regression analysis and a time-series approach. Our problem, as discussed in Chapter II above, is basically that of estimating the production function and also cost function for family planning services.

(A) Time Series Approach. Four districts, two East, two West, were selected for analysis. The basic data, to repeat, were monthly observations for the last half of 1966, all of 1967, 1968, and 1969, for the following variables:

Output Variables

Couple-Years of Protection	(12)
IUD's inserted	(2)
Sterilizations performed	(3)
Condoms	(4)
Other family planning methods	(5)

Input Variables

Family Planning offices in place	(6)
Medical personnel	(7)
Para medical personnel	(8)
Union Council Secretaries	(9)
Dais (midwives)	(10)
Agents	(11)
Same 6 variables lagged 3 time periods	(28)
	(29)
	(30)
	(31)
	(32)
	(33)

Dummy Variables

Variables (15) - (26) represented dummy variables to account for the effect of the month of the year on the output variable. Possible trend was tested for by including a time variable (27) and the effect

of the year was accounted for by variable (1). A step-wise regression analysis was then performed.

Table III presents the results and these are to say the least, perplexing. In District 1:2, a strong influence of time - months, the year, and also trend - is apparent but except for the trend, the signs are negative. The large R^2 indicates a rather significant relationship between outputs and the explanatory time variables. In District 1:1, on the other hand, the year is significant and positive in its impact on output. District 3:1 also shows a negative impact for year and positive impact for trend on CYP's but not IUD's. Family Planning officers in Dlare and UC Secretaries also emerge here as significant but inconsistently so. In District 3:2 time dominates, with year negatively related and trend positively related to CYP output, while trend is negatively related to IUD's and year shows no relationship. A strong season pattern emerges here for CYP with 10 months showing a significant impact on output of CYP's, but no such pattern is found for IUD's.

On balance, it seems fair to conclude that the wide range of results and variations and inconsistencies suggest either that each district is totally different from all others and there is no consistent pattern; or that the quality of the monthly data is very poor. We lean towards the latter explanation.

(B) Cross-Sectional Approach. We now turn to the second approach to the problem which argues that each district can be viewed as a single observation on a national production function of family planning services.

TABLE III

Regression of Family Planning Output
and Selected Program and Time Variables,
4 Districts of Pakistan, 1966-1969

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
District 3:1				
Dependent Variable (12)				
Independent Variables:				
(1)	-18759.60459	2.49919	-1.05878	
(27)	2593.46773	3.88916	1.65143	
(31)	- 551.52743	2.15866	-0.23368	.56277
Dependent Variable (2)				
Independent Variables:				
(28)	334.68571	1.41980	.21904	.02418
District 3:2				
Dependent Variable (12)				
Independent Variables:				
(1)	-74806.51009	2.53167	-6.89771	
(15)	61986.23079	2.37977	1.37014	
(16)	56122.98032	2.38332	1.24053	
(17)	42928.72985	2.03794	.94889	
(18)	42267.23408	2.24388	1.06488	
(19)	40893.56693	2.49684	1.03027	
(20)	41272.39979	2.95707	1.03982	
(21)	38372.91782	3.25783	.84819	
(22)	25857.29479	2.61337	6.51450	
(23)	19548.12766	2.51145	4.92497	
(24)	26550.96052	4.40019	6.68927	
(27)	6985.91714	2.72575	7.26749	.57774
Dependent Variable (2)				
Independent Variables:				
(21)	1916.89496	2.52849	.26177	
(24)	2333.26573	3.53908	.36317	
(27)	- 64.69911	3.18884	- .41583	
(30)	- 38.21887	2.29338	- .29951	.57383

TABLE III Cont'd.

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
District 1:1				
Dependent Variable (12)				
Independent Variables:				
(1)	2165.59647	3.74616	4.27829	
(31)	- 97.97743	5.01868	5.73157	.76444
Dependent Variable (2)				
Independent Variables:				
(1)	764.84090	9.53566	8.85636	.77572
District 1:2				
Dependent Variable (12)				
Independent Variables:				
(1)	5990.41702	10.60028	9.33626	
(17)	- 3617.09523	2.27435	-2.00315	.80940
Dependent Variable (2)				
Independent Variables:				
(1)	4016.79048	3.62021	3.92325	
(15)	- 2424.65739	2.69594	-0.84150	
(16)	- 2546.04271	3.05219	-0.88363	
(17)	- 3059.31837	3.99065	-1.06177	
(18)	- 2321.42195	3.64197	-0.96681	
(19)	- 2121.93003	3.88568	-0.88372	
(20)	- 1837.19137	3.84454	-0.76514	
(21)	- 926.75915	2.17529	-0.32164	
(27)	- 247.17495	2.69145	-2.55131	
(32)	- 14.52955	2.53504	-0.51017	
(33)	- 2.35570	3.60976	-0.64384	.71522

In an effort to deal with the problem of the strong monthly variation, we converted the monthly output series into annual averages. Two questions were addressed: first, what is the relationship between cost per unit and program volume and perhaps other shift variables; second, what program variables (personnel inputs, etc.) or non-program variables (socio-economic characteristics) explain inter-district differences in terms of costs per CYP?

Table IV presents the basic data for the analysis. The first regression was run with cost per CYP as the dependent variable against total output (2) family planning budget per capita, (3) percent urban, (4) percent literate, (5) population per square mile, (6) medical personnel per person per square mile, (7) dais per capita per square mile, (8) cost per CYP Index, (9) family planning budget per capita minus publicity expenditures, (10) and a dummy variable for location in East or West Pakistan.

The zero-order correlation matrix is given in Table V.

In the actual regression itself variable (9) was eliminated due to redundancy and variable (3) was eliminated also due to some redundancy and high inter-correlations with several other variables.

Thus the step-wise regression was begun with cost per CYP as the dependent variable and variables number (2), (4), (5), (6), (7), (8), (10) and (11) as the independents.

The last iteration found the following results significant to acceptable levels.

Cost per CYP = f((2)Output, (11)Dummy-East)

TABLE IV

Family Planning Output and Socio-Economic Characteristics of Pakistan by District

West Pakistan	Total CYP's 1966-67	Population (1961) 000's	CYP per 1000 pop.	Per-cent Urban	Percent Literate	Medical Personnel	Med. Pers. per Person per sq mi.	Dais	Dais per person per sq. mile	Cost per CYP 1966-67
Multan	137,914	2702	51.05	21	9	45	.093	1425	2.97	1.78
Lyallpur	103,902	2683	33.73	21	15	35	.045	930	1.22	1.72
Lahore	133,923	2479	54.02	59	21	92	.082	1125	1.00	1.58
Karachi	129,974	2044	63.59	93	32	120	.079	880	.58	.99
Sialkot	59,801	1596	37.47	16	15	25	.032	1100	1.42	2.24
Sargodha	70,680	1467	48.18	19	13	25	.028	680	.78	1.88
Gujranwala	68,324	1291	52.92	27	14	18	.032	750	1.34	2.18
Gujrat	67,402	1326	50.83	13	15	12	.009	460	.35	1.25
Hyerabad	74,015	1286	57.55	40	14	29	.111	630	2.43	1.73
Rawalpindi	65,623	1137	57.72	36	28	32	.056	800	1.42	1.96
Peshawar	50,423	1710	29.49	32	13	23	.026	400	.46	2.23
Sheikhupura	40,213	1081	37.20	13	11	18	.038	565	1.21	2.37
Jhang	39,367	1079	36.48	16	12	10	.031	610	1.92	2.50
Hazara	34,370	1050	32.73	5	10	15	.068	500	2.27	3.34
Muzaraffargarh	38,603	989	39.03	7	8	8	.045	325	1.85	1.98
Sukkur	35,998	837	43.01	26	14	12	.079	325	2.15	2.21
Rahimyar Khan	32,140	1016	31.63	11	8	5	.022	350	1.55	2.30
Mardan	21,978	814	27.00	13	8	5	.007	125	.19	2.74
Jhelum	34,674	749	46.29	14	21	15	.055	320	1.18	1.92
Nawabshah	46,348	692	66.98	13	12	6	.025	200	.84	1.42
Bahawalpur	31,823	736	43.24	18	10	10	.129	290	3.77	1.84
Larkana	26,172	604	43.33	13	12	6	.019	180	.58	2.03
Montgomery	86,216	2134	40.40	11	9	20	.039	920	1.82	2.00
Khairpur	16,829	472	35.65	10	10	6	.076	130	1.67	3.12
D.I. Khan	15,451	352	43.89	18	9	3	.037	185	2.28	2.69

TABLE IV Cont'd.

East Pakistan	Total CYP's 1966-67	Population (1961) 000's	CYP per 1000 pop.	Per-cent Urban	Percent Literate	Medical Personnel	Med. Pers. per Person per sq. mi.	Dais	Dais per person per sq. mile	Cost of CYP 1966-67
Mymensingh	225,509	7018	32.13	3	14	15	.013	3240	2.94	1.83
Dacca	340,189	5095	66.77	15	19	75	.042	3500	1.98	1.43
Comilla	105,296	4383	24.02	3	20	12	.006	2400	1.22	1.87
Barisal	88,513	4263	20.76	3	18	17	.016	1400	1.39	4.87
Chittagong	81,340	2983	27.27	12	23	15	.013	610	.55	2.32
Rajshahi	96,727	2811	34.41	4	4	25	.032	2180	2.83	1.86
Khulna	84,310	2449	34.43	7	22	11	.020	990	1.88	2.15
Noakhali	74,064	2383	31.08	1	10	7	.003	1000	.56	2.18
Dinajpur	116,287	1710	68.00	4	21	25	.038	1100	1.68	3.23
Bogra	77,941	1574	49.51	3	19	12	.250	1375	2.86	2.42
Kushita	45,229	1166	38.79	5	12	7	.008	600	.70	2.15

TABLE V

Zero-Order Correlation Matrix - Step-Wise Regression #1
(Cost per CYP = f(output))

Variable	(1) Cost per CYP	(2) Total Output (CYP)	(3) Family Planning Budget/Capita	(4) Percent Urban	(5) Percent Literate	(6) Pop. per sq. mile
Cost per CYP	1.000					
Total Output (CYP)	-.297	1.000				
Family Planning Budget/Capita	.096	.669	1.000			
Percent Urban	-.399	.065	-.387	1.000		
Percent Literate	-.212	.310	.121	.223	1.000	
Pop. per sq. mile	-.247	.607	.460	-.058	.391	1.000
Med. Per. per capita per sq. mile	-.065	-.008	-.002	.250	.148	-.422
Dais per cap. per sq. mile	.063	.189	.167	.008	-.261	-.422
Cost per CYP Index	.860	-.205	.148	-.348	-.150	-.142
FP Budget per cap. (minus Pub. Exp)	.020	.698	.993	-.369	.106	.450
Dummy (East-West)	.212	.474	.858	-.530	.126	.486

TABLE V Cont'd.

Variable	(7) Med. Personnel per capita per sq. mile	(8) Dais per cap. per sq. mile	(9) Cost per CYP Index	(10) FP budget per capita (minus Publicity Exp)	(11) Dummy (East-West)
Med. Per. per capita per sq. mile	1.000				
Dais per cap. per sq. mile	.555	1.000			
Cost per CYP Index	-.118	.052	1.000		
FP Budget per cap. (minus Pub. Exp)	.018	.198	.072	1.000	
Dummy (East-West)	-.105	.108	267	.838	1.000

The actual equation is

$$\text{Cost per CYP} = 2.4/2 - .0000057\beta_2 + .668\beta_{11}$$
$$(.1652) \quad (.0000019) \quad (.2516)$$

B coefficients: $\beta_2 = -.51$

$\beta_{11} = .45$

$R^2 = .249$

R^2 (corrected) $= .203$

F ratio $= 5.466$

Examination of the cost per CYP function reveals that some economies of scale are present in Pakistani family planning programs. That is, the larger the total output (greater amount of CYP provided) the lower is the cost per unit of output as indicated by the negative sign of the β_2 coefficient. These economies might come about from the standard type efficiencies which arise from the long time existence of distribution techniques and other administrative efficiencies. These are very reasonable explanations in terms of family planning programs since once the distribution and administrative apparatus have been established the extra cost associated with the distribution of an extra unit of contraceptive is practically zero.

The dummy variable, a positive quantity for East Pakistan districts, indicates that performance in terms of cost per CYP will be better in the West than in the East.

In summary, we might say that larger Family Planning Programs are less costly per unit than smaller ones and that districts in the West possess better cost characteristics than do those in the East.

The second regression run used Total Output divided by population as the dependent variable with (2) Population per square mile, (3) Percent Male non-agriculture, (4) Percent Urban, (5) Percent Literate, (6) Medical Personnel, (7) Medical Personnel per person per square mile, (8) Dais, (9) Dais per person per square mile.

The zero-order correlation matrix is given in Table VI.

In the actual regression itself variable number (3) was eliminated due to redundancy with number (4). Variables number (6) and number (8) were eliminated due to redundancy with numbers (7) and (9) respectively and also to high inter-correlations with the other variables.

The last iteration yielded the following equation with accompanying tests of significance.

Output per 1000 persons = f((4)Percent Urban, (7)Medical Personnel)

$$\text{Output per 1000 persons} = 34.59 + .290\beta_4 + 66.294\beta_7$$

$$(2.982) \quad (.1070) \quad (40.924)$$

B coefficients: $\beta_4 = .4113$

$\beta_7 = .2486$

$R^2 = .277$

R^2 (corrected) $= .233$

F ratio $= 6.320$

This particular regression indicates several things.

Firstly, those districts which are largely urban are likely to have better performance characteristics in terms of output per capita. Many factors may be involved in this conclusion but several possible

TABLE VI

Zero-Order Correlation Matrix - Step-Wise Regression #2
(Output per capita = f(a,b,c))

Variable	(1) CYP Capita	(2) Pop. per sq. mile	(3) Male Non-Agriculture	(4) Percent Urban	(5) Percent Literate	(6) Medical Personnel	(7) Med. Per. per person per sq. mile	(8) Dais	(9) Dais per person per sq. mile
CYP per capita	1.000								
Pop. per sq. mile	-.059	1.000							
Male non-agriculture	.395	.033	1.000						
Percent Urban	.467	.136	.829	1.000					
Percent Literate	.361	.386	.323	.505	1.000				
Medical Personnel	.507	.442	.635	.799	.555	1.000			
Medical Personnel per capita per sq. mile	.341	.422	.090	.225	.134	.201	1.000		
Dais	.037	.595	-.238	-.142	.196	.343	-.033	1.000	
Dais per capita per sq. mile	.068	.422	-.238	-.194	-.254	-.081	.555	.326	1.000

explanations may be that urban areas are more sophisticated in many ways and use of Family Planning products may be easier to have accepted or that urban areas have a more concentrated population enabling much Family Planning Information to pass by word of mouth also perhaps making publicity expenditures more productive.

Secondly, those districts having more medical personnel per capita per square mile are more likely to exhibit better performance characteristics in terms of total output than those districts having fewer medical personnel. The relationship between output and medical personnel - a positive one - is very straightforward and there is little need for further exposition.

A separate analysis was undertaken on a quarterly basis using a 12 district sample, however it is more than likely that quarters represent time periods too short for meaningful inter-quarterly comparisons of performance. From this analysis it was observed that there is a tendency for performance to decline from the first to the second period, rise in periods two to three and rise further in the third to fourth period. Interpretation of these quarterly trends must be done very cautiously since there appears to be no uniform method of reporting actual expenditure and output associated with quarters. Some districts reported all or no expenditure as having taken place in one period or another, when in fact it had not. For example, in Jhelum no costs were indicated in the last half of the year for IUD fees even though over 6500 IUD's were reported as inserted.

Summary of Cross-Section Findings

The statistical findings are therefore two: one is that cost per CYP is a decreasing function of output and two is that output is a direct increasing function of degree of urbanization and number of medical personnel. On these findings then we might like to say that cost per CYP is a function of the degree of urbanization and the number of medical personnel. This, though consistent logically, has not proven to be the case given the evidence and findings. When these two variables were introduced as independent variables in the first regression they were eliminated early in the iterative process because of non-significance. One possible explanation is that these variables are not truly "independent" to the whole scheme. Perhaps also is that the goals of maximum output (CYP) and maximum efficiency (cost per CYP) may be inconsistent. The evidence and findings thus far indicate that the larger programs are also more efficient but this is not to say we can continue to increase the size of Family Planning Programs without incurring increasing costs - costs brought on by pushing the programs in areas less urbanized and with less medical personnel.

Overall Conclusions on Pakistan

Most of the change in output within given districts through time is explained by the time trend itself or by the highly seasonal nature of variations in output. The monthly data are a poor statistical basis on which to attempt an analysis of costs and output. The dominant factor explaining variations in output among districts is differences

in population. Once population is adjusted for by converting into per capita terms, then degree of urbanization and also number of medical personnel emerge as important variables.

CHAPTER VI

FAMILY PLANNING IN INDIA

Summary of Earlier Findings

In the Phase II Report of this project, the Indian family planning program was examined at some length and we need only summarize those findings here. The picture which emerged was of a program which although "old" as such programs go (dating from 1952) clearly has its greatest accomplishments and opportunities ahead of it. Relative to other programs in comparable nations, the Indian effort has been for most of its history relatively underfinanced, less dependent upon foreign assistance and has spent less on research and evaluation. This situation has begun to change rapidly but as of the late 1960's this remained essentially the picture. The scheme has broadly speaking been a vascetomy program with IUD's having a major impact in only two or three years and condoms only in the very recent past with an as yet uncertain result. Tables I and II present the major financial inputs and also program outputs, the latter expressed in terms of both Couple-Years of Protection (CYP's) and total of new clients. Since nothing is known about the number of condoms or other non-clinical users, new clients in this table is equal to IUD insertions plus male and female sterilizations. For most of the years covered by these tables the role of the condom in the program was relatively minor and our arbitrary definition of new client may be not

TABLE I

Expenditures on Family Planning in India, 1961-62 - 1968-69
(Thousands of Rupees)

	Total Indian Government Spending	Ford Foundation	Population Council	USAID*	SIDA	Other Foreign Aid	Totals** Thousands of Rupees	Totals** Thousands U.S. Dollars
1961-62	12,775	1,650	-	-	-	-	14,425	3,069.
1962-63	26,266	1,650	-	-	-	-	27,916	5,940.
1963-64	24,252	1,650	-	-	-	-	25,902	5,511.
1964-65	47,111	1,650	355	-	-	-	49,116	10,450.
1965-66	86,094	1,650	946	-	-	-	88,690	11,825.
1966-67	149,842	1,650	683	550	1,185	-	153,910	20,521.
1967-68	290,810	1,650	616	3,982	1,515	-	298,573	39,810.
1968-69	306,200	1,650	210	20,077	1,035	3,000	331,962	44,261.

* Includes only dollar spending on advisors, participant training, etc. not reflected in GOI budget.

** Rupees converted to dollars as 7.5 to $1.00 after 1965-66 but 4.7 to $1.00 prior to that.

TABLE II

Output of Family Planning Program in India

	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Methods								
Sterilizations*	104.585	157,947	170,246	269,505	476,889	868,350	1,828,328	1,664.064
IUD's Inserted**	-	-	-	-	812,713	917,303	662,178	478,328
Condoms Distributed	25,440,000	33,050,000	25,310,000	45,630,000	44,660,000	30,160,000	48,650,000	60,000,000***
Couple-Years of Protection Implied								
Sterilizations	784,388	1,184,602	1,276,845	2,021,288	3,576,668	6,512,625	13,712,460	12,480,480
IUD's	-	-	-	-	2,031,782	2,293,258	1,655,445	1,195,820
Condoms	254,440	330,500	253,100	456,300	446,600	301,600	486,500	600,000
Total CYP's	1,038,828	1,515,102	1,509,945	2,477,588	6,055,050	9,107,483	15,854,405	14,276,300
Total New Clients	784,388	1,184,602	1,276,845	2,021,288	5,608,450	8,805,783	15,367,905	13,686,300

* Male and female.
** First insertions.
*** Estimated.

too unrealistic. Table III presents the indicated costs per unit of output for the program. As noted in the earlier report on India, the Rupees cost per unit series displays a rather consistent trend with the apparent increase in the recent past reflecting partly the decline of the IUD and partly also large foreign aid inputs beginning in 1968-69.

Some Questions About the Program

The Indian program has been reviewed, analyzed, evaluated and reorganized on several occasions. Several factors have been frequently mentioned as explanations for the continuing difficulties which have plagued the Scheme, for the basic fact that the program has yet to make a major impact on Indian fertility. Let us consider some of these.

(1) The program has never achieved critical scale of inputs. As our own earlier report indicated relative to other successful programs, India spends less per capita. It has received a smaller proportion of outside help relative to the size of the program than many other countries. Thus, in programmatic terms, this argument states that success (or output) is related to the level of financial inputs (spending) and that insufficient inputs have been forthcoming to insure the desired level of output.

(2) The socio-economic setting is particularly unfavorable to family planning in India. Literacy, urbanization, income per capita and similar indicators do seem inversely correlated with fertility, both in the demographic history of the Western nations and also in Asian nations now well-launched on their own transitions. Most of

TABLE III

Cost per Unit of Family Planning in India

	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Cost (Thousands of Rupees)	14,425.	27,916.	25,902.	49,116.	88,690.	155,910.	298,573.	331,962.
CYP's (Thousands)	1,039.	1,515.	1,510.	2,478.	6,055.	9,108.	15,854.	14,276.
Cost per CYP								
Rupees	13.88	18.55	17.15	19.82	14.65	16.90	18.83	23.25
U.S. Dollars	$ 2.95	3.95	3.65	4.22	1.95	2.25	2.51	3.10
Cost per Acceptor								
U.S. Dollars	$29.22	37.59	32.42	38.70	9.17	11.17	15.99	20.66

these indicators are distinctly negative in India. This point, in programmatic terms, is stating that program output is a function of the accessibility and also receptivity of the population. The more literate and urban the people the more easily they can be reached. The higher their income, education, health and living standards the more likely they are to be interested in family planning.

(3) Certain key inputs are essential and these are missing in large measure in India. Thus, physicians are required for both sterilization and IUD insertions. (Para medical personnel have in some cases been trained to do IUD's but this not occurred on any scale in India.) Since physicians are in short supply outside the large cities, mobile units have been suggested as a substitute. Thus, this proposition states that, for largely clinical programs, physicians and/or mobile units are the critical input and success (output) will be related to them.

Let us consider these as three hypotheses concerning the causes of success (or the lack of it) in Indian family planning. Let us now investigate these hypotheses empirically with geographically diaggregated cross-sectional data for the Indian program's inputs and outputs and also the relevant socio-economic data for several years of the recent past.

Geographical Variations in Indian Family Planning Success

The logical, even natural, geographical unit of analysis for this purpose would be the district. The original design of this phase of our

work called for a study of districts, on a sample basis at the least and perhaps for one hundred percent coverage. As has already been indicated, we were not allowed to proceed on this basis and, in consequence, fell back on the use of states as our unit of analysis. The district data would have required additional field work but state data were already available (Table IV).

Only two years of data, 1967-68 and 1968-69, were available for most of the program variables and to increase our number of observations, the two years were pooled and a dummy variable added to sort out the possible effect of the timing. We then applied a routine least-squares regression analysis, moving step-wise from the first equations including many independent variables to a final equation in which only variables with a critical level of statistical significance to their relationship were retained. The variables employed, and their specification, reflect availability rather than absolute desirability. Still, all in all, they would seem adequate to provide at least a rough test of the three hypotheses above.

Our analysis proceeded in terms of the following variables:

(A) Output

(2) Sterilizations performed
(1) IUD's inserted
(25) Couple-Years of Protection achieved
(26) Total new acceptors

(B) Program Inputs

(9) Total current expenditures
(3) Mobile IUD units
(4) Mobile sterilization units
(5) Physicians in place

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TABLE IV Cont'd.

States	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
1. Delhi	No expenditure was incurred by Territory Admn. but grant was given to Local Bodies & Vol. Orgs. by the Center.					215	327
2. Himachel Pradesh	09	62	57	72	205	581	1,031
3. Manipur	23	20	05	18	50	45	187
4. Tripura	14	40	11	32	69	86	148
5. Pondicherry	9	8	12	23	87	99	169
6. Goa, Daman & Diu	-	-	23	35	93	69	143
7. A&N Island	-	-	-	-	-	-	1
8. L.M.A. Island	-	-	-	-	-	-	5
9. NEFA	-	-	-	-	-	-	-
10. D&N Haveii	-	-	-	-	-	11	10
11. Chandigarh	-	-	-	-	-	4	112
	8,181	12,129	16,557	34,987	69,016	115,368	189,202

(6) Urban FP centers
(7) Rural FP main centers
(8) Rural FP sub-centers

(C) Socio-Economic Setting

(14) Percent literate
(22) Percent Hindu
(23) Percent urban
(15) Total population
(10) Index of socio-economic development

(D) Dummy Variable

(18) Year

Results of the Analysis

(1) Production function for family planning services.

(a) Variable (1) as a function of variables (3), (4), (5), (6), (7), (8), (9), (10), (14), (15), (18), (22), (23) revealed a significant relationship only with respect to (15). In other words, IUD's inserted are a function of population.

(b) Variable (2) as a function of variables (3) - (10), (14), (15), (18), (22), (23) revealed a significant relationship with respect to (4), (7) and (23). Thus, sterilization units, rural FP centers and the percent urban.

(c) Variable (25) as a function of variables (3) - (10), (14), (15), (18), (22), (23) showed a significant relationship with variables (4), (6) and (8). Total CYP's achieved are a function of mobile sterilization units, urban FP centers and rural FP sub-centers.

(d) Variable (26) as a function of variables (3) - (10), (14), (15), (18), (22), (23) showed a significant relationship with respect to (4), (6) and (8). Total new acceptors are a function of mobile sterilization units, urban FP centers and rural FP sub-centers.

These results are summarized in Table V. Sterilizations, total CYP's and new acceptors are in large measure "explained" by program input variables, but IUD's inserted seem to be only a function of

TABLE V

Regression Analysis of Program Output and Selected Explanatory Variables

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
(a) Dependent variable is (1), Independent variables are as follows:				
(15)	.00063110	3.36478	.550777	.27656
			F-Ratio =	11.32177
(b) Dependent variable is (2), Independent variables are as follows:				
(4)	1220.70887	3.72217	.46913	
(7)	105.97572	2.91223	.35623	
(23)	375966.20386	3.87098	.39452	.75089
			F-Ratio =	28.12847
(c) Dependent variable is (25), Independent variables are as follows:				
(4)	8848.52728	4.03302	.44771	
(6)	281.29584	3.18075	.29773	
(8)	71752.24840	4.28484	.45859	.78360
			F-Ratio =	33.59052
(d) Dependent variable is (26), Independent variables are as follows:				
(4)	1094.87994	3.62137	.39438	
(6)	38.75535	3.18013	.29201	
(8)	41.83919	4.97721	.52257	.79175
			F-Ratio =	35.21691

TABLE V Contd.

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
(e) Dependent variable is (28), Independent variables are as follows:				
(22)	.031033	3.19252	.48534	
(23)	.077689	2.95176	.44626	
(27)	21.125391	2.44521	.37442	.41433
			F-Ratio =	7.13109
(f) Dependent variable is (29), Independent variables are as follows:				
(9)	.000001	2.06635	.38194	.11171
			F-Ratio =	4.26974

population. Population had also shown a strong relationship with the other three measures of the dependent variable, being consistently one of the last independent variables eliminated by the step-wise regression because of a t-value below the significant level. It is well-known that elimination of a variable in such a step-wise regression does not guarantee that it might not have been significant if enough other variables had been eliminated first.

In view of the findings with respect to population and IUD's, it was felt to be advisable to probe further. This was done with a new regression in which the two measures of overall output, CYP's and new acceptors were put on a per capita basis.

(e) CYP per capita (Variable 28) showed a significant relationship with percent Hindu (Variable 22), percent urban (Variable 23) and program expenditures per capita (Variable 27).

(f) Acceptors per capita (Variable 29) showed a significant relationship only with respect to current expenditures (Variable 9).

Thus, IUD's seem unrelated to either program inputs or socio-economic setting. Total sterilizations and the two Indexes of overall program activity, CYP's and acceptors, showed a relationship with several measures of the physical input network of the program but these appear to have been in large measure inter-correlated with population. In per capita terms, the overall program output indexes are related to program expenditures and mildly to the socio-economic factors of percent urban and percent Hindu.

(2) Cost functions for family planning services.

In view of the significance of the expenditure variable the next important question was exactly what is the nature of this relationship? That is, what is the average cost functions for family planning services and what explains variations in unit costs among the states. This was also analyzed via step-wise regression analysis.

(a) Average cost per CYP (Variable 27) is significantly related to total CYP's (Variable 25).

(b) Average cost per acceptor (Variable 28) is significantly related to total acceptors.

These results are summarized in Table VI. They indicate quite clearly that program volume is the major source of variation in per unit costs of delivering family planning services. However, it indicates that the effect is positive: the greater the volume, the higher the unit costs.

Overall, we are left a bit puzzled by our analysis. There do not seem to be economies of scale in the program and the larger the volume the higher the unit cost. However, total expenditures (costs) are positively related to total output. Thus, evidently costs rise faster than output. No impact of any socio-economic variables can be seen in the variation of unit costs.

Overall Conclusions

A few major conclusions do suggest themselves. First, looking only at the production function relationship, population seems an

TABLE VI

Regression Analysis of Costs per Unit and Selected Explanatory Variables

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
(a) Dependent variable is (27), cost per CYP; Independent variables are as follows:				
(25)	.000032	4.40427	.660991	.41438
			F-Ratio =	19.39767
(b) Dependent variable is (28), cost per acceptor; Independent variables are as follows:				
(26)	.000023	2.66673	.470596	.19032
			F-Ratio =	7.11145

important explaner of variation in total output by states. This is especially true of IUD's which do not seem to correlate well with anything else. Once this effect of population is removed, the most powerful explanatory variable is expenditures. A moderate effect of the environmental variables percent Hindu and percent urban is also shown, the former presumably due to higher Moslem fertility.

Costs per unit of family planning services indicate that costs increase more than proportionately to volume of output thus leading to rising unit costs among states.

In general, the various measures of output all seem to move together and to involve the same sets of explanatory variables. IUD's alone do not follow this rule.

Referring back to the three "hypotheses" suggested above, we must conclude that our analysis does not lend support to any of them. It is, of course, also possible that the basic data are of a quality too poor to permit the real relationships to be determined.

CHAPTER VII

THE FAMILY PLANNING PROGRAM IN COLOMBIA

Introduction

The purpose of this chapter is to summarize the data presently available to us with respect to nationwide efforts in family planning in Colombia, South America. Following a brief introductory description of the country in terms of selected geographic, demographic, social, and economic characteristics, an outline of current attitudes and activities of various Colombian public and private institutions is presented. This is followed by a section which analyses selected family planning program data for 1968, 1969, and 1970, employing the methodology outlined in a previous chapter.

The Republic of Colombia, the fourth most populous country in South America, is located in the northwest part of the continent of South America, in the region of the northern Andes. Today at least four principal regions are significant in terms of population and resources. Each also has a major urban center. These regions are: The Eastern Cordillera, centered on Bogota; the department of Antioquia and its southern extension, Caldas, centered on Medellin; the Valle de Cauca in Southwest Colombia, formerly focused on Popayan, now on the economically and demographically burgeoning Cali; and the Atlantic region, once with Cartagena as its principal city, but with Barranquilla

now dominant. Some observers would add to this list the region around Bucaramanga in the northeast, and another comprising the departments of Caldas and Quindio. There are also lesser regions, and sub-regions, with some importance. Several include cities of 100,000 or more inhabitants (see Table I and accompanying map).

The consequence of the above is that, unlike many South American countries, Colombia does not seem to have one over-ridingly important primate city. Rather, there are several well-defined regions, each containing large cities. Further, since these regions differ with respect to many geographic, demographic, social, and economic characteristics, Colombia presents a fairly good setting in which to statistically test for differences among regions in the method of organizing and distributing family planning services.

With respect to aggregate characteristics of Colombia, Table II presents selected characteristics. It should be added that the population is growing at a rate which tends to double in about 21.5 years (that is, where the present rate of growth per year, about 3.2% divided into the constant 70, indicates a doubling of the population in about 21.5 years). Also, evidence suggests that Colombia is behind such other countries as Mexico and Brazil as far as the transition in mortality is concerned, and that a downward fertility trend is not noticeable. This implies, with a younger population in Colombia than in the other two countries, a considerable acceleration of the rate of growth in Colombia, vis-a-vis Mexico and Brazil, as additional gains in mortality become a reality. In other words, comparison of the demographic situation in

TABLE I

Population Distribution in Colombia, and Percent Increase, by Administrative Divisions[1)]

Administrative Division	1951 (May 9)	1964 (July 15)	% Increase	Capital City	1951 (May 9)	1964 (July 15)	% Increase
Departments:	11,329,095	17,096,390	--				
Antioquia	1,570,197	2,477,299	35.19	Medellín	358,189	772,887	60.07
Atlántico	428,429	717,406	39.88	Barranquilla	279,627	498,301	44.80
Bolívar	665,195	1,006,347	31.90	Cartagena	128,877	242,085	48.98
Boyacá	801,436	1,058,152	21.30	Tunja	44,250	68,905	34.16
Caldas	1,068,180	1,455,872	23.76	Manizales	126,201	221,916	43.74
Cauca	443,439	607,197	24.13	Popayán	44,808	76,568	41.47
Cundinamarca	1,624,044	2,819,524	42.73	Bogotá	715,250	1,697,311	67.74
Córdoba	326,263	585,714	45.38	Montería	77,057	126,329	38.21
Chocó	131,101	181,863	25.14	Quibdó	36,558	42,926	22.41
Huila	293,692	416,289	26.81	Neiva	50,494	89,790	44.63
Magdalena	407,731	789,410	51.39	Santa Marta	47,354	104,471	61.85
Meta	67,492	165,530	70.42	Villavicencio	33,342	58,430	43.47
Nariño	547,323	705,611	19.45	Pasto	81,103	112,876	25.39
Norte de Santander	387,450	534,486	24.70	Cúcuta	87,481	175,336	54.15
Santander	747,706	1,001,213	22.39	Bucaramanga	112,252	229,748	55.83
Tolima	712,490	841,424	12.70	Ibagué	98,695	163,661	39.11
Valle del Cauca	1,106,927	1,733,053	34.59	Cali	284,186	637,929	63.25
Intendencias:	161,854	291,737	85.46				
Arauca	13,221	24,148	46.75	Arauca	8,675	7,965	-6.45
Caquetá	40,950	103,718	73.63	Florencia	25,129	30,445	14.66
Guajira	102,008	147,140	28.18	Ríohacha	13,068	31,897	70.03
San Andrés y Providencia	5,675	16,731	85.46	San Andrés	3,705	14,413	108.53

TABLE I Cont'd.

Administrative Division	1951 (May 9)	1964 (July 15)	% Increase	Capital City	1951 (May 9)	1964 (July 15)	% Increase
Comisarias:							
Amazonas	7,619	12,962	41.13	Leticia	3,493	4,013	10.58
Guainia	--	3,602	47.97	San Felipe	--	1,090	47.97
Putumayo	28,105	56,284	54.09	Mocca	5,678	13,059	32.53
Vaupés	9,169	13,403	47.97	Mitú	840	6,206	47.97
Vichada	12,330	10,130	-14.80	Puerto Carreño	--	1,449	-14.80
Total	11,548,172	17,484,508	31.96				

1) The following changes have been made since the 1964 census: (a) Cesar was created as a departamento in 1967, separated from Magdalena; (b) Guajira was elevated to status of departamento in 1964; (c) Quindio and Riserlda were created as departamentos in 1966, separated from Caldas; (d) Sucre was created as a departamento in 1966, separated from Bolivar; (e) Putumayo was elevated as intendencia in 1968.

Source: Departamento Administrativo Nacional de Estadistica, XIII Censo Nacional de Poblacion: Resumen General. Bogota, D.E.: Imprenta Nacional, 1967, p. 30.

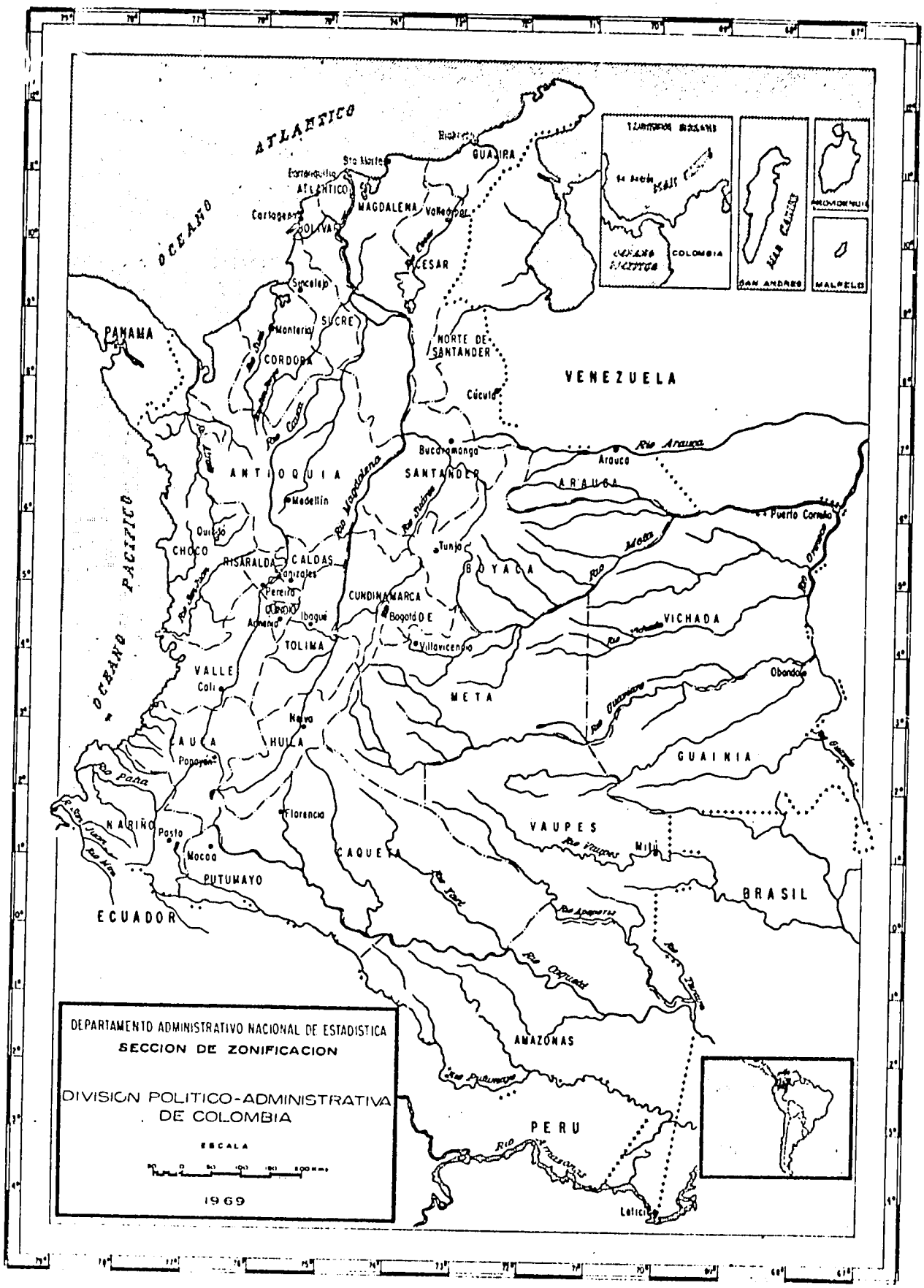
DEPARTAMENTO ADMINISTRATIVO NACIONAL DE ESTADISTICA
SECCION DE ZONIFICACION
DIVISION POLITICO-ADMINISTRATIVA DE COLOMBIA
ESCALA
1969
ATLANTICO
OCEANO
OCEANO PACIFICO
PANAMA
VENEZUELA
ECUADOR
PERU
BRASIL
GUAJIRA
ATLANTICO
MAGDALENA
BOLIVAR
CESAR
SUCRE
CORDOBA
NORTE DE SANTANDER
ANTIOQUIA
SANTANDER
ARAUCA
CHOCO
RISARALDA
CALDAS
BOYACA
CUNDINAMARCA
TOLIMA
VICHADA
VALLE
META
CAUCA
HUILA
GUAINIA
NARIÑO
VAUPES
CAQUETA
PUTUMAYO
AMAZONAS
Cartagena
Sincelejo
Montería
Cúcuta
Bucaramanga
Arauca
Medellín
Quibdó
Tunja
Pereira
Manizales
Armenia
Ibagué
Bogotá D.E.
Villavicencio
Cali
Neiva
Popayán
Pasto
Mocoa
Florencia
Puerto Carreño
Obando
Leticia
Mitú
Río Magdalena
Río Cauca
Río Meta
Río Orinoco
Río Putumayo
Río Caquetá
Río Amazonas
Río Negro
Río Vaupés
Río Guaviare
Río Arauca
Río Patía
Río San Juan
Río Mira
SAN ANDRES
MALPELO
PROVIDENCIA

TABLE II

Selected Demographic, Social and Economic Characteristics for Colombia, South America

Population (in millions)	
1964 census	17.5
1969 estimate	21.4
1980 projection	31.4
Current Estimate of Vital Rates per 1,000 Population	
Birth rate	41-44
Death rate	12-14
Rate of natural increase	32
Percent Distribution of total population by age	
all ages	100
under 15 years	47
15-64 years	50
65 years and over	3
Dependency ratio	99
Number of females 15-44 years (1969 estimate in millions)	
Total	4.4
Married	2.3
Density (1967 population per square kilometer	17
Percent literate (year: age group) 1964:25-34	
Male	78.1
Female	74.3
Adjusted school enrollment ratio	
Both sexes, 1950	30
Both sexes, 1960	52
Females, 1965	52
Population (in thousands) per specific health worker	
Doctor	2.5
Midwife	U
Nurse	3.5
Population (in thousands) per hospital bed	0.4
Real Gross Domestic Product	
Per capita in U.S. Dollars	313
Percent derived from agriculture	
1950	38
1965	32

TABLE II Cont'd.

Percent of total population residing in urban areas	52	Annual percent increases 1960-1966 average	
Percent of total population residing in cities of 100,000 and over	33	Total	4.4
		Per capita	1.2
		Index of per capita food production in 1966-1968 (Base period, 1952-1956=100)	97

Source: D. Nortman, "Population and Family Planning Programs: A Factbook." Studies in Family Planning. December 1969, p. 23.

Colombia with, say, that which prevails in Brazil (which is universally recognized as facing a "population explosion") suggests that Colombia faces an even greater "explosion."

We turn now to see whether and to what extent various Colombian institutions have recognized this problem, and to the actions which have been initiated to cope with the problem. Specifically, we review the attitudes and actions toward family planning taken by the Colombian government; Universities; Professionals; Businessmen and Labor Unions; the Church; the Press; Public Opinion; and other private organizations.

Attitudes and Actions Towards Family Planning

(A) Government. The attitude of the Colombian government appears to be, in principle, favorable to family planning. Former Colombian President Carlos Lleras Restrepo was, for example, one of the chiefs of state to sign the United Nations "Declaration of Human Rights," (1967) which included the proviso that the right of the family to choose family size was indeed a basic human right. Further, the Colombian Minister of Public Health also in 1967 at a conference of ministers of health held in Caracas, Venezuela, and sponsored by the Pan American Health Organization, argued forcefully that the need for family planning was one of the more pressing requirements for the continued development of Latin American countries, and a similar argument was made by United Nations Ambassador from Colombia, Dr. Julio Cesar Turbay Ayala, in 1968. However, while high government officials seem to support family

planning in principle, there seems to be no official government policy with respect to family planning.

Government activity in the area of family planning has been both direct and indirect. Thus, the government has supported extensive social, medical, and economic research in population and family planning through the Division of Population Studies which was created in November 1964 by the Colombian Association of Medical Schools. Also, the Ministry offers family planning services as part of a broader program of maternal and child health care in about 340 centers (270 Health Centers with ASCOFAME coordination and an additional 70 Health Centers in more rural areas without ASCOFAME coordination). However, it is difficult to say precisely how many centers are offering family planning due to some irregularity in reporting.

With respect to data availability in general for the portion of family planning in Colombia under direct control of the ministry of health, it should be noted that the ministry has apparently been extremely reluctant to release its data on numbers of new acceptors, continuation rates, et cetera, to anyone but ASCOFAME (The Colombian Medical School Association referred to above), which is in charge of all evaluation efforts. For political and religious reasons (Colombia has a Concordat with the Holy See in Rome which especially ties this strongly Roman Catholic country to the Church), it appears that the government activity in family planning also is not as direct and aggressive as it would otherwise desire. Perhaps these reasons help to explain the reluctance on the part of the ministry to disclose

detailed figures regarding its activities in family planning. In any event, data which is presently available with respect to government activity in family planning does not permit a cost analysis of the program. We may, however, indicate that the program is extensive in coverage, including relatively rural areas of the country. Thus, for example, Table III shows the breakdown, by section, of government clinics for which family planning activities have been programmed, and Table IV presents the results of the government effort.

Support for the government program is included within the genera program of "Extension of Services for Maternal and Child Protection and Family Well-Being." The 1970 budget for this three-pronged program totaled $2,011,411.00 U.S. of which 34.7%, or $697,959.61, was received from PAHO. Table V presents the budgeted expenditures of the global figure, by category of expenditure.

Now, if we assume that the provision of family planning services requires the use of one-third of the budget amount, then the cost per new acceptor estimate for 1970 is $16.43. Obviously, though, this is a very crude estimate.

(E) Universities. A wide spectrum of attitudes prevails among Colombian Universities, both public and private, with respect to providing leadership for efforts at family planning. On the one hand, there seems to be an inhibiting force to active participation because of the strong influence of the Church in Colombia. Indeed, many of the private schools are directed by Roman Catholic religious communities, and the Church, again under the terms of the concordat mentioned above,

TABLE III

Number of Government Clinics Offering Family Planning Services, by Section, June 1970

Section*	Number of Clinics**
Antioquia	114
Atlántico	8
Bolívar	14
Caldas	24
Caqueta	6
Cauca	9
Córdoba	11
Cundinamarca	13
Guajira	8
Huila	15
Magdalena	13
Meta	7
Nariño	14
Norte De Santander	12
Quindío	12
Risaralda	16
Santander	18
Sucre	6
Tolima	8
Valle	28
Cali	12
Medellín	18
Total	386

* Information on the departamentos of Boyaca, Chocó and Cesar, and the intendencia of San Andrés, which were recently included in the program, is unavailable.

** The actual number of centers providing services varies from month to month due to the annual turnover in doctors at the participating clinics, which causes a temporary lapse or gap in coverage. Also, the number cited can only be an estimate because of the lack of complete monthly reporting by all centers.

Source: Ministerio de Salud Publica. Programa de Extension de Servicios de Proteccion Materno Infantil y de Bienestar Familiar: Informacion General. Bogota, D.E., Octubre de 1970, p. 11.

TABLE IV

New Acceptors of Family Planning Services
in Government Clinics, 1967-1970*

	1970	1969	1968	1967
Rhythm	671	610	1,112	785
Pill	23,184	18,007	13,433	2,821
IUD	15,567	12,629	14,145	4,937
Other	1,280	841	436	90
Total	40,813	32,087	29,126	8,633

* Note: As seen in the table, before March 1969 family planning activities were carried on - but these activities were conducted on an unofficial basis. That is, only after March 1969 did the government formally program family planning activities - via the "Extension of Services" program within the Maternal and Child Health section of the Ministry of Health.

Source: Various ASCOFAME monthly reports titled Boletin de Estadisticas de Servicio.

TABLE V

1970 Budget for "Extension of Services" Program

Training of personnel	10%
Salaries, administrative and Para-medical personnel	25%
Salaries, medical personnel	40%
Materials and supplies	6%
Evaluation	5%
Travel	2%
Administration	10%
Miscellaneous	2%
	100%

Source: Ministerio de Salud Publica. op. cit., p. 5.

maintains a strong influence in policy decisions for the public universities as well.

On the other hand, recognition of the need for providing leadership in the area of family planning has resulted in the organization of such institutions as: (1) the Division of Population Studies (DEP) of the Colombian Association of Schools of Medicine, which is responsible for training and research, and for health education activities, directed to opinion leaders and pressure groups, and to program evaluation; (2) the Colombian Association for the Scientific Study of Population (CIECP); and (3) the University Committee for the Investigation of Population (CUIP). Also, family planning services may be obtained directly through ASCOFAME, which receives support from the Population Council. ASCOFAME offers post-postum family planning services in 26 hospitals. The following statistics, given in Table VI, indicate that a sizeable contribution to family planning in Colombia is being carried out by ASCOFAME.

Support for the ASCOFAME Post-Postum program which was instituted in October 1968, derives from Population Council grants. Table VII summarizes expenditures, by clinic (central office expenses are imputed to the various participating clinics by means of weights derived from the share of total output for the program attributable to the 26 respective clinics).

Table VIII was constructed from the summary tables VI and VII by aggregating the data by departamento, and shows the cost per CYP, and cost per new acceptor, by departamento, for the ASCOFAME-run program.

TABLE VI

ASCOFAME[1] - New Acceptors, by Clinic,
Oct. 1968 - Dec. 1970

	1970			
	IUD	Pill	Female Sterilization	Other[3]
San Juan de Dios, Bogota	3055	598		390
San Jose[2], Bogota	724			
H. Militar[2], Bogota	439	54	11	25
H. U. Evaristo Garcia, Cali	866	552	45	174
C. Rafael Calvo, Cartagena	161	1312	85	150
H. San Diego, Cereté	241	56	151	
H. San Cristobal, Ciénaga	206	142	11	1
H. San Rafael, Girardot	644	47	6	2
H. Univ. de Caldas, Manizales	324	509	9	2
C. Luz Castro de G., Medellín	1548	2424	39	185
H. San Vicente, Medellín	441	855	19	26
I.C.S.S., Medellín	419	2976		136
H. San Jerónimo, Montería	215	338	8	6
H. San Fran. de Asís, Sincelejo	158	379	126	7
H. Regional, Sabanalarga	165	158	18	6
H. San Vicente de Paul, Pamira	559	448	51	64
H. San Jorge, Pereira	791	552	20	12
H. Univ. San José, Popayán	389	76	52	32
H. San Juan de Dios, Sta. Marta	293	107	12	3
H. Santa Helena, Buenaventura	67	30	3	9
H. San Luis de Montford, Villavicencio	335	201	15	55
H. San Juan de Dios, Armenia	430	18		
H. Rosario Pumarejo, Valledupar	84	73		
H. Sagrado Corazón, Cartago	213	110		
H. de Barranquilla, Barranquilla	144	313		24
H. Regional, Rionegro	54	103	5	
Total	12,965	12,431	686	1,309

1) Data derived from ASCOFAME reports which indicated total acceptors and percent acceptance by method. In many cases, the % breakdown did not sum by 100% (i.e., 99 or 101 common): hence, we altered the % breakdown in order to have $\Sigma = 100.0$, by rounding up or down (rounded up or down the highest %'s).

2) Data for these hospitals are not included in our computation of CYP since they are a 'duplicate' of cases already reported by Profamilia.

3) 'Other' includes "injections", "condoms", and "suppositories".

Source: Various ASCOFAME reports titled Boletin de Estadisticas de Servicio

TABLE VI (Cont.)

ASCOFAME[1] - New Acceptors, by Clinic,
Oct. 1968 - Dec. 1970

	1969			
	IUD	Pill	Female Sterilization	Other[3]
San Juan de Dios, Bogoto	2710	549		66
San Jose[2], Bogota	976			
H. Militar[2], Bogota	460	81		17
H. U. Evaristo Garcia, Cali	1021	810		232
C. Rafael Calvo, Cartagena	210	1104	48	260
H. San Diego, Cereté	367	46	97	
H. San Cristobal, Ciénaga	236	98	3	1
H. San Rafael, Girardot	342			
H. Univ. de Caldas, Manizales	835	225	10	
C. Luz Castro de G., Medellín	1098	1971	3	160
H. San Vicente, Medellín	381	827	13	50
I.C.S.S., Medellín	88	1621		52
H. San Jerónimo, Montería	336	213	1	5
H. San Fran. de Asís, Sincelejo	266	236	70	22
H. Regional, Sabanalarga	375	234	18	12
H. San Vicente de Paul, Pamira	573	186	15	
H. San Jorge, Pereira	1028	215	25	2
H. Univ. San José, Popayán	437	87	46	11
H. San Juan de Dios, Sta. Marta	170	291	9	14
H. Santa Helena, Buenaventura	230	50	3	37
H. San Luis de Montford, Villavicencio	510	370	28	18
H. San Juan de Dios, Armenia				
H. Rosario Pumarejo, Valledupar				
H. Sagrado Corazón, Cartago				
H. de Barranquilla, Barranquilla				
H. Regional, Rionegro				
Total	12,649	9,214	389	959

1) Data derived from ASCOFAME reports which indicated total acceptors and percent acceptance by method. In many cases, the % breakdown did not sum to 100% (i.e., 99 or 101 common): hence, we altered the % breakdown in order to have $\Sigma = 100.0$, by rounding up or down (rounded up or down the highest %'s).

2) Data for these hospitals are not included in our computation of CYP since they are a 'duplicate' of cases already reported by Profamilia.

3) 'Other' includes "injections", "condoms", and "suppositories".

Source: Various ASCOFAME reports titled Boletin de Estadisticas de Servicio

TABLE VI (Cont.)

ASCOFAME[1] - New Acceptors, by Clinic,
Oct. 1968 - Dec. 1970

	1968			
	IUD	Pill	Female Sterilization	Other[3]
San Juan de Dios, Bogota	299	66		13
San Jose[2], Bogota	233			
H. Militar[2], Bogota				
H. U. Evaristo Garcia, Cali	180	94		25
C. Rafael Calvo, Cartagena	33	139	25	92
H. San Diego, Cereté	28		5	
H. San Cristobal, Ciénaga				
H. San Rafael, Girardot				
H. Univ. de Caldas, Manizales	100	15	1	
C. Luz Castro de G., Medellín				
H. San Vicente, Medellín				
I. C. S. S., Medellín				
H. San Jerónimo, Montería				
H. San Fran. de Asís, Sincelejo	30		7	8
H. Regional, Sabanalarga	77	13	1	2
H. San Vicente de Paul, Pamira	37	16	3	
H. San Jorge, Pereira				
H. Univ. San José, Popayán	12	1	3	1
H. San Juan de Dios, Sta. Marta		39		
H. Santa Helena, Buenaventura	23	14		
H. San Luis de Montford, Villavicencio	143	53		2
H. San Juan de Dios, Armenia				
H. Rosario Pumarejo, Valledupar				
H. Sagrado Corazón, Cartago				
H. de Barranquilla, Barranquilla				
H. Regional, Rionegro				
Total	1,195	450	45	143

1) Data derived from ASCOFAME reports which indicated total acceptors and percent acceptance by method. In many cases, the % breakdown did not sum to 100% (i.e., 99 or 101 common): hence, we altered the % breakdown in order to have Σ = 100.0, by rounding up or down (rounded up or down the highest %'s).

2) Data for these hospitals are not included in our computation of CYP since they are a 'duplicate' of cases already reported by Profamilia.

3) 'Other' includes "injections", "condoms", and "suppositories".

Source: Various ASCOFAME reports titled Boletin de Estadisticas de Servicio

TABLE VII

Costs, by Clinic*, for ASCOFAME's Post-Partum Program**

	1970	Oct.-Dec. 1968-1969
San Juan de Dios, Bogotá (11/68)	$ 9,957.04	$ 6,229.33
H. U. Evaristo Garcia, Cali (11/68)	20,602.12	12,774.34
C. Rafael Calvo, Cartagena (11/68)	15,290.89	12,211.42
H. San Diego, Cereté (11/68)	5,907.80	4,127.76
H. San Cristóbal, Ciénaga (5/69)	3,791.89	1,477.49
H. San Rafael, Girardot (6/69)	3,474.51	1,803.51
H. Universitario de Caldas, Manizales(11/68)	6,944.47	5,309.77
C. Luz Castro de G., Medellín (2/69)		
H. San Vicente, Medellín (2/69)	55,174.92	18,397.89
ICSS, Medellín (8/69)		
H. San Jerónimo, Montería (2/69)	1,973.76	4,718.46
H. San Francisco de Asís, Sincelejo (11/68)	7,367.14	5,184.64
H. Regional, Sabanalarga (11/68)	4,523.45	3,717.99
H. San Vicente de Paúl, Pamira (11/68)	9,842.72	5,105.52
H. San Jorge, Pereira (1/69)	10,121.04	3,343.59
H. Univ. San José, Popayán (11/68)	6,991.98	5,026.21
H. San Juan de Dios, Sta. Marta (11/68)	7,558.58	6,892.27
H. Santa Helena, Buenaventura (11/68)	3,381.96	5,278.28
H. San Luis de Montfort, Villavicencio(10/68)	5,050.84	7,382.09
H. San Juan de Dios, Armenia (5/70)	5,343.40	--
H. Rosario Pumarejo, Valledupar (7/70)	2,542.83	--
H. Sagrado Corazón, Cartago (7/70)	3,473.68	--
H. de Barranquilla, Barranquilla (7/70)	5,163.77	--
H. Regional, Rionegro (7/70)	1,497.82	--
Total	$195,976.61	$108,980.56

* The dates refer to entry by the particular clinics into the program.

** We do not include payments to S. Jose, Bogota (through Profamilia) or to H. Militar, Bogota, since the major portion of program support for these clinics derives from Profamilia, and are therefore included with Profamilia, the other private program offering family planning services in Colombia (see below).

Foreign Exchange rates employed to convert from Colombian Pesos to U.S. Dollars for 1970 and 1968-69 are, respectively, 18.368 and 17.329 Pesos per dollar.

Source: Expenditure totals are derived from ASCOFAME's accounting office at ASCOFAME's Division of Population Studies central office in Bogota, Colombia.

TABLE VIII

Cost/CYP and Cost/New Acceptor, by Departamentos, 1970 and 1968-69, for ASCOFAME, in U.S. Dollars

	1970		1968-69	
	Cost/ CYP	Cost/ New Acceptor	Cost/ CYP	Cost/ New Acceptor
Antioquia	$ 5.88	$ 6.14	$ 2.89	$ 2.94
Atlántico	10.24	11.70	4.35	5.06
Bogotá, D.E.	2.46	2.46	1.68	1.68
Bolívar	6.76	8.95	5.12	6.39
Caldas	7.69	8.23	4.22	4.48
Cauca	7.88	12.74	5.49	8.40
Cesar	16.20	16.20	-	-
Córdoba	3.85	8.03	5.00	8.06
Cundinamarca	4.70	5.34	5.27	5.27
Magdalena	12.28	14.55	8.91	9.90
Meta	7.18	8.33	5.65	6.57
Quindío	11.93	11.93	-	-
Riseralda	6.72	7.36	2.33	2.63
Sucre	4.94	11.00	4.55	8.11
Valle	9.73	11.69	6.29	6.55

(C) Professionals, Businessmen, Labor Unions. While there does exist some strong resistence to efforts in the field of family planning within the medical profession, in general the attitude of the majority is one of a favorable disposition towards and recognition of the need for expanded efforts in instruction and motivation for family planning. Even more enthusiastic in their support for family planning are the members and officials of various labor unions, and leaders of the business community.

(D) Church. As mentioned, Colombia is one of the "most Catholic" of countries - at least as evidenced by the concordat, which grants the church special influence in what are typically viewed in most countries as purely secular affairs.

The official attitude of the Church in Colombia is absolute obedience to Papal Authority - hence, it rejects any form of birth control other than the officially approved rhythm (Ogino) method. Nevertheless, this official attitude is not typically translated into active open campaigns against programs of family planning, with the exception of certain statements, declarations and publications (mostly in the form of pastoral letters) by individual high ranking members of the clergy. Furthermore, it is claimed that, acting extra officially, many priests tacitly approve of the efforts being made in family planning. In fact, some even encourage/advise their parishioners to visit a clinic, thereby assuaging possible deleterious effects on the patient as a result of the fear of incurring the Church's negative sanctions.

(E) The Press. The Colombian press is not disfavorable, and when it does treat the theme it makes generally favorable (or at least neutral) remarks.

(F) Public Opinion. Evidence suggests that there is a strong "felt need" for family planning in Colombia. Furthermore, there seems not to be any significant degree of satisfaction with the inefficient rhythm method.

(G) Private Organizations. The organization which has carried a large share of the private effort in organizing a nationwide family planning program in Colombia is the Colombian Association for the Welfare of the Family (Profamilia). This organization, chartered in 1966 as a non-profit organization, actually began operating clinics to provide family planning services in the same year it was organized, and has enlarged the scope of its program to the present time. (There are, at present, 32 clinics operating in 20 cities in Colombia). Support for the Profamilia program, under the Presidency of Dr. Fernando Tomayo, comes mainly from the International Planned Parenthood Federation, with which it is affiliated. However, Profamilia has also received support from the SIDA (1967), the American Friends Service Committee, or AFSC (1968 and 1969), from World Neighbors which supports the San Jose Clinic totally (1968 and 1969), as well as from local contributions. In addition, some portion of the costs of the program are covered by charging a nominal fee for services rendered to at least some of the patients.

Tables IX, X, and XI, present summary data for the various Profamilia clinics. Thus, Table IX presents the statistics on program achievements; Table X presents summary expenditures, by clinic, for the program over time, as well as the date of entry into the program for the various clinics; and, Table XI presents the aggregated cost per CYP, by departamento, for the years 1968, 1969, and 1970.

(H) Summary. Efforts to establish a nationwide program in family planning in Colombia are carried out by three principal organizations:

1. The Ministry of Health, with support from the Pan-American Health Organization.
2. The Population Division of ASCOFAME, with support from the Population Council.
3. Profamilia, with support from the International Planned Parenthood Association.

Additionally, these three organizations have also received substantial external assistance from:

Rockefeller Foundation
Ford Foundation
Church World Service
Pathfinder
World Neighbors

Results of the Statistical Analysis

(A) Statistical Procedure. The model employed in the analysis is the basic stochastic model for relationships among variables; that

TABLE IX

Profamilia - Program[1] Results, by Clinic[2], 1965 - 1970

	1970				
	IUD		Pills	Injec-tions	Dia-phragm
	Total Insertions	1st Insertions			
Armero	398	362	35		
Armenia	1804	1645	429		
Armenia, I.C.S.S.	157	157			
Bautista (B/quilla)	1087	964	134	90	
Seccion Atlántico (B/quilla)	1866	1764	127		
Piloto (Bogotá)	14901	10273	1109	336	183
Santa Maria (Bogotá)	240	216	155		
H. San Jose (Bogotá)	929	724			
C. de Salud #6, H. San Jose (Bogotá)	942	805	132	9	
H. Militar Central (Bogotá)	480	433	52	10	1
ICSS/San Pedro Clavo/Bogotá	6670	6670			
Kennedy (Bogotá)	317	271	25		
Las Colinas (Bogotá)	1108	941	190		
Plan Padrinos (Bogotá)	168	163	41		
Buenaventura	483	435	304		
Cali	3205	2943	756		
Cali, I.C.S.S.	750	750			
Cartegena	19	19	63	12	
Cúcuta	1156	1066	299		
Ibagué	1008	981	557		
Manizales	479	439	474	24	
Medellín	2318	2029	1355	326	
Montería	504	450	157		
Neiva	1294	1233	218	10	
Palmira	154	149	183	1	
Pasto	1448	1250	169		
Pereira	1965	1805	460	1	
Pereira, I.C.S.S.	245	245			
Puerto Bérrio	114	102	97	13	
S. Santander (B/manga)	2468	2299	408		
Sincelejo	209	209	172		
Sogamoso	716	631	14		
Santa Marta					
Villavicencio					
H. Infantil - Bogotá					
Total	49,602	42,423	8,115	832	184

1) All data in terms of 'number of new acceptors', except "total IUD insertions".

2) In Centro Piloto (1970) 92 vasectomies and 7 female sterilizations were also performed.

Source: Data derived from records on file in Profamilia's central office in Bogotá, Columbia.

TABLE IX (Cont.)

Profamilia - Program[1] Results, by Clinic[2], 1965 - 1970

	1969				
	IUD		Pills	Injec-tions	Dia-phragm
	Total Insertions	1st Insertions			
Armero	220	209	12		
Armenia	221	211	73		
Armenia, I.C.S.S.					
Bautista (B/quilla)	1023	910	59	31	
Seccion Atlántico (B/quilla)	1480	1426	55		
Piloto (Bogotá)	15741	12107	1073	372	123
Santa Maria (Bogotá)	250	220	159		
H. San Jose (Bogotá)	1265	975	3		
C. de Salud #6, H. San Jose (Bogotá)	948	763	53		
H. Militar Central (Bogotá)	159	145	27	2	
ICSS/San Pedro Clavo/Bogotá	4252	4252			
Kennedy (Bogotá)	104	98	19		
Las Colinas (Bogotá)	164	143	42		
Plan Padrinos (Bogotá)	267	263	108		
Buenaventura	607	581	112		
Cali	1144	1113	278		
Cali, I.C.S.S.					
Cartegena					
Cúcuta	1504	1422	134		
Ibagué	856	841	305		
Manizales	449	406	230	6	
Medellín	3246	2875	1293	163	
Montería	472	435	75	3	
Neiva	651	626	111	1	
Palmira					
Pasto	1459	1341	118		
Pereira	831	803	182		
Pereira, I.C.S.S.					
Puerto Bérrio	128	125	145	1	
S. Santander (B/manga)	3190	3050	222		
Sincelejo					
Sogamoso	735	678	19		
Santa Marta					
Villavicencio					
H. Infantil - Bogotá					
Total	41,366	36,018	4,907	579	123

1) All data in terms of 'number of new acceptors', except "total IUD insertions".

2) In Centro Piloto (1970) 92 vasectomies and 7 female sterilizations were also performed.

Source: Data derived from records on file in Profamilia's central office in Bogotá, Columbia.

TABLE IX (Cont.)

Profamilia - Program[1] Results, by Clinic[2], 1965 - 1970

	1968			
	IUD		Pills	Injec-tions	Dia-phragm
	Total Insertions	1st Insertions			
Armero					
Armenia	11	11			
Armenia, I.C.S.S.					
Bautista (B/quilla)	1119	980	28	13	
Seccion Atlántico (B/quilla)	149	140	29		
Piloto (Bogotá)	11601	9713	240	215	
Santa María (Bogotá)	84	80	60		
H. San Jose (Bogotá)	1097	1097			
C. de Salud #6, H. San Jose (Bogotá)	1143	894	37		
H. Militar Central (Bogotá)					
ICSS/San Pedro Clavo/Bogotá					
Kennedy (Bogotá)					
Las Colinas (Bogotá)					
Plan Padrinos (Bogotá)					
Buenaventura	21	21	8		
Cali					
Cali, I.C.S.S.					
Cartegena					
Cúcuta	647	614	19		
Ibagué	148	147	22		
Manizales					
Medellín	2755	2504	1207	8	
Montería					
Neiva	170	167	36		
Palmira					
Pasto	147	146	22		
Pereira					
Pereira, I.C.S.S.					
Puerto Bérrio	14	14	9	1	
S. Santander (B/manga)	75	74	1		
Sincelejo					
Sogamoso	368	354	4		
Santa Marta	4	4	1		
Villavicencio					
H. Infantil - Bogotá					
Total	19,553	16,960	1,723	237	

1) All data in terms of 'number of new acceptors', except "total IUD insertions".

2) In Centro Piloto (1970) 92 vasectomies and 7 female sterilizations were also performed.

Source: Data derived from records on file in Profamilia's central office in Bogotá, Columbia.

TABLE IX (Cont.)

Profamilia - Program[1] Results, by Clinic[2], 1965 - 1970

	1967				
	IUD		Pills	Injec-tions	Dia-phragm
	Total Insertions	1st Insertions			
Armero					
Armenia					
Armenia, I.C.S.S.					
Bautista (B/quilla)	943	886	10		
Seccion Atlántico (B/quilla)					
Piloto (Bogotá)	18485	16816	390	91	
Santa Maria (Bogotá)					
H. San Jose (Bogotá)	71	71			
C. de Salud #6, H. San Jose (Bogotá)	1171	1050	36		
H. Militar Central (Bogotá)					
ICSS/San Pedro Clavo/Bogotá					
Kennedy (Bogotá)					
Las Colinas (Bogotá)					
Plan Padrinos (Bogotá)					
Buenaventura					
Cali					
Cali, I.C.S.S.					
Cartegena					
Cúcuta					
Ibagué					
Manizales					
Medellín	1077	1018	4		
Montería					
Neiva					
Palmira					
Pasto					
Pereira					
Pereira, I.C.S.S.					
Puerto Bérrio					
S. Santander (B/manga)					
Sincelejo					
Sogamoso					
Santa Marta					
Villavicencio	1989	1952	39		
H. Infantil - Bogotá					
Total	23,736	21,793	479	91	

1) All data in terms of 'number of new acceptors', except "total IUD insertions".

2) In Centro Piloto (1970) 92 vasectomies and 7 female sterilizations were also performed.

Source: Data derived from records on file in Profamilia's central office in Bogotá, Columbia.

TABLE IX (Cont.)

Profamilia - Program[1] Results, by Clinic[2], 1965 - 1970

	1966				
	IUD		Pills	Injec-tions	Dia-phragm
	Total Insertions	1st Insertions			
Armero					
Armenia					
Armenia, I.C.S.S.					
Bautista (B/quilla)					
Seccion Atlántico (B/quilla)					
Piloto (Bogotá)	6305	6075	20		
Santa María (Bogotá)					
H. San Jose (Bogotá)					
C. de Salud #6, H. San Jose (Bogotá)	243	237	55		
H. Militar Central (Bogotá)					
ICSS/San Pedro Clave/Bogotá					
Kennedy (Bogotá)					
Las Colinas (Bogotá)					
Plan Padrinos (Bogotá)					
Buenaventura					
Cali					
Cali, I.C.S.S.					
Cartegena					
Cúcuta					
Ibagué					
Manizales					
Medellín	61	61	1		
Montería					
Neiva					
Palmira					
Pasto					
Pereira					
Pereira, I.C.S.S.					
Puerto Bérrio					
S. Santander (B/manga)					
Sincelejo					
Sogamoso					
Santa Marta					
Villavicencio					
H. Infantil - Bogotá	171	163	27		
Total	6,780	6,536	103		

1) All data in terms of 'number of new acceptors', except "total IUD insertions".

2) In Centro Piloto (1970) vasectomies and 7 female sterilizations were also performed.

Source: Data derived from records on file in Profamilia's central office in Bogotá, Columbia.

TABLE IX (Cont.)

Profamilia - Program[1] Results, by Clinic[2], 1965 - 1970

	1965				
	IUD		Pills	Injec-tions	Dia-phragm
	Total Insertions	1st Insertions			
Armero					
Armenia					
Armenia, I.C.S.S.					
Bautista (B/quilla)					
Piloto (Bogotá)	83	83			
Santa Maria (Bogotá)					
H. San Jose (Bogotá)					
C. de Salud #6, H. San Jose (Bogotá)					
H. Militar Central (Bogotá)					
ICSS/San Pedro Clavo/Bogotá					
Kennedy (Bogotá)					
Las Colinas (Bogotá)					
Plan Padrinos (Bogotá)					
Buenaventura					
Cali					
Cali, I.C.S.S.					
Cartegena					
Cúcuta					
Ibagué					
Manizales					
Medelín					
Montería					
Neiva					
Palmira					
Pasto					
Pereira					
Pereira, I.C.S.S.					
Puerto Bérrio					
S. Santander (B/manga)					
Sincelejo					
Sogamoso					
Santa Marta					
Villavicencio					
H. Infantil - Bogotá					
Total	83	83			

1) All data in terms of 'number of new acceptors', except "total IUD insertions".

2) In Centro Piloto (1970) vasectomies and 7 female sterilizations were also performed.

Source: Data derived from records on file in Profamilia's central office in Bogotá, Columbia.

TABLE X

Clinic Expenditures, 1968-1970, for Profamilia*

	1970	1969	1968
Armero (11/68)	$ 6,436.07	$ 7,070.18	$ 458.96
Armenia (9/69)	23,134.60	8,093.48	--
Armenia, I.C.S.S. (5/70)		--	--
Barranquilla, Bautista (5/67)	14,400.71	13,968.25	5,366.91
Barranquilla, S. Atlantico (7/68)	25,398.90	24,444.53	10,095.71
Bucaramanga, S. Santander (11/68)	31,470.18	32,848.15	3,255.05
Buenaventura (10/68)	13,772.12	13,177.47	2,199.50
Bogotá, H. Militar (7/69)	19,404.48	14,587.88	--
Bogotá, I.C.S.S. (5/69)	39,726.00	30,626.63	--
Bogotá, H. San Jose (8/66)	18,938.56	23,998.30	6,556.74
Bogotá, Centro #6 (8/66)			
Bogotá, Plan Padrinos (4/69)	5,541.30	5,352.84	--
Bogotá, Sta. Maria (6/68)	5,292.59	6,980.38	607.06
Bogotá, Kennedy (8/69)	5,278.36	7,058.88	--
Bogotá, Las Colinas (9/69)	50,817.67	47,618.25	--
Bogotá, Unidad Piloto (9/65)	150,970.79	178,403.32	175,698.73
Cali (3/69)	45,861.97	25,182.81	--
Cali, I.C.S.S. (9/70)		--	--
Cartagena (9/70)	5,065.78	--	--
Cúcuta (2/68)	18,434.75	21,617.73	6,618.89
Ibagué (9/68)	18,339.63	17,016.94	4,193.12
Manizales (1/69)	16,881.19	16,847.06	387.80
Medellín (9/66)	51,391.77	53,346.59	23,010.76
Montería (4/69)	9,380.69	10,521.81	159.04
Neiva (6/68)	19,149.32	13,924.03	1,688.70
Palmira (5/70)	9,449.26	--	--
Pasto (8/68)	19,346.59	19,383.19	4,455.77
Pereira (7/69)	28,911.11	14,249.47	--
Pereira, I.C.S.S. (1/70)		--	--
Puerto Bérrio (11/68)	5,627.83	5,833.12	585.29
Sincelejo (6/70)	7,725.26	--	--
Sogamoso (2/68)	11,069.67	11,813.33	2,986.88
Total	$677,217.93	$622,964.62	$249,460.02

* We do not list, for 1968, Sta. Marta clinic expenditures totalling $1,135.11. Also, Profamilia program expenditures for 1967 and 1966 totalled $114,083.05 and $38,467.01, respectively. Finally, Profamilia expenditures, by clinic, for 1968, 1969, and 1970 in Table X differ

TABLE X Cont'd.

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from expenditure figures on file in Profamilia's central office in Bogota because (a) we have imputed rent, services, etc. to participating clinics which are not fully supported with Profamilia funds, and (b) we have allocated central office and laboratory expenditures among the clinics as described above in the section dealing with ASCOFAME's Post-Partum program.

Source: Data derived from accounting records on file in Profamilia's central office in Bogota, Colombia.

TABLE XI

Cost per CYP* for Profamilia Program, by Departamento, 1968-1970

	1970	1969	1968
Antioquia	$14.54	$12.86	$ 6.30
Atlántico	12.92	15.48	12.99
Bogotá, D.E.	12.60	14.97	14.82
Bolívar	53,32	-	-
Boyacá	17.16	16.94	8.34
Caldas	18.02	26.24	-
Córdoba	15.45	20.51	-
Huila	13.11	18.87	8.31
Nariño	13.63	13.29	26.52
Norte de Santander	13.50	13.89	10.46
Quindío	10.37	28.50	-
Riseralda	11.51	14.47	-
Santander	11.62	10.04	43.40
Sucre	20.28	-	-
Tolima	12.80	17.62	25.84
Valle	12.51	18.41	75.84

* Since the Profamilia data on program results is almost totally in terms of new acceptors, (except for 99 sterilizations performed in one clinic in 1970), cost per CYP and cost per new acceptor are virtually the same.

is, we employ the classical linear regression model. Specifically, the following are the stages of the analysis:

(1) We executed simple two-variable regressions of each of the three dependent variables - cost/CYP for Profamilia, cost/CYP for ASCOFAME, cost/new acceptor for ASCOFAME - on each of the independent variables (see Appendix A for the matrix of observations, by departamento, for the socio-economic variables employed in the analysis).

(2) Because of the need to pool cross-section and time series data for the departamentos (in order to increase our number of observations) for which there were an unequal number of observations among departamentos, we employed a weighted regression technique which, in effect, eliminated statistical bias by transforming all of the observed values for the k independent variables and our dependent variables by the weight given by the square root of the inverse of the observed value for all variables.

(3) Finally, we also employed the multi-variate regression model using the "step-wise" option in which

(a) A regression is run with a set of k independent variables.

(b) The regression is rerun (that is, successive iterations are executed) with that variable omitted for which the ratio of the regression coefficient to its standard error is the smallest of all such ratios, until a

regression is run in which all variables attain statistical significance at the 95% level of confidence.

(B) Summary of Results. Tables XII, XIII, and XIV present a summary view of our statistical findings. Table XII incorporates the statistically significant variables for all of the two-variable regressions executed. Table XIII shows the step-wise process of elimination when an intermediate model employing ten explanatory variables was run, as well as the final statistical results; and, Table XIV shows the same data when our final model, employing seven explanatory variables, was run.

(C) Interpretation of Results. Examination of the results obtained from the execution of our final model indicates the following:

(1) Regression of all three of our dependent variables on selected independent variables yields the conclusion that the number of inhabitants per hospital bed is the most important explanatory variable. Thus, for example, using Profamilia cost/CYP as the dependent variable, our results imply that a one unit increase in the number of inhabitants per hospital bed will cause a 1.8 cent increase in the cost of providing contraceptive protection to a woman for one year, all other variables being held constant. Similar interpretations may be given to the other regression coefficients found in Table XIV.

TABLE XII

Significant Results for the Two-Variable Regressions Executed

	Regression Coefficient	Student t	Constant	Constant's Student t	$\bar{R}^2$	F-ratio
(a) Dependent Variable:						
(19) Profamilia $\frac{\text{Cost}}{\text{CYP}}$						
Independent Variables:						
(21) Percent urban	0.182	1.72	6.04	1.62	0.05	2.96
(23) Inhabitants per hospital bed	0.016	1.96	3.19	1.99	0.07	3.83
(27) Kilometers of roads	-0.002	1.67	15.23	6.11	0.04	2.79
(31) Real income per worker in manufacturing	0.002	1.95	4.63	1.16	0.06	3.80
(35) Nurses per 100,000 inhabitants	0.529	2.37	6.99	2.77	0.10	5.66
(b) Dependent Variable:						
(19) ASCOFAME $\frac{\text{Cost}}{\text{New Acceptor}}$						
Independent Variables:						
(20) Density of population	-0.0059	2.18	6.45	10.13	0.12	4.77
(22) Percent rural	0.084	2.52	2.91	2.23	0.16	6.32
(23) Number of inhabitants per hospital bed	0.006	2.51	3.09	2.49	0.16	6.32
(24) Number of hospitals per 100,000 inhabitants	1.615	2.94	1.68	1.10	0.22	8.64
(25) General mortality	0.334	1.45	3.98	2.77	0.04	2.09
(26) Infant mortality	0.042	1.66	3.63	2.79	0.06	2.74
(27) Kilometers of roads	-0.001	2.65	7.73	9.62	0.18	7.02

TABLE XII Cont'd.

	Regression Coefficient	Student t	Constant	Constant's Student t	$\bar{R}^2$	F-ratio
(28) Number of vehicles per 1,000 inhabitants	-0.217	1.92	7.88	6.55	0.09	3.69
(29) Per capita beef consumption	-0.059	2.37	7.65	8.10	0.14	5.61
(30) Per capita pork consumption	-0.462	2.15	7.44	7.98	0.11	4.64
(32) Real gross product in manufacturing	-0.000002	2.86	6.94	10.44	0.21	8.18
(33) Real aggregate value added in manufacturing	-0.0000045	2.79	6.86	10.44	0.20	7.78
(34) Physicians per 10,000 inhabitants	-0.597	2.58	7.66	8.59	0.17	6.68
(35) Nurses per 100,000 inhabitants	-0.123	1.55	7.42	6.34	0.05	2.39
(c) Dependent Variable:						
(19) ASCOFAME $\frac{\text{Cost}}{\text{CYP}}$						
Independent Variables:						
(20) Density of population	-0.0046	1.71	5.30	8.30	0.06	2.93
(22) Percent rural	0.071	2.12	2.35	1.80	0.11	4.48
(23) Number of inhabitants per hospital bed	0.0048	2.11	2.51	-2.02	0.11	4.53
(24) Number of hospitals per 100,000 inhabitants	1.877	3.79	-0.026	-0.02	0.33	14.40
(25) General mortality	0.350	1.57	2.86	2.06	0.05	2.46
(26) Infant mortality	0.042	1.63	2.73	1.92	0.06	2.67
(27) Kilometers of roads	-0.00078	1.66	6.06	6.48	0.06	2.74

TABLE XII Cont'd.

	Regression Coefficient	Student t	Constant	Constant's Student t	$\bar{R}^2$	F-ratio
(28) Number of vehicles per 100,000 inhabitants	-0.180	1.62	6.52	5.47	0.06	2.61
(29) Per capita beef consumption	-0.04	1.70	6.15	6.39	0.06	2.89
(30) Per capita pork consumption	-0.362	1.68	6.07	6.50	0.06	2.82
(32) Real gross product in manufacturing	-0.0000015	2.04	5.64	8.19	0.10	4.15
(33) Real aggregate value added in manufacturing	-0.0000033	1.96	5.57	8.18	0.09	3.03
(34) Physicians per 10,000 inhabitants	-0.462	1.96	6.23	6.86	0.10	3.85

TABLE XIII

Results for Intermediate Model

	Variable Dropped on Successive Step-Wise Iterations (t=1.65)								Regression Coefficient	Student t	$\bar{R}^2$	F-Ratio	Beta Coeff.	Coeff. of Determinate of Correlation Matrix
	#1	#2	#3	#4	#5	#6	#7	#8						
(a)														
Dependent Variable:														
(19) Profamilia $\frac{\text{Cost}}{\text{CYP}}$														
Independent Variables:														
(21) Percent urban			21											
(23) Number of inhabitants per hospital bed	23													
(25) General mortality					25									
(27) Kilometers of roads		27												
(28) Number of vehicles per 1,000 inhabitants								28						
(29) Per capita beef consumption							29							
(31) Real income per worker in manufacturing				31										
(33) Real aggregate value added in manufacturing									-0.00000258	4.54			-0.76	
(34) Physicians per 10,000 inhabitants						34								
(35) Nurses per 100,000 inhabitants									1.306	5.25			0.89	
Constant = 4.80										2.28	.41	14.60		0.53

TABLE XIII Cont'd.

	Variable Dropped on Successive Step-Wise Iterations (t=1.65)								Regression Coefficient	Student t	$\bar{R}^2$	F-Ratio	Beta Coeff.	Coeff. of Determinate of Correlation Matrix
	#1	#2	#3	#4	#5	#6	#7	#8						
(b)														
Dependent Variable:														
(19) ASCOFAME $\frac{\text{Cost}}{\text{CYP}}$														
Independent Variables:														
(21) Percent urban									0.077	2.74			0.38	
(23) Number of inhabitants per hospital bed									0.0099	5.22			0.78	
(25) General mortality									0.7387	4.55			0.62	
(27) Kilometers of roads					27									
(28) Number of vehicles per 1,000 inhabitants		28												
(29) Per capita beef consumption				29										
(31) Real income per worker in manufacturing									0.00111	3.75			0.50	
(33) Real aggregate value added in manufacturing									-0.00000378	2.81			-0.42	
(34) Physicians per 10,000 inhabitants	34													
(35) Nurses per 100,000 inhabitants			35											
Constant = -10.68										-4.45	.67	11.82	0.26	0.07

TABLE XIII Cont'd.

	Variable Dropped on Successive Step-Wise Iterations (t=1.65)								Regression Coefficient	Student t	$\bar{R}^2$	F-Ratio	Beta Co-Eff.	Coeff. of Determinate of Correlation Matrix
	#1	#2	#3	#4	#5	#6	#7	#8						
(c)														
Dependent Variable:														
(19) ASCOFAME $\frac{\text{Cost}}{\text{New Acceptor}}$														
Independent Variables:														
(21) Percent urban	21													
(23) Number of inhabitants per hospital bed									0.0109	3.81			0.84	
(25) General mortality									0.661	3.85			0.54	
(27) Kilometers of roads		27												
(28) Number of vehicles per 1,000 inhabitants									0.243	1.88			0.40	
(29) Per capita beef consumption									-0.0469	1.89			-0.33	
(31) Real income per worker in manufacturing									-0.00115	3.64			0.50	
(33) Real aggregate value added in manufacturing									-0.00000298	2.18			-0.32	
(34) Physicians per 10,000 inhabitants				34										
(35) Nurses per 100,000 inhabitants			35											
Constant = -7.98										-2.49	.64	8.90		0.07

TABLE XIV

Results of Final Model

	Variable Dropped on Successive Step-Wise Iterations (t=1.65)					Regression Coefficient	Student t	$\bar{R}^2$	F-Ratio	Beta Coeff.	Coeff. of Determinate of Correlation Matrix
	#1	#2	#3	#4	#5						
(a)											
Dependent Variable:											
(19) Profamilia $\frac{\text{Cost}}{\text{CYP}}$											
Independent Variables:											
(23) Number of inhabitants per hospital bed						0.018	2.34			0.34	
(24) Number of hospitals per 100,000 inhabitants	24										
(25) General mortality		25									
(29) Per capita beef consumption			29								
(31) Real income per worker in manufacturing						0.0025	2.33			0.34	
(33) Real aggregate value added in manufacturing					33						
(34) Physicians per 10,000 inhabitants				34							
Constant = -2.65							-0.54	0.16	4.86		0.98

TABLE XIV Cont'd.

	Variable Dropped on Successive Step-Wise Iterations (t=1.65)					Regression Coefficient	Student t	$\bar{R}^2$	F-Ratio	Beta Coeff.	Coeff. of Determinate of Correlation Matrix
	#1	#2	#3	#4	#5						
(b)											
Dependent Variable:											
(19) ASCOFAME $\frac{\text{Cost}}{\text{CYP}}$											
Independent Variables:											
(23) Number of inhabitants per hospital bed						0.0073	4.19			0.58	
(24) Number of hospitals per 100,000 inhabitants						1.6267	3.79			0.52	
(25) General mortality						0.3996	2.22			0.34	
(29) Per capita beef consumption	29										
(31) Real income per worker in manufacturing				31							
(33) Real aggregate value added in manufacturing			33								
(34) Physicians per 10,000 inhabitants		34									
Constant = -7.29						-5.18	-3.10	0.58	11.01		0.67

TABLE XIV Cont'd.

	Variable Dropped on Successive Step-Wise Iterations (t=1.65) #1	#2	#3	#4	#5	Regression Coefficient	Student t	$\bar{R}^2$	F-Ratio	Beta Coeff.	Coeff. of Determinate of Correlation Matrix
(c)											
Dependent Variable:											
(19) ASCOFAME $\frac{\text{Cost}}{\text{New Acceptor}}$											
Independent Variables:											
(23) Number of inhabitants per hospital bed						0.00897	4.19			0.69	
(24) Number of hospitals per 100,000 inhabitants	24										
(25) General mortality						0.5838	3.35			0.48	
(29) Per capita beef consumption			29								
(31) Real income per worker in manufacturing						0.0011	3.24			0.47	
(33) Real aggregate value added in manufacturing						-0.00000342	2.40			-0.37	
(34) Physicians per 10,000 inhabitants		34									
Constant = -5.34							-2.26	0.59	10.79		0.42

(2) In general, examination of Table XIV indicates that the increased abailability of health services, in the form of available hospital beds, would lower average program costs. Similarly, we note that the expected direct relationship between mortality and program costs is found to be statistically significant. In other words, the hypothesis that higher levels of mortality implies a lower receptivity towards the acceptance of family planning, because the family may not have attained desired family size, and hence, ceteris paribus, higher program costs for a given level of resources expended to provide family planning services, is confirmed. And, finally, the hypothesis that increased industrialization will lower program costs is confirmed by the value added in manufacturing variable, which may be interpreted as confirming the often-stated hypothesis that industrialization increases the likelihood that a population would become more receptive to family planning.

(3) Finally, we note that the estimating equations explain respectively, 16%, 58%, and 59% of the variation in cost, by departamento, when one or another of our three dependent variables are regressed on the explanatory variables, and that the estimates derived for the model are significant, as is the total equation.

(D) Conceptual Problems. Need for further research.

(1) In general, results obtained from the regression analysis when Profamilia cost/CYP was used as the dependent variable rather than ASCOFAME cost/CYP or ASCOFAME cost/new acceptor, supports the researcher's view that the two programs differ significantly in the following manner: the Profamilia program is essentially an urban program, whereas the ASCOFAME program, conducted mainly in University hospitals throughout the country, is less homogeneous with respect to many of the explanatory variables we have tested in this analysis, by departamento. Thus, the fact that "better" results are obtained from the ASCOFAME regressions simply means that the ASCOFAME data was more suited for the types of variables employed in the analysis. Further, we feel that, of the three programs presently operative in Colombia, and discussed in earlier sections of this chapter, the Ministry of Health program, should the data become available, would be the preferred program to investigate along the lines of differences among regions, since the Ministry program is the most heterogeneous of the three.

(2) The conceptual problem noted above implies, of course, that variations among costs for the Profamilia program can be better explained by investigating differences among urban areas rather than differences among regions, or departamentos.

Ethnic composition, or primary type of economic activity, by city, for example, would seem on *a priori* grounds to be more suitable variables for explaining observed variations in costs per unit of output.

Appendix A

Columbia - Setting Variables, by Departamento

1) Departamento	Population Density, 1967	Percent Urban, 1964	Percent Rural, 1964	No. of Inhabitants per Hospital Bed, 1970
Antioquia	42.11	55.35	44.65	494
Atlántico	236.60	93.59	6.41	582
Bogotá, D. E.	1204.99	98.40	1.60	272
Bolívar	28.09	60.02	39.98	587
Boyacá	16.25	18.38	81.62	705
Caldas	102.12	56.15	43.85	364
Cauca	20.83	21.92	78.08	939
Cesar	12.42	3) 53.71	3) 46.29	912
Córdoba	25.36	32.22	67.78	1115
Cundinamarca	51.18	25.94	74.06	239
Choco	4.04	22.07	77.93	649
Huila	21.90	41.07	58.93	706
Guajira	8.53	39.36	60.64	1285
Magdalena	25.14	53.71	46.29	797
Meta	2.21	44.88	55.12	515
Nariño	23.56	27.03	72.97	391
Norte de Santander	26.89	48.61	51.39	460
Quindío	174.41	3) 56.15	3) 43.85	116
Risaralda	116.07	3) 56.15	3) 43.85	[illegible]
Santander	33.72	42.16	57.84	2[illegible]
Sucre	31.14	3) 60.02	3) 39.98	1193
Tolima	36.90	43.16	56.84	536
Valle de Cauca	87.08	71.34	28.66	548

Appendix A (Cont.)

Columbia - Setting Variables, by Departamento

1) Departamento	No. of Hospitals per 100,000 inhabitants, 1970	General Mortality, for 1968	Infant Mortality, for 1968	Kilometers of Roads, 1969
Antioquia	4	9.22	77.65	5483
Atlántico	6	6.67	54.39	756
Bogotá, D. E.	2	6.62	58.53	---
Bolívar	3	2.69	2) 41.27	588
Boyacá	3	8.78	68.74	3748
Caldas	4	10.33	96.69	1716
Cauca	3	12.82	114.05	1152
Cesar	6	2) 7.31	69.68	1028
Córdoba	2	3.66	34.02	1394
Cundinamarca	4	9.70	75.79	4718
Choco	4	2) 9.45	2) 100.45	267
Huila	4	10.11	87.42	2668
Guajira	3	2) 1.80	2) 14.78	684
Magdalena	3	2) 4.80	41.10	1377
Meta	5	10.20	83.30	2092
Nariño	3	11.49	95.55	1060
Norte de Santander	4	11.15	79.13	2728
Quindío	4	10.72	103.68	545
Riseralda	4	9.78	101.76	1053
Santander	4	9.96	73.90	3547
Sucre	2	2) 4.03	2) 23.27	586
Tolima	5	9.76	83.52	5531
Valle de Cauca	3	8.90	86.08	4449

Appendix A (Cont.)

Columbia - Setting Variables, by Departamento

1) Departamento	Number of Vehicles per 1000 inhabitants, 1967	Per Capita Beef Consumption in kilos, 1969	Per Capita Pork Consumption in kilos, 1969	Real Income per Worker in Manufacturing, 1967, in pesos
Antioquia	10	35.57	4.18	7447
Atlántico	21	31.04	2.49	6688
Bogotá, D. E.	27	---	---	7007
Bolívar	10	19.58	2.18	8392
Boyacá	8	20.29	1.63	6814
Caldas	22	45.97	5.43	5236
Cauca	5	27.33	2.04	5039
Cesar	7	23.23	1.81	7398
Córdoba	7	16.92	2.84	3255
Cundinamarca	20	118.09	12.99	7998
Choco	1	8.48	2.13	2031
Huila	8	35.11	3.68	5406
Guajira	2	14.26	1.29	3404
Magdalena	9	15.92	1.01	7706
Meta	9	67.76	4.30	5758
Nariño	6	14.94	3.24	3664
Norte de Santander	11	39.18	2.40	4415
Quindío	3) 22	53.43	6.39	3931
Riseralda	3) 22	45.32	6.84	5096
Santander	13	35.40	3.82	6271
Sucre	3) 10	23.97	3.41	2367
Tolima	11	47.39	3.23	5180
Valle de Cauca	15	48.17	4.99	7884

Appendix A (Cont.)

Columbia - Setting Variables, by Departamento

1) Departamento	Real Gross Product in Manufacturing, 1967 (000 of pesos)	Real Aggregate Value in Manufacturing	Physicians per 10,000 Inhabitants	Nurses per 10,000 Inhabitants
Antioquia	3,221,013	1,526,660	5.41	35.1
Atlántico	1,222,669	535,068	6.05	10.6
Bogotá, D. E.	3,368,003	1,374,009	15.74	34.2
Bolívar	619,512	238,391	5.36	28.5
Boyacá	566,343	162,950	1.54	9.7
Caldas	294,070	110,954	3.46	10.5
Cauca	130,607	50,801	2.06	13.6
Cesar	94,644	23,568	1.72	3) 14.1
Córdoba	63,654	10,390	2.73	2.2
Cundinamarca	710,229	287,845	2.14	31.1
Choco	1,172	278	2.20	4.5
Huila	80,023	24,423	2.57	11.5
Guajira	21,100	1,119	2.38	8.5
Magdalena	70,444	40,986	3.22	14.1
Meta	66,610	23,894	3.92	9.6
Nariño	99,830	40,036	1.73	9.4
Norte de Santander	152,968	57,733	3.22	9.0
Quindío	271,392	51,045	3.62	3) 10.5
Riseralda	413,033	132,187	3.29	3) 10.5
Santander	752,682	356,903	3.18	9.2
Sucre	6,627	2,647	2.43	3) 28.5
Tolima	255,092	73,178	2.26	5.2
Valle de Cauca	3,105,324	1,307,853	6.93	24.0

Notes:

1) Cesar was created as a dept. in 1967, separated from Magdalena

Guajira was elevated to status of dept. in 1964

Quindío and Riseralda were created as dept. in 1966, separated from Caldas

Sucre was created as dept. in 1966, separated from Bolívar

Guainia was created as comisaria in 1963, separated from Vaupes

Putumayo was elevated as intendencia in 1968

2) Registration deficient

3) Data refers to pre-1969 political sub-divisions

Sources (by column):

#1 Dane. General Statistical Yearbook, Volume 1, p. 14.

#2,3 Dane. Census 1964, p. 41.

#4 Dane. INPES Cistado de Institutionces de Atencion Medica.

#5 Dane. Banco de Datos. Proyecciones de Población y Estudio de Instituciones de atención médica del INPES.

#6,7 Dane, Banco de Datos. Tabulado de Demographia, 1968.

#8 Dane, Datos Suninistrados por el nunistino de Obras Publicas y Secretaría de Ohras Públicas Departamentales.

#9 Dane. Separata Transportes, 1967.

#10
#11 Dane. Boletin Mensual. No. 233, Dec. 1970, p. 30.

#12 Dane. Boletin Mensual. No. 236, Mar. 1971, p. 82.

#13,
14 Dane. Boletin Mensual. No. 236, Mar. 1971, p. 83.

#15 Asociacion Colombiana de Facultades de Medícina. Directorio Medico Colombiano. ASCOFAME: Bogota, D. E., May 1968.

#16 Asociacion Colombiana de Facultades de Medícina. Recursos de Enfermerica: Aspectos Generales. ASCOFAME: Bogota, D. E., 1967.

CHAPTER VIII

COMPARATIVE COSTS OF FAMILY PLANNING

Introduction

In this chapter we return to our earlier (Phase II) efforts to look cross-nationally at family planning program costs and outputs. In addition to the six covered in our earlier efforts and the four analyzed in Chapter VII, we have added output and cost data from secondary sources dealing with 6 other programs. Our procedure will follow the methodology outlined in Chapter II: we first present the basic cost and output series (Table I); next relate the resulting cost per unit series to various plausible socio-economic setting variables (Tables II and III); finally relate the cost per unit series to program-related variables, especially volume (Table IV).

First let us return to some of the basic conceptual problems arising in this analysis and indicate how we dealt with them.

Inter-Country CYP Comparisons

As indicated above, the calculation of CYP Index for any given program is relatively simple. Making a comparison of the level of output achieved by different national programs is also relatively simple. However, there are also some new problems which arise in the inter-country comparisons.

TABLE I

Costs and Ouput of Selected Family Planning Programs

	Total Cost (Thous. of U.S. Dollars)	Total Output: Thous. of CYP's	Total Output: Thous. of Acceptors	Cost per CYP	Cost per Acceptor
India					
1961-62	3,069.	1,039.	104.6	$ 2.95	$29.22
1962-63	5,940.	1,515.	157.9	3.95	37.59
1963-64	5,511.	1,510.	170.2	3.65	32.42
1964-65	10,450.	2,478.	269.5	4.22	38.70
1965-66	11,825.	6,055.	1,289.6	1.95	9.17
1966-67	20,521.	9,108.	1,785.6	2.25	11.49
1967-68	39,810.	15,854.	2,490.5	2.51	15.99
1968-69	44,261.	14,276.	2,142.4	3.10	20.66
Korea					
1964	1,149.	691.	290.	1.66	3.96
1965	1,450.	940.	430.	1.54	3.37
1966	2,614.	1,344.	568.	1.94	4.60
1967	2,804.	1,131.	477.	2.48	5.88
1968	6,038.	926.	487.	6.52	12.40
Taiwan					
1964	141.	115.	50.2	1.20	2.82
1965	501.	248.	99.3	2.13	5.06
1966	484.	283.	111.2	1.72	4.36
1967	461.	307.	121.1	1.84	3.81
1968	689.	325.	123.7	2.21	5.56
Chile					
1964	163.	30.	11.7	5.48	13.58
1965	302.	72.	25.7	4.18	11.62
1966	791.	109.	37.6	7.28	20.82
1967	766.	136.	39.9	5.62	19.15
1968	1,278.	184.	60.0	6.95	21.30
Pakistan					
1965-66	6,780.	1,035.	258.	6.55	26.28
1966-67	11,091.	2,808.	637.	3.95	17.41
1967-68	15,434.	5,532.	1,023.	2.79	15.09

TABLE I Cont'd.

	Total Cost (Thous. of U.S. Dollars)	Total Output Thous. of CYP's	Total Output Thous. of Acceptors	Cost per CYP	Cost per Acceptor
Tunisia					
1968	826.	40.	16.	$20.00	$51.62
Hong Kong					
1963	148.	37.9	14.3	3.89	10.53
1964	158.	59.8	21.4	2.63	7.55
1965	199.	109.7	35.3	1.81	5.68
1966	209.	73.2	23.1	2.86	9.07
1967	235.	65.8	19.3	3.56	12.40
1968	273.	64.4	26.6	4.27	10.12
Thailand					
1968	1,026.	215.8	57.3	4.76	17.91
1969	1,528.	364.0	130.7	4.34	11.69
1970	2,385.	581.2	180.0	4.10	10.60
Malaysia					
1967	4,062.	22.0	20.7	18.45	21.80
1968	7,356.	53.5	74.9	13.74	10.90
1969	9,390.	75.4	115.4	12.45	9.04
1970	10,944.	94.8	148.5	11.55	8.19
Singapore					
1963	44.3	8.65	8.4	5.12	5.25
1964	53.7	9.18	9.3	5.85	5.74
1965	58.3	11.54	9.8	5.05	5.93
1966	110.9	28.1	34.0	3.95	3.26
1967	122.9	26.7	33.0	4.60	3.72
1968	206.8	57.3	36.8	3.61	5.62
1969	237.1	81.7	36.6	2.90	6.47
Ceylon					
1967-69*	900.1	114.	145.	7.89	6.21

TABLE I Cont'd.

	Total Cost (Thous. of U.S. Dollars)	Total Output: Thous. of CYP's	Total Output: Thous. of Acceptors	Cost per CYP	Cost per Acceptor
Jamaica					
1965	24.	4.	5.8	$ 5.84	$ 4.05
1966	48.	10.	14.	4.80	3.43
1967	205.	14.	19.	14.62	10.77
1968	537.	21.4	30.	25.08	17.90
Nepal†					
1968-69	220.	15.1	5.0	14.66	44.00
U.A.R.†					
1967	3,450.	875.	600.	3.10	5.75
Colombia					
1968	249.5	18.9	18.9	13.18	13.18
1969	731.9	69.5	66.7	10.53	10.98
1970	873.2	83.4	78.2	10.47	11.16

* Three year average
† Projected Budgets

TABLE II

Costs per Unit of Family Planning in Relation to Indicators of Socio-Economic Development*

		Cost per CYP	Income per Capita	Percent Urban	Adult Literacy Rate	Infant Mortality Rate	Inhabitants per Physician	Population Growth Rate	Kilometers of Roads per 100 sq. Kilometer	Population Density per sq. Kilometer
1	Chile	6.95	450.	70.0	84.0	120.	2,100	2.4	6.7	13.
2	Tunisia	20.00	180.	40.0	30.0	130.	8,990	2.4	5.7	31.
3	India	3.10	90.	17.0	28.0	125.	5,780	2.5	15.5	164.
4	Pakistan	2.79	90.	13.1	19.2	122.	6,200	2.1	10.3	118.
5	Korea	2.48	120.	30.0	81.0	25.	2,710	2.5	13.0	316.
6	Taiwan	2.21	190.	25.0	77.0	20.	2,470	2.8	44.0	384.
7	Thailand	4.10	110.	14.0	55.0	56.	7,110	3.1	1.4	68.
8	Ceylon	7.90	130.	19.0	75.0	48.	4,180	2.4	47.0	187.
9	Nepal	14.66	70.	4.	8.0	175.	41,180	1.8	0.1	77.
10	Jamaica	1[illegible].62	430.	27.0	15.0	35.	1,810	2.4	4.0	179.
11	U.A.R.	3.10	150.	40.0	25.0	118.	2,270	2.5	1.7	32.
12	Colombia	9.96	270.	50.0	83.0	92.	2,470	3.2	2.3	18.
13	Hong Kong	4.27	320.	73.	60.0	23.	2,320	2.2	73.0	3859.
14	Malaysia	12.45	260.	50.0	40.0	50.	5,320	2.8	8.1	69.
15	Singapore	2.90	460.	100.0	70.0	25.	1,790	2.1	50.0	3471.

* Data are for 1968 or closest available year.

(1) The CYP calculation procedure outlined above "weights" IUD's by average retention period in years or fractions thereof, and sterilizations by the average number of years the female (who has been sterilized or whose husband has been sterilized) will remain alive, married and fecund. These "weights" (2.5 years and 7.5 years respectively in our procedure as outlined above) may, in fact, vary from one population to another with the resulting consequence that the number of CYP's generated by one IUD inserted or sterilization performed will also vary. Thus, two programs which had inserted exactly the same numbers of IUD's for exactly the same total cost yet if the females reached in the one program retained their IUD's on the average slightly longer than the females reached in the other program the CYP's generated might differ markedly. Now, if one were satisfied that such a difference in retention periods were, in fact, related to program efficiency or performance - educational activities, careful screening of clients, medical follow-up, etc. - then the difference in CYP's would be meaningful for evaluating the two programs. But, it also seems clear that in many cases the length of the retention period might be related to underlying socio-economic and cultural factors - health of the clients (their ability to tolerate bleeding), motivation to contracept effectively, availability of other methods, etc. - not related to program efficiency. Thus, one can argue for "standardizing" the setting factors influence on CYP's and making possible a comparison of costs and CYP's generated in which the differential impact of any of the variables intervening between inputs and CYP-outputs is eliminated. In our procedure we do this by using the

same "weights" for all our countries for IUD retention period, sterilizations, and so on. Now, this could, in theory, result in understatement or overstatement of the true CYP's generated by a program. In fact, we find that the relevant "weights" do not vary much from program to program. The "weights" of 2.5 years for the mean IUD retention period and 7.5 as the sterilization's duration is drawn from the experience of the Pakistan Program.

(2) The final comparison of costs in relation to outputs must be accomplished in a common currency unit to be meaningful. We have used, for rather obvious reasons the U.S. Dollar. However, as is well known, such inter-country value comparisons are fraught with difficulty. The official rates almost certainly are not equilibrium or market-clearing rates and the degree of disequilibrium will differ from country to country. "True" costs of the programs will thus be obscured. There is, in general, no "correct" solution to this problem but our study is no more invalid on these grounds alone than is any other inter-country study.

(3) The CYP index loses sight of the differing program "mixes" - IUD's vs. conventionals vs. sterilizations, etc. - which may exist. This, in turn, obscures the possibility that differences in aggregate cost-output relationships observed between two programs may reflect different underlying technologies in the two. Thus, an IUD program may simply have, other things being equal, a different cost-output relationship than a conventionals program. Thus, the program "mix" may be another important intervening variable.

(4) Relative factor costs will differ among countries no matter what overall exchange rate between the currencies is employed. The cost per CYP in one country may be above that of another country because government wages are higher in the first country. This, in turn, may be partly offset by productivity differences. That is, the higher salaried government physician may work harder and insert more IUD's than his lower priced counterpart in a second country. However, these wage-productivity differentials will affect the cost per CYP regardless of the exchange rate used. To some extent, this may also be handled by dealing only with countries of a relatively homogeneous socio-economic and administrative structure such that labor and other costs do not differ greatly. This is the approach we have attempted in part.

Effect of Non-Program Variables on Costs

Table I presents cost per unit of family planning data and socio-economic variables for 15 countries. These were then analyzed using step-wise regression with the following format:

Dependent Variable	
Cost per CYP	(1)
Cost per acceptor	(10)
Socio-Economic Variables	
Income per capita	(2)
Percent urban	(3)
Adult literacy rate	(4)
Infant mortality rate	(5)
Inhabitants per physician	(6)
Population growth rate	(7)
Kilometers of roads per 100 square kilometers	(8)
Population density per sq. kilometers	(9)

TABLE III

Socio-Economic Factors
Related to Cost per Unit of
Family Planning, 16
Country Sample, 1968

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
Dependent Variable (1)				
Independent Variables:				
(2)	.017036	.781439	.417301	
(3)	.129131	.728956	.614103	
(4)	- .127269	1.332808	- .627316	
(5)	- .022649	.387424	- .204974	
(6)	.000444	1.784378	.783196	
(7)	4.867586	.743133	.326098	
(8)	.113781	.708320	.465574	
(9)	- .004472	1.187085	-1.001195	.016056
			F-Ratio =	1.028556
Dependent Variable (10)				
Independent Variables:				
(2)	.018091	.338089	.181077	
(3)	- .067776	.155873	- .131702	
(4)	- .018236	.077805	- .036729	
(5)	.100643	.701371	.372168	
(6)	.000601	.985086	.433648	
(7)	2.385838	.148396	.065310	
(8)	- .117398	.297751	- .196287	
(9)	.001592	.172193	.145657	.010242
			F-Ratio =	1.018108

The results obtained from this regression are shown in Table III. When the first regression, with cost per CYP as the dependent variable, is run step-wise, only variable (6), inhabitants per physician finally retains any significance (regression coefficient = .000242, T-Value of 1.701469; beta coefficient = .426770; corrected R^2 = .119219). Variables (4) literacy, and (9) density, are almost significant and were eliminated in the step-wise run only at the last stage.

Significance aside, the direction of the relationships indicated is what would be expected for these variables. Both have a negative sign indicating higher costs per unit the lower the literacy and density. Positive relationships are shown with inhabitants per physician, the population growth rate and income per capita.

The use of the second measure of output, dependent variable (10), cost per acceptor, in a regression produces similar results. In this case, a step-wise regression eliminates everything except variable (5), infant mortality. (Final statistics: regression coefficient = .178542, T-Value of 3.169504; beta coefficient = .6602309; corrected R^2 = .392513). In this run also, inhabitants per physician and density are retained relatively late in the step-wise run.

The most puzzling result in both runs is the positive relationship between costs per unit and income per capita. This runs counter to expectations but may in fact be very plausible in the income per capita figures are interpreted as being measures of the differences in relative wages. Thus, costs per unit are a positive function of wages per capita, a hardly surprising result.

Effects of Scale on Costs

Among the several program-related variables discussed above, the scale or volume of the program is perhaps most easily measured. Our normal expectation would be that cost per unit would be inversely related to volume.

In an effort to test this, we chose those five country-program which seemed most similar in terms of socio-cultural setting, relative wage levels and also program emphasis and considered them as observations from one program. Each country contributed several observations and the result was to give us enough observations to make a meaningful regression analysis possible. This amounts to pooling several time series into a single cross-sectional. The countries chosen were: Korea, Taiwan, Hong Kong, Thailand, Singapore, and the following variables were employed:

<u>Dependent Variables</u>	
Cost per CYP	(4)
Cost per acceptor	(5)
<u>Independent Variables</u>	
Output in CYP's	(2)
Output in acceptors	(3)
<u>Dummy Variables</u>	
Korea	(6)
Taiwan	(7)
Hong Kong	(8)
Thailand	(9)
Singapore	(10)

Our hypothesis in the regression was that costs per CYP (or per acceptor) would be inversely related to program volume. We were

further assuming implicitly that the five countries were a homogeneous group, and we employed dummy variables in our regression to test this assumption. The results shown in Table IV were disastrous to both hypotheses. The significant statistical association between costs per output unit and dummy variables (for countries) indicate that strong underlying differences exist among even superficially similar programs.

The lack of any significance for volume as an independent variable speaks for itself, although in the case of cost per CYP there is a mild inverse relationship with total CYP's. However, when total expenditure is substituted for CYP's as the measure of program volume, it remains significant even after the step-wise analysis. (Regression coefficient = .000998, student T-Value = 9.525455; beta coefficient = .869049; overall R^2 = .76266). The same holds true when total cost is regressed on cost per acceptor. (Regression coefficient = .001925; T-Value = 7.490259; beta coefficient = .521507; corrected R^2 = .86177).

The sign in both cases is positive, indicating rising unit costs with volume as measured by total costs.

Summary on Overall Cost Relationships

The analysis of this chapter has resulted in modest, mostly negative findings, and there is not much left to sum up. There is strong evidence that the country programs cannot be considered to have one production function but that each program displays considerable uniqueness. There is some evidence that the cost per unit of family planning

TABLE IV

Effect of Program Volume on Cost per Unit of Family Planning

	Regression Coefficient	Student T-Value	Beta Coefficient	Corrected R^2
Dependent Variable (4)				
Independent Variables:				
(2)	- .000505	.233771	- .119369	
(6)	3.335854	1.489399	.826657	
(7)	1.948982	2.513371	.482976	
(8)	3.202883	6.172485	.848507	
(9)	5.774134	5.098787	1.159938	
(10)	4.456088	9.570209	1.242805	.435674
			F-Ratio =	4.05010
Dependent Variable (5)				
Independent Variables:				
(3)	.003169	.320862	.103087	
(6)	4.614539	1.010376	.355692	
(7)	4.001582	2.785290	.308445	
(8)	9.151049	9.427849	.754072	
(9)	19.451230	10.796049	1.215410	
(10)	5.065410	5.600127	.439432	.80381
			F-Ratio =	18.02538

services does fall as physical volume rises but this is not strong or persuasive. Moreover, it also appears that costs rise more rapidly that physical output for most of the programs. The effect of program mix remains unclear but may be part of the strong country differences noted. Finally, socio-economic differences do not explain the variations in unit costs of various programs to any significant extent. Health-related variables such as infant mortality and physicians per thousand population seem the best of a bad lot of explanation variables of this type.

The tentative nature of these conclusions must be stressed. This is partly a matter of the small number of observations but even more fundamentally a question of the inherent difficulty of making inter-country comparisons of complex social programs. It is very unlikely that even with a larger number of observations, any more definite conclusions could be reached. In short, this does not seem a promising line of attack for further research.

CHAPTER IX

SUMMARY AND CONCLUSIONS

We will not attempt to summarize the specific empirical findings presented in the preceding chapters. They cover in some detail a total of eight country programs and touch in one way or another on another eight or ten and each chapter has its own summary. Our approachs throughout this report has been quantitative and our results mixed. Instead of trying to review the pro's and con's of our empirical findings, in this concluding chapter we will attempt to step back, as it were, and gain some perspective: perspective on the problem on which our entire project, covering nearly three years of effort, has focused; perspective on the methods and tools employed in tackling that problem; and finally perspective on the findings of our study.

The Problem

Several assumptions underlie our project and these included: first, that family planning programs were for most if not all developing countries useful, socially-beneficial public activities; benefits were judged to be large, in fact. Second, it would be useful to know more about precisely what such program cost to operate for any given scale of effort and type of system; thirdly, any such program would find highly useful for evaluation purposes a cost-reporting and analysis scheme which revealed the cost per unit of output for its various

sub-units or geographical areas; finally, variations in the costs of producing family planning services as among country programs or as among the sub-units of a single program should be explicable in terms of some combination of program-related variables (inputs expenditures) and socio-economic setting variables (literacy, income, etc.) together with a residual efficiency factor.

The Findings

Our Phase I Report reaffirmed the correctness of our first assumption on benefits. No matter which of the several approachs possible one followed, the benefits per birth averted seem very large indeed, running to the order of two to three time present per capita income in developing nations. However, it also emerged in our formulation that these benefits were most macro (societal). What remains unclear is the exact mechanism by which these benefits are transmitted to the couples most directly concerned. There is the further disturbing possibility that benefits as viewed as the micro (family) level may differ sharply from the benefits measured at the macro level. Some of the resistence to family planning can perhaps be explained in these terms: we are using macro models and arguments to influence micro decisions and actions.

Phase II of the project centered around the actual cost of family planning. This research and its later extensions in the present report established that the costs per unit of family planning are by no means negligible. While there is considerable range among programs, the

average cost per Couple-Years of Protection is some $10.00 U.S. Only in a few very small, highly efficient programs does it go as low as $2.00 to $3.00. And in some the cost of providing a couple with contraceptive protection for a year may be $25.00 or more. In these later cases, the implication is that preventing a birth might cost $50.00 to $75.00 U.S., a very non-negligible sum indeed.

The range in costs per unit among countries seems to defy easy explanations. Program volume is no part of the differences, since very small ones are in some cases very low-cost and in other cases very high-cost. Health-related variables such as infant mortality and physicians available seem the only significant socio-economic correlate with the cost differences among countries.

In Phase III, the present report, our focus became more evaluatory and practical in its implications. Three country programs were thoroughly studied on a disaggregated basis and, in general, it was indeed found that program variables, including volume, and socio-economic variables, including urbanization and health factors do account for much of the intra-program cost-output variation. In this work, even if not in the earlier phases, we feel we were able to demonstrate that in most programs data already exist or can be easily collected to permit a cost-effectiveness analysis. Our experience also persuades us that program administrators quickly realize the value of such analysis.

The Approach

Perhaps that is, indeed, our most important findings cost-effectiveness analysis for family planning works and adds a significant new

dimension to program evaluation. The question of whether to use the CYP concept or some other index of output is of little moment. Some index must be used and program administrators are aware of this. It seems likely that this project and others like it have planted a seed. Cost-effectiveness evaluation of program may, within a matter of years, be as routine as computing IUD retention rates.

Finally, the essentially quantitative approach we have been following has proven feasible. The typical program encountered already collects more data than it knows what to do with and cost-effectiveness analysis imposes no new burden on the staff. Correlation-regression analysis combined with high-speed computation and data storage equipment makes easy the exploitation of this information. To suggest that quantitative, statistical approachs to family planning are inappropriate is to take a giant step backwards. This we also feel has been demonstrated anew by our project.

APPENDIX

SOURCES AND METHODS

Methodology

No new approaches are developed in this report. The Couple-Years of Protection Index stems from work of Dr. Samuel Wishik written up in several places. In particular we have drawn on his unpublished 1968 paper, "Indexes for Measurement of Contraceptive Practice" and on the critique of the CYP concept by Seltzer and Bean, "The Couple-Years of Protection Index: A Methodological Criticism," Demography, Vol. 5, No. 2 (1968). The measurement of the output of contraceptive delivery programs is one of the more lively statistical problems in the field of family planning research and analysis and is far from settled. We continue to employ the CYP, supplemented by the "Acceptors" concept, simply because it still seems the best, operational alternative known to us. A survey of some of the recent development is contained in David Seidman, "Alternative Modes of Delivering Family Planning Services," Studies in Family Planning, No. 52, April 1970. The regression program employed through this analysis is described in M. C. Hallberg, Statistical Analysis of Single Equation Stochastic Models using the Digital Computer, Agricultural Experiment Station, A.E. & R.S. Bulletin No. 78, The Pennsylvania State University, February 1969.

Statistical Sources

(1) India. Our India data are basically those contained in the earlier Phase II report and the detailed sources were listed and discussed in that document. Generally speaking they are the annual reports of the Family Planning Division in the Ministry of Health together with certain other unpublished tabulations supplied us by the Ministry in 1969.

(2) Pakistan. The Pakistan data were also referenced in the Phase II report and no major new series have been added here. The monthly data on which our district-wise analysis is based come from the very useful Research Report by Bean et al., Family Planning in Pakistan: A Review of Selected Service Statistics, 1966-67, Pakistan Institute of Development Economics, Karachi, Pakistan, 1968.

(3) Hong Kong. All the data on the Hong Kong program are taken from the annual reports of the Family Planning Association of Hong Kong. Some data on the budgets from earlier years were generously supplied by the Secretary of the Association from unpublished materials.

(4) Singapore. Data pertaining to the early years of the program were taken from the Annual Reports of the Singapore Family Planning Association. After the inception of the official program, the annual reports of the Singapore Population and Family Planning Board become the main source. Some more recent data were kindly supplied by officials of the SPFPB.

(5) Malaysia. The Annual Reports of the Malaysian program are also available in printed form and they contain the basic data on performance and also costs. In this case, too, the responsible officials of the evaluation unit raciously provided preliminary data for the most recent annual report then unpublished. The Honorable Secretary of the Private Association also cooperated fully by making available published and unpublished reports bearing on the operations of the FFPAM and its affiliated State organizations.

(6) Thailand. As is indicated in the main report, the Thai program is somewhat more complex in organization and so were the sources employed. No annual report is issued by the Ministry but highly useful for the general background and for performance up through 1969 is their document Family Health Project - Thailand, Ministry of Public Health, 1969. C. Chandrasekaran's very valuable, mimeographed report, prepared in July 1970, "Targets for Numbers of Acceptors in Thailand's National Family Planning Programme and Birth Rate Reductions Expected, 1970-76," has been mentioned in the text. Also useful were the reports prepared by Bruce Carlson of the U.S. Operations Mission in Bangkok, "Population/Family Planning in Thailand," Sept. 1970; and "Preliminary Population Notebook on Thailand, Supplement," August 1969. Finally, much first-hand information was obtained in conversations and from unpublished materials made available in Bangkok. The cooperation of the local Population Council staff in Bangkok was also invaluable.

(7) Colombia. Basic data sources for Colombia include:

(a) For the setting variables, or socio-economic variables utilized in the analysis, such diverse publications of the official Colombian statistical organization, the Dirrecion Administrative Nacional de Estadisticas, were used as the Colombian Census, 1964, Colombian Statistical Yearbook, 1966-1967, as well as various of the organization's Monthly Bulletins.

(b) Most of our cost figures, as well as the output figure, from monthly and yearly reports on file in Profamilia and ASCOFAME central offices in Bogota, Colombia.

(c) Finally, where appropriate, exact sources for data contained in the Chapter are cited with the corresponding tables in the text.

(8) Korea. Data pertaining to the program achievement, on which computations are based were made for CYP for individual counties, were compiled by American Population Council, Korea, from the primary data originating from the Ministry of Health and Social Affairs, Republic of Korea; data on personnel input (family planning workers) are based on the survey conducted by PPFK (Planned Parenthood Federation of Korea) staff, stationing at each Health Center for July 1, 1969; sources for other explanatory variables are the Annual Statistical Reports (1969) of individual provinces and special cities (Seoul and Pusan) and the compiled data available at the Economic Planning Board, Korea. Expenditures data, previously non-existent at either the provincial or the national level, were obtained through the active cooperation from the Planned

Parenthood Federation of Korea, whose staff members at the national office, in collaboration with their provincial staff, meticulously assembled all the relevant figures with the exception of those concerning fixed assets. (In view of the labor-intentive nature of the program, the omission of fixed assets is expected to nave only a minor effect in the overall analysis.) For the sources of other variables, see Table I.

Other Countries Included in the Survey. The data in Table I of Chapter VIII are drawn from our own work in this and earlier reports, and from the following sources:

(a) George Zaidan, "The Costs of Family Planning with Special Reference to the United Arab Republic," unpublished paper, 1968.

(b) Gavin Jones and M. Selvaratnam, "Costs and Benefits of Family Planning in Ceylon," unpublished paper, 1970.

(c) A. S. David, "Nepal: National Development, Population and Family Planning," in Studies in Family Planning, May 1969, No. 42.

(d) International Bank for Reconstruction and Development, Jamaica, Review of the Family Planning Program, April 1969.