Public Disclosure Authorized

Public Disclosure Authorized

Policy, Research, and External Affairs

WORKING PAPERS

Population, Health, and Nutrition

Population and Human Resources
Department
The World Bank
August 1991
WPS 759

The Profamilia Family Planning Program, Colombia

An Economic Perspective

Jesus Amadeo
Dov Chernichovsky
and
Gabriel Ojeda

Profamilia, an affiliate of the International Planned Parenthood Federation, provides more than 60 percent of Colombia's family planning services. In 1986, Profamilia recovered more than half of its costs, which is rare for family planning services. But it could have provided more protection for the same amount of money.

The Policy, Research, and External Affairs Complex distributes PRE Working Papers to disseminate the findings of work in progress and to encourage the exchange of ideas among Bank staff and all others interested in development issues. These papers carry the names of the authors, reflect only their views, and should be used and cited accordingly. The findings, interpretations, and conclusions are the authors' own. They should not be attributed to the World Bank, its Board of Directors, its management, or any of its member countries.

Policy, Research, and External Affairs

WORKING PAPERS

Population, Health, and Nutrition

WPS 759

This paper — a product of the Population, Health, and Nutrition Division, Population and Human Resources Department — is part of a larger effort in PRE to examine the relative importance of constraints of demand and supply on the use of contraception. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Otilia Nadora, room S6-065, extension 31091 (113 pages, with tables).

Profamilia, an affiliate of the International Planned Parenthood Federation, provides more than 60 percent of Colombia's family planning services.

Profamilia's outreach effort (CBD) delivers mainly pills in rural and outlying urban areas, through 100 field workers. Its two clinic-based programs provide (1) voluntary sterilization and (2) clinical services: gynecological consultation, intrauterine device (IUD) services, and over-the-counter sales of contraceptives.

In 1986, these three programs delivered more than 1 million "couple years of protection" (CYP) at a cost of about US$6.43 million. The sterilization program provided the most protection. The clinical and CBD programs each provided about 43 percent of revenues. The outreach program accounted for 31 percent of costs, the clinical program 39 percent, and the voluntary sterilization program 30 percent.

Amadeo, Chernichovsky, and Ojeda address the question: Could Profamilia have provided more protection with the same resources? They found that:

- Operations tend to be constrained by limited personnel and supplies. With more of each, more protection could be delivered.

- The labor costs and unit costs of contraception are lower in the outreach and clinical programs, which can be expanded with available infrastructure. The marginal unit cost of voluntary sterilization is higher partly because surgeons are paid "by the piece." (But the effects of educating the people about sterilization may make sterilization more cost-effective in the long run than this study found to be true for the short term.)

- The clinical program (delivering mainly the IUD) and the outreach program (delivering mainly the pill) are the most cost-effective. The voluntary sterilization program is the least cost-effective because of the higher cost of sterilization, the heavy subsidy for sterilization, and the higher mean age of clients who are sterilized. It might be more efficient to shift emphasis from sterilization to the other two programs.

- Fees for service should be seriously considered, and more research done on the issue. More demand could be met with more workers, and higher prices — particularly for sterilization — might not reduce revenues.

- More resources should be targeted to areas where there are proportionately more mothers and where people are better educated (and hence more receptive to family planning).

- Experienced and married workers sell more in the outreach program than their junior, unmarried colleagues. Experienced workers tend to be paid more than inexperienced workers, but married workers tend to be paid less than unmarried workers. It would pay to retain experienced staff (who are more likely to be married).

- In both the clinical and surgical programs, output would increase if there were proportionately more nurses and fewer doctors.

The underlying hypothesis of this study (which remains untested) is that there is sufficient demand for the various operations to expand.

The PRE Working Paper Series disseminates the findings of work under way in the Bank's Policy, Research, and External Affairs Complex. An objective of the series is to get these findings out quickly, even if presentations are less than fully polished. The findings, interpretations, and conclusions in these papers do not necessarily represent official Bank policy.

Produced by the PRE Dissemination Center

TABLE OF CONTENTS

List of Tables and Figures

EXECUTIVE SUMMARY

Profamilia, an affiliate of the International Planned Parenthood Federation (IPPF) in Colombia, is a non-governmental, not-for-profit organization providing more than sixty percent of the country's family planning services. The remainder is provided by the government and the private sector. Profamilia's program is vertically organized; it provides mainly family planning and closely related services, and does not provide services such as maternal and child care.

Profamilia's outreach effort, the Community-Based Distribution (CBD) Sub-program, delivers mainly pills in rural and outlying urban areas. It is run by about 100 field workers. The agency has two clinic-based (sub-) programs, administered through some 38 clinics with a staff of about 500. The first is the Clinical Sub-program which provides gynecological consultations, IUD services and over-the-counter sales of contraceptives. The second is the Voluntary Sterilization Sub-program.

In 1986, Profamilia's three sub-programs delivered approximately 1,267,919 Couple Years of Protection (CYP) to the population of Colombia at a cost of 1,252.8 million Colombian pesos ($US 6.43 million). The program recovered about 647.3 million pesos ($US 3.32 million), or more than 50% of its cost. In this regard Profamilia is comparatively unique among family planning programs.

According to Profamilia's accounts, the sterilization program provided in 1986 the largest share of CYP, 61%, followed by the CBD program, 27.6%. The CBD and the Clinical Sub-Programs provided the major share of revenue, about 43% each. In terms of total costs, the CBD program accounted for the smallest share, 31%; the Clinical Sub-Program 39%, and the Voluntary Sterilization Sub-Program for 30%.

These data reflect key policy and management decisions concerning fees charged to clients, allocation of resources between sub-programs, and allocation of resources within sub-programs. Although Profamilia is considered one of the best run programs, the question is, nonetheless: could Profamilia have done better with its resources by providing more protection than it did?

To answer this question, we examine Profamilia's resource allocation and costs of operations in relation to output (volume and value of contraceptive sales) and in conjunction with population characteristics, method mix, and the manner in which resources are allocated. We study the CYP unit cost of Profamilia's overall service delivery, and of each sub-program separately, to identify comparatively cost-effective services. The study employs a cross-sectional analysis of the operations of 97 field workers and 38 clinics in 1986.

The data show a positive correlation between labor output and input in all operations. Profamilia's operations must therefore be following, although not necessarily satisfying, demand for family planning. The indication is

that operations are, on the average, constrained by labor and supplies availability: with more of these resources the program could deliver more protection.

The data indicate that the CBD and the Clinical Sub-program can be expanded with the available clinical infrastructure. For this reason, and because of the quasi-fixed nature of labor cost in these two sub-programs, higher levels of outputs are associated, on the average, with lower unit costs of contraception. The same does not hold for the Surgical Sub-program. Unit cost of sterilization rises with output levels because sterilization has a comparatively high marginal cost, which is in part associated with the payment method "by piece" to surgeons.

Of the different sub-programs, the Clinical sub-program delivering mainly the IUD, and the CBD Program delivering mainly the pill, are the most cost-effective. Per peso invested in each, these programs yield most CYP, adjusted for cost-recovery potential and users' age. The Voluntary Sterilization Sub-program is the least cost effective because of the comparatively high cost of sterilization, the high subsidy to clients who obtain this method, and their high mean age relative to the clients of other methods. Given the comparative efficiency of the sub-programs and the viability of expanding each sub-program's operations, overall efficiency might be improved by studying the possibility of shifting resources, within the existing institutional constraints and policies, from the Voluntary Sterilization Sub-program to the CBD and Clinical sub-program.

Fees for service should be studied further as a vehicle to improve Profamilia's performance. Since the evidence suggests that more demand could be met with more workers in all sub-programs, and that higher prices may not necessarily reduce revenues especially in the sterilization Sub-Program, there may be scope to raise prices of sterilization in order to finance additional staff and supplies in the other sub programs, and increase overall contraceptive delivery. This issue merits, however, more research about demand for contraception in the different programs, and about the factors which influence this demand.

There is scope to increase the cost-effectiveness of any of the three sub-programs individually by more careful targeting of operations, better mix of labor inputs, and improved use of community resources.

Productivity of outreach operations is higher where there is a higher concentration of mothers in the population, and productivity of clinical operations is higher where the population is more educated. At the margin, targeting or shifting limited resources towards those populations could therefore increase the cost-effectiveness of the different programs.

In the CBD Sub-Program, experienced and married workers sell more than their junior and unmarried colleagues. While experienced workers are paid more than inexperienced workers, married staff are paid, on the average, less than unmarried staff. Retaining experienced staff (who are also more likely to be married), should therefore increase productivity and possibly cost-effectiveness. In the Clinical-based sub-programs the ratio of nurses

to physicians correlates with output of clinics; higher nurses to physicians ratios are associated, on the average, with higher output. There is scope, therefore, in both the Clinical and Surgical sub programs to increase output without additional outlays, e.g. improve efficiency, by trading physicians in favor of nurses, within a reasonable range.

Community resources tend to augment program resources in the CBD outreach activity. The number of points of sale administered by a field worker in the community, correlates strongly with contraceptive sales. While there are no data available on the costs of these sale points, their impact on worker productivity suggests they may be a major means to increase cost-effectiveness in the CBD program.

The finding of this study suggest that there is scope to increase the efficiency of Profamilia's operations through marginal changes in allocation of resources across and within its different sub-programs. The underlying hypothesis, which remains to be tested yet, is that there is indeed sufficient demand for the contraceptives offered by the different operations that are recommended for expansion. Moreover, the study stressed short term economic dimensions of Profamilia's delivery efforts. Long term effects, such as educating the population about sterilization, presently the least cost effective method, may render this method more cost effective in a long run perspective than is suggested here.

PREFACE

Cost-effectiveness in family planning delivery has become especially important in recent years in view of the slowdown in the growth of public resources for family planning, at a time when the need for it remains pressing.

This study is part of an operational research program in family planning initiated by the World Bank. Under this program, a quantitative economic approach with a cost-effectiveness orientation has been developed to assist policy-makers and managers of developed programs to learn from their own program experience about resource allocation, cost and finance, and how these relate to program objectives. This process should considerably enhance efforts to improve resource mobilization and internal program efficiency.

The present work program included development of guidelines for operational research with a cost-effectiveness orientation, and studies of two distinct family planning programs: the Indonesian National Family Planning Program and the Colombian Profamilia Program. This study of the Colombian program was undertaken in collaboration with the International Planned Parenthood Federation (IPPF) and Profamilia.

We thank Ms. Susan Cochrane for helpful and insightful comments.

1. INTRODUCTION

Profamilia, an affiliate of the IPPF in Colombia, South America, is a not-for-profit non-government organization (NGO) providing family planning services. Profamilia has several important features. First, it is an NGO providing more than sixty percent of total family planning services available in Colombia. Second, Profamilia recovers about one-half of its recurrent costs. Third, its program is vertically organized; most resources are invested in provision of family planning services rather than in related areas, such as maternal and child health.

The objective of this study is to examine whether and how Profamilia can do better with the resources available to it. To that end, we analyze the cost-effectiveness of Profamilia's service delivery, which includes the Community-Based Distribution (CBD), Clinical, and Voluntary Sterilization Programs. For all of these programs combined and for each separately, costs and resource productivity are compared while considering population characteristics and method mix, in order to establish relatively efficient operations.

The discussion is based on Profamilia's service statistics, including operations of 97 field workers and 38 clinics. These data concern sales and distribution of contraceptives, input and costs. Some of this information is summarized in Villamil (1986) and Ojeda (1986); other information is

drawn from Profamilia files. All data sources are discussed in the following chapters.

This study falls into three major parts. In the first part, Chapters 2 and 3, we provide a brief summary of population policy and family planning in Colombia, and an introduction to Profamilia. In the second part, Chapter 4, we present the issues and analytical framework guiding the discussion. In the last part, Chapters 5 through 7, we examine resource allocation and cost effectiveness in Profamilia's CBD outreach program, the clinical based programs, and all programs combined. Conclusions are drawn in Chapter 8.

2. POPULATION AND FAMILY PLANNING IN COLOMBIA

2.1. The Population: Size, Growth, and Distribution

Colombia is divided into five geographical regions and twenty-three provinces or departments.

According to the 1985 census, Colombia had a population of 30 million. The rate of population growth for 1973-1985 was 1.8% annually. This growth rate is significantly lower than the high of 3.73% annually for 1965-1973. The crude birth rate in 1984 was 28 per thousand, down from 45 in 1965. The infant mortality rate per thousand live births was 48. Average life expectancy at birth was 65 years in 1984.

The largest population concentration, 27.4% of the total, is found in the Central region, which also appears to be the most affluent (Table 2.1). Seventy-two per-cent of the population lives in urban areas; the average annual growth rate of Colombia's urban population was 2.9% between 1973-1984.

Table 2.1: Population Characteristics by Region

	Atlantic	Bogota	Central	Oriental	Pacific	Total
Total Population	5,678,001 (18.1%)	3,982,941 (12.7%)	7,643,553 (24.3%)	5,214,400 (16.6%)	8,887,741 (28.3%)	31,406,636 (100.0%)
Average Household Income 1981 (Colombian Pesos)	16,086	12,673	22,501	15,278	17,136	17,374
% Urban Dwellers	76.8%	72.5%	72.8%	62.4%	73.5%	72.0%
% Women Aged 12-59 With No or Primary Education Only	60.1%	37.5%	59.4%	63.9%	61.3%	58.0%

Source: Corporacion Centro Regional de Poblacion et al. (1986)

2.2. Population Policy and Family Planning

The government of Colombia does not have an explicit population policy defined in terms of fertility levels and demographic growth targets. In 1969, the government introduced a development plan which included a set of proposals for family planning within maternal and child health programs. These proposals did not specify demographic objectives. The attempt to formulate a population policy granted de facto legitimacy to private organizations providing family planning services, stimulating growth in the scope and volume of services they provided. Since 1969, all government administrations have included a family planning component in their economic development plans.

The 1986 Demographic and Health Survey (DHS) indicates that 99.4% of married women of fertile age (15 to 49) were aware of at least one method of family planning (see Table 4.1, Corporacion Centro Regional de Publacion, 1986). Of these, 64.8% were actually using some contraceptive method, with female sterilization being the most prevalent at 18.3%. Oral contraceptives were used by 16.4%, intra-uterine devices (IUDs) by 11%, rhythm and withdrawal by 5.7%, injectables by 2.4%, vaginal tablets by 2.4%, condoms by 1.7%, vasectomy by 0.4%, and other methods by 0.9%.

The level and volume of family planning services offered by the public sector has been inconsistent over time and across regions. It has varied historically as the relative importance placed on the subject by different

administrations has varied. The government provides its services through local, regional and university hospitals, health centers, and "health posts". The volume and scope of family planning services is determined independently by the service directors in each locality, leading to large geographical variances. No central coordinating or administrative unit monitors and evaluates delivery and impact of family planning services. This lack of central coordination contributed to expansion of the private sector in family planning services.

The private sector, including not-for-profit organizations, delivers the majority of the family planning services provided in Colombia. Most services are subsidized. Private sector family planning services are provided by Profamilia, small private clinics, private physicians practices and pharmacies. Family planning services in the private sector are financed by international and national donations, and by fees collected for services in private clinics and private physicians practices. Insurance policies, with the exception of those of some large employers, do not usually cover expenses associated with family planning.

The main source of supply of family planning services is Profamilia, which provided coverage to 38.7% of those women using some contraceptive method (Table 2.2). Profamilia's activity is most notable in the provision of sterilization. The next most important source of contraceptive method is commercial drugstores, which provide 33.3% of all coverage. Profamilia's actual coverage extends well beyond the proportion receiving family planning services directly through its programs, as it supplies more than 80% of the

drugstores and pharmacies in Colombia with subsidized contraceptive products.

Table 2.2: Distribution of Contraceptive Users (%) by Source of Supply

	Method						
Source	Pill	IUD	Inj.	Spermic.	Condom	Steril.	Total
Hospital/ Health Post	12.2	38.3	8.8	2.2	5.2	10.8	16.3
Clinic/ Private Hospital	0.8	4.8	3.1	0.0	0.0	9.1	4.6
Profamilia Clinic	2.3	42.3	1.7	7.0	6.5	74.4	36.3
Profamilia Distribution Outlet	6.2	-	1.0	4.9	8.5	0.0	2.5
Private Doctor	8.7	10.1	7.1	3.3	7.5	1.7	6.2
Pharmacy	63.1	-	73.4	75.5	60.9	0.0	28.2
Health Worker	1.6	-	2.7	1.2	0.0	0.0	0.7
Friend/Relative	0.4	-	-	-	0.0	0.0	0.1
Other[1]	4.7	4.5	2.2	4.9	3.6	4.0[2]	3.5
No response	0.3	0.0	1.0	0.0	7.8	0.0	0.0
Number of current users	522	332	78	72	44	573[3]	1,623

1 Includes private and public social security systems
2 Private social security systems only
3 Includes hysterectomies

Source: Corporacion Centro Regional de Poblacion et al. (1986)

3. PROFAMILIA

3.1. Brief History

Profamilia was founded in 1965 to offer family planning information and services, primarily to families with limited economic means. Its first service delivery outlet was in a private physician's office. In 1966 it became an affiliate of the Western Hemisphere Region of the IPPF. That same year, Profamilia founded its pilot clinic in Bogota. During the following years it opened clinics in the principal cities of Colombia, establishing a network of forty-two clinics and family planning centers.

Profamilia's provision of voluntary surgical sterilization was initiated in 1970 with a vasectomy program. Female sterilization was included as part of the Voluntary Sterilization Program in 1971.

In 1971, Profamilia inaugurated its Community-Based Distribution Program to local communities to provide family planning information and contraceptive services which do not require strict medical supervision. This program is run by about 100 "instructors", each responsible for a particular jurisdiction.

The activities of the Information, Education, and Communication (IEC) Program are closely associated with service delivery. IEC activities include: preparation and publication of pamphlets, training manuals, and posters; production of family planning promotional radio spots; and sponsorship of

public family planning conferences at clinics, schools, and other public and private institutions. IEC activities played an important role in the initial expansion of Profamilia in the early 1970s, when much effort was devoted to informing the public of the existence of family planning services. Currently, Profamilia reinforces the importance of family planning in the public consciousness, but is increasingly concerned with emphasizing the quality of that service.

Profamilia emphasizes monitoring and evaluation of its delivery of family planning services. Explicit output and cost-effectiveness targets are set by senior management, and efforts to meet them are guided and monitored by Profamilia's Planning and Evaluation Department.

Although organized as three separately administered programs, the discussion below deals with the outreach activities, the Community-Based Program, on the one hand, and the clinic-based activities, the Clinical and Voluntary Sterilization Programs, on the other hand.[1]

3.2. The Community-Based Distribution (CBD) Program

Profamilia inaugurated its CBD Program in 1971 only in rural communities as part of a cooperative agreement with the National Coffee Growers Federation. Based on the initial success of the rural program and on economies of scale, Profamilia created a separate urban CBD Program in 1974.

---

1 They are referred here as sub-programs.

Because it was not cost-effective to have two separate management and support structures for programs which shared the same philosophy, objectives, and procedures, the rural and urban CBD Programs were merged in 1981. The most recent structural change in the CBD Program was made in 1986, when the commercial marketing program was merged with the traditional CBD Program. The resulting program, in which CBD Program instructors were allowed to sell Profamilia products to private sector outlets (e.g. pharmacies, etc.), is called the Community Marketing Program.[2]

The basic objective of the Community-Based Distribution (CBD) Program is to provide family planning information and services to those sectors of Colombia's population which cannot or do not wish to use the services provided by the Clinical Program or are unable to do so. The CBD Program operates primarily in rural and outlying areas of urban centers, and the methods it distributes - condoms, pills, and spermicides - do not generally require direct medical supervision.

The current CBD Program encompasses identification, training, motivation, and logistical support of over 3,600 distributors and over 8,400 pharmacies, cooperatives, and other outlets where Profamilia's contraceptive products are sold. This work was carried out in 1986 by ninety-seven "instructors", or field workers (Table 3.1). These workers to not sell contraceptives directly to users.

The CBD network has achieved national coverage, distributing

---

2 The term "CBD" is nonetheless retained throughout the discussion.

contraceptives in all twenty-three of Colombia's provinces. The CBD Program is designed to capitalize on local community facilities and personalities for the promotion of family planning and the distribution of contraceptives. Selection of distributors is made by the field workers, who also deliver supplies to their points of sale. Informational meetings are held periodically in both new and presently active communities.

Table 3.1: Basic Characteristics of Field Workers

Mean Age	34.4 years
Percent Males	20%
Percent Married	35.8%
Mean Years of Schooling	12.5 years
Percent Completed High School	86.3%
Mean Experience	6.1 years
Mean Number of Children	1.0 children

Source: Profamilia internal documents

Table 3.2: CBD Program Prices to Consumer

Unit Price to Consumers (Colombian pesos)

	Mean	S.D.
Pill	52.5	2.69
Condom	11.6	0.73
Spermicides	18.4	15.72

Source: Profamilia internal documents

During these meetings, community leaders, qualified to become distributors and effective motivators of family planning, are identified. After selection,

new distributors are trained to counsel family planning, to identify side effects of the contraceptives, and in basic screening of candidates for contraceptive use.

CBD Program field workers use two modes of supply delivery: consignment basis and cash basis. Distribution outlets which receive supplies on a consignment basis must sell the contraceptives at Profamilia's established prices, which allow a small profit margin as an incentive to the distributor. Outlets operating on a cash basis purchase the contraceptives at the time of delivery, and may then set a selling price higher or lower than Profamilia's retail price (but no higher than the ceiling price set by the government).

Table 3.2 shows method prices. The data indicate substantial variation in the prices of the three methods, and of spermicides in particular.

The output in CYP, units of contraceptives sold, and revenues are shown in Table 3.3. In 1986, Profamilia spent about 389 million Colombian pesos on the CBD Program, which generated some 276 million pesos in revenues.

Pills constitute the most important form of contraception delivered through the CBD Program, both CYP and revenues.[3] CYP from pills is 84% of the total CYP, and 78% of total revenues. The relative contributions of the Sub-Program to condoms and spermicides are minor.

---

[3] The following CYP coefficients were assigned to methods: pills, 0.077; condoms, 0.010; spermicides, 0.118; IUD, 2.500; and sterilization, 12.500. These are based on Profamilia's data. Slight variations in implied coefficients may exist in some computations, due to rounding.

Table 3.3: Profamilia CBD Program, 1986

Sales of:		
Pill (Cycles)	3,818,413	
Condoms (Units)	3,240,992	
Spermicides (Units)	199,769	
Couple-Years of Protection (Total)	349,731	(100.0%)
Pills	293,724	(84.0%)
Condoms	32,410	(9.3%)
Spermicides	23,597	(6.7%)
Values of Gross Sales in 1,000 Colombian pesos	275,709	(100.0%)
Pills	216,373	(78.4%)
Condoms	30,082	(10.9%)
Spermicides	29,254	(10.6%)
Total Program Recurrent Costs (in 1,000 Colombian pesos)	388,863	

Note: The CBD and Commercial Marketing Program are combined under "CBD". Distribution of sales by method is based on data from the field.

Sources: Ojeda (1987), tables 30,31a,32,37,40;
Villamil (1987), tables 7-9

3.3. The Clinic-Based Programs

Two distinct programs are clinically oriented: the Clinical Program and the Voluntary Sterilization Program.

3.3.1. The Clinical Program

The objective of the Clinical Program is to provide low-income groups with low-cost family planning services and information about effective contraception. Profamilia's thirty-eight clinics (1986) also offer tests for the early detection of cervical cancer, infertility treatment, gynecological examinations, pregnancy tests, and some general medicine. The clinics also provide the surgical setting for the Voluntary Sterilization Program, which is considered a separate program providing just sterilization and are administrative and logistical bases for the CBD Program. Because of their location in principal cities, 93% of Clinical Program acceptors are residents of urban areas.

Profamilia divides its clinics into four major groups: large clinics, medium clinics, small clinics, and male clinics[4]. Table 3.4 provides the number, average area, consultations and surgeries by type of clinics. The large clinics have an average area of 1,576 square meters (m^2), the medium, 476 m^2, and the small clinics, 344 m^2. The large clinics supply considerably more services than the medium and small ones. Such services include even

---

[4] Separate data for male clinics has been available only for one clinic. This clinic was included with the group of large clinics. See Annex 1 for the list of clinics by groups.

medical gynecological, pregnancy tests and even pertinent legal advice.

The Clinical Program is run by five major types of personnel[5]: physicians, auxiliary workers, assistants, office workers and administrators. At the end of 1986 there were 538 full time equivalent (FTE) positions.[6] These positions were distributed as follows:

Physicians: 33 FTE

Auxiliary workers: 238 FTE (141 non-certified and 106 certified nurses)

Assistants: 118 FTE

Office workers: 55 FTE

Administrators: 16.50

The remaining staff are administrative help.

The physicians were further distributed between physicians in the Clinical Program (53% of total), physicians in the Surgical Program (31.1%), and managers (15.9%).

No explicit data on prices of contraceptives to clients, are available for the Clinical Program. It is Profamilia's policy that for the clinical procedures, including IUD insertion and sterilization, poor clients pay less. Prices of contraceptives sold over-the-counter (pills, condoms, and spermicides) were assumed to be the same in the clinics as in the

---

[5] Based on Profamilia internal documents.

[6] An FTE is based on 8 hours per day as a full-time position. Thus two workers with 4 hours per day each, are equivalent to one FTE.

corresponding CBD distribution outlets for that clinic.[7] The clinics also charge for consultations, for laboratory tests and for surgeries. Table 3.5 indicates the average price for each service.

Table 3.6 shows the output of the two clinic-based programs in units of contraceptives, CYP, and revenues in 1986. In 1986, delivery of contraceptives through the Clinical Program generated 917,918 CYP.[8]

The major activity of the Clinical Sub-Program is its family planning consultation service, which provided 328,283 consultations, of which about 37% were new users of the service. Most of the consultations were for IUD users (53%), about 30% were for sterilizations, 8% for pill users, and about 9% for other methods.

When the two Clinic-based Sub-Programs are separated, the great majority of Clinical Program total CYP, about 80%, was generated through IUDs. Of the CYP from the other contraceptive methods provided, pills were predominant with 11.1%, and condoms and spermicides together provided less than 9.5%. The remaining consultations were medical in nature and some resulted in referrals to the Surgical Sub-Program.

---

[7] There is substantial price discrimination in clinical operations, and gross revenue data were unavailable. It was hard, therefore, to establish unit costs for those contraceptives.

[8] The data here follow Profamilia's practice to report CYP only for new IUD users. This practice is not followed later in the discussion. Each IUD insertion, whether to an old or new user, is considered as delivering 2.5 CYP.

In 1986, Profamilia invested 484.5 million pesos in its Clinical Sub-Program, and recovered 237.1 million pesos in revenues. Of those 237.1 million pesos, over 61% were for consultation fees. Fees for laboratory services, such as pregnancy tests, accounted for 32.1% of all revenues. Pills, condoms, and spermicides provided the remaining 6.5% of revenues.

Table 3.4: Area, Annual Consultations and Surgeries by Type of Clinic, 1986

	Large	Medium	Small
Number of Clinics	4	16	18
Average Area (m^2)	1576	476	344
Average Consultations	47,951	5,123	3,025
Average Surgeries	5,522	1,841	460

Source: Profamilia internal documents

Table 3.5: Estimated Prices and Total Revenues for the Surgical and Clinical Sub-Programs, 1986

	Average Price (Colombian pesos)
Pills*	52.50
Condoms*	11.60
Spermicides*	18.40
Consultations	443.24
Surgeries (per operation)	1,555.82
Laboratory Tests	514.36

*Prices are assumed as CBD averages for pills, condoms, and spermicides.

Source: Profamilia internal documents

Table 3.6: Profamilia Clinic-Based Sub-Programs, 1986

Sales of:		
Pill (Cycles)	209,214	
Condoms (individual units)	250,261	
Spermicides (units)	95,697	
IUD* (insertions)	45,906	
Family Planning Consultations**	282,377	
Male Sterilizations	2,201	
Female Sterilizations	59,681	
Couple-Years of Protection (Total)	917,918	(100.0%)
Pills	16,093	(1.7%)
Condoms	2,503	(0.3%)
Spermicides	11,302	(1.2%)
IUD*	114,765	(12.5%)
Male Sterilizations	27,837	(3.0%)
Female Sterilizations	745,418	(81.2%)
Values of Sales (Total) (in 1,000 Colombian pesos)	366,930	(100.0%)
Pills, Condoms, and Spermicides	17,800	(4.8%)
Consultations*	168,145	(45.8%)
Laboratory Services	87,906	(23.9%)
Male and Female Sterilizations	93,079	(25.4%)
Total Sub-Program's Recurrent Costs* (in 1,000 Colombian pesos)	863,974	
of which sterilization	379,500	

* This figure refers just to new acceptors, per Profamilia reporting.
** Does not include consultations accompanied by IUD insertions.

Sources: Ojeda (1987), Tables 1,26,28,29; Villamil (1987), Tables 7-9

3.3.2. The Voluntary Sterilization Program

The basic objective of the Voluntary Sterilization or Surgical Sub-Program is to offer irreversible surgical sterilization to users who have achieved their desired number of children and wish to cease reproducing. Requirements for voluntary sterilization are a minimum age of twenty-five for females and thirty for males, and a minimum of three live children. The Surgical Program was initiated in 1970 with a vasectomy service. Female sterilization was added to the program in 1971, and has had the largest impact of any family planning method in reducing the population growth rate in Colombia. Profamilia offers four types of surgical sterilization: laparoscopies, mini-laparotomies, post-partum, and vasectomies.

Sterilizations are mostly performed in Profamilia's clinics. However, Profamilia also offers sterilizations via mobile units and through agreements with private clinics, physicians and government outlets. The mobile units travel to areas not served by clinics, and perform surgical sterilizations in government and private clinics. Agreements with other public and private sector clinics cover sterilizations in areas not covered by the mobile units and Profamilia's clinics. For this reason, many of the sterilizations shown by the contraceptive prevalence survey to have been provided by government or private clinics were actually provided indirectly by Profamilia. According to the 1976 DHS (Corporacion Centro...1986), there were approximately 750,000 male and female sterilizations performed in Colombia by the end of 1986. Profamilia directly provided almost 500,000 of these through its Voluntary

Sterilization Program.

In 1986, 773,255 CYP were delivered through the 61,882 surgeries performed by the Voluntary Sterilization Program. Over 96% of the surgeries performed were female sterilizations.

Profamilia spent approximately 379.5 million Colombian pesos in 1986 and recovered about 93.1 million pesos in surgical fees.

4. PROGRAM EFFICIENCY: THE ISSUES AND ANALYTIC FRAMEWORK

4.1. Introduction

Profamilia is a not-for-profit organization whose ultimate goal is to promote family planning. Other activities as well as cost recovery efforts aim to serve this goal. In 1986, Profamilia's three programs delivered approximately 1267 million CYP to the population of Colombia at a cost of 1252.8 million Colombian pesos ($US 6.43 million). The program recovered about 642.7 million pesos ($US 3.32 million), or about 50% of its costs.

In total CYP, the share of Community-Based Distribution Sub-Program was 27.6%, of the Clinical Sub-Program 11.4%, and of the Voluntary Sterilization or Surgery Sub-Program 61.0% (Figure 4.1). The shares in revenues from these programs were 42.9%, 42.6% and 14.5%, respectively. In costs, the Community-Based Distribution Sub-Program's share was 31.0%, the Clinical Sub-Program 38.7%, and the Voluntary Sterilization Sub-Program 30.3%.[10] Moreover, the different sub-programs service populations of different ages, leading to variations in potential demographic impact.

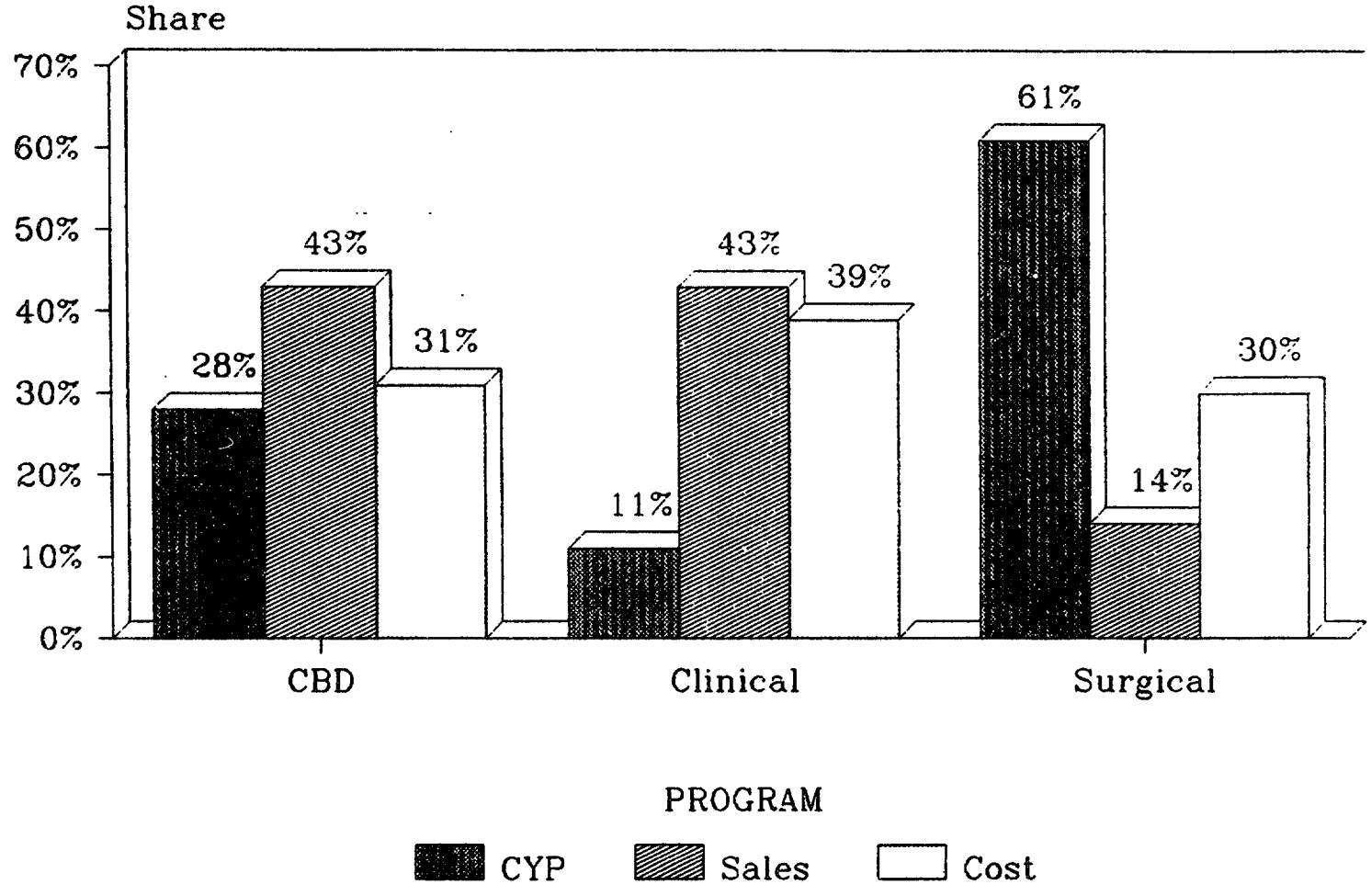
These data reflect key policy and management decisions: allocation of resources amongst sub-programs, fee setting, and allocation of resources

---

10 These data are based on Profamilia's financial records, which may "over-report" the cost of the clinical program and "under-report" the costs of the other two programs because the clinical sub-program serves the other sub-programs.

within programs. The basic efficiency questions are whether and how Profamilia might do better with the resources available to it, or alternatively, where and how it should allocate the resources it has, or additional resources donated to its operations, to maximize the contraceptive protection it offers.

Figure 4.1. Shares in CYP, Gross Value of Sales and Costs, By Sub-Program



4.2. The Efficiency Issue[11]

Efficiency in operations calls for production of maximum contraceptive protection subject to:

a) the budget available to Profamilia from sources other than its own cost recovery efforts;

b) patterns of population use of contraception; and

c) equity considerations.

Because of a lack of suitable data about the population, including its income levels and distribution and family planning practices, we focus on program efficiency with regard to only the first constraint.[12] In addition, Profamilia's current fee structure is taken as given.[13]

---

11 This section is based on Chernichovsky (1991) and Chernichovsky and Anson (1991).

12 The Colombian Demographic and Health Survey (DHS) data for 1986 would be useful to fill this information gap. These data were not available for this analysis. Scheduled work will take advantage of this data.

13 A discussion involving changes in the fee structure would consider consumer response to fees, which has implications for both use of contraception and cost recovery. There is no clear model guiding fee-setting under the circumstances discussed here. Such a model would balance the two considerations as well as equity in delivery. Fees - at least beyond some level - are detrimental to overall contraceptive use, but generate revenues which can be used to further promote contraception through improved access. Revenues collected through fees should be used to improve service so that total protection delivered would increase without harm to overall equity.

Maximum protection delivered with a given "external" budget means that the program delivers protection at minimal unit cost, which is considered a prime measure of operational efficiency. Various methods have different attributes in terms of: (a) efficacy coefficients (or CYP), (b) efficiency levels even when properly used, (c) cost recovery coefficients (or prices to cost ratios), (d) potential impact, due to age of users, and (e) costs. Consequently, with a given external budget and input prices, unit costs of protection can be controlled through improvements in:

a) input levels or scale of operation;
b) combination of inputs and worker attributes; and
c) method mix.

We divide the efficiency issue here into two components: internal efficiency and allocative efficiency. Internal efficiency issues relate to unit cost of protection <u>for a given method mix</u>. These issues concern two questions. The first is: which inputs (e.g. nurses, MDs) and worker attributes (e.g. age, sex, experience) should be expanded at the margin, possibly at the expense of others, in order to increase the efficiency within each sub-program or part of it? The second is: should the entire scale of the operations be expanded to increase efficiency?

Allocative efficiency issues relate to the question to what sub-program or method should an additional peso be allocated. The allocation question

stems primarily from varying levels of efficacy (in terms of CYP), cost recovery potential (in terms of prices or fees relative to cost), and different consumer demand patterns (in terms of age of users of particular programs/methods).[14]

Therefore, we divide the discussion into two major parts. In the first part we examine separately each of Profamilia's sub-programs, both outreach and clinic-based, in order to identify the means by which Profamilia may increase the internal efficiency of each sub-program or components thereof individually. In the second part we compare the two types of programs, studying the ways in which Profamilia might increase overall efficiency by shifting resources between its programs, or by promoting particular programs. Within the clinic-based operations we compare Profamilia's Clinical and Surgical Sub-Programs.

Any programmatic changes suggested should be considered marginal within the realms of current contraceptive technology, consumer demand patterns, and Profamilia's current structure and delivery patterns. The two analyses may suggest promotion, at the margin, of one family planning method at the expense of another, and the serving of different populations. It must be borne in mind, however, that no data are available on demand for alternative methods. That is, suggestions from a cost-effectiveness perspective about a "preferred" method (cum mode of delivery) and program from a cost-

---

14 Method mix optimization and unit cost minimization through better use of resources are inter-related, because the efficiency of a method is in part related to the cost of delivering it. The two are dealt with separately here for the sake of clarity and simplicity of discussion.

effectiveness perspective must ultimately consider consumer preferences. A program may be cost-effective but socially inefficient when consumer preferences are disregarded. That is, the program may deliver a mix of methods with a given budget so that total delivery cost, say per CYP, are minimized. Yet, demand patterns may not match this mix; some methods may be oversupplied while others are undersupplied.

4.3. Costs, Resource Productivity and Internal Allocation of Resources

A program or operation can be identified at any particular time by two types of inputs: those which change with output level - variable inputs - and those which do not - fixed inputs. In a clinic, the building size and amount of equipment are unlikely to change with the number of visitors. Levels of supplies (e.g. of contraceptives) certainly change, probably in proportion to the number of visitors. In an outreach operation with a single field worker promoting, coordinating, and delivering contraceptives, the worker may be considered the fixed input, if employed full-time, although his or her time input may change in relation to output levels. Here again, supplies vary with output. Parallel to inputs, their costs are also divided accordingly between fixed and variable.

The unit cost of an operation is the ratio between total costs, determined by the nature of inputs and their prices, and resource productivity, measured by number of contraceptives sold, CYP delivered, and revenues.

Consequently, the potential for increasing returns to scale - lower unit cost because of scale of operations - is higher in operations where the fixed cost component is high in relation to the variable cost component.

From the viewpoint of variable costs, costs of supplies are proportional to output levels. Hence, a rise in the variable unit cost of an operation follows a decline in marginal productivity of labor among other things. This leads to an increase in marginal cost of output. This is to say, the rise in output levels is less than proportional to the leading rise in amount and cost of labor. This may reflect, on the one hand, constraints of fixed inputs - including management, and on the other hand (especially in the field of family planning), the need to increase efforts to mobilize additional users.

When all costs are considered, the decline in the fixed costs (per unit of output) may be offset, beyond a particular level of output, by rising marginal costs due to falling labor productivity within that range.

In the long run, an operation may be considered inefficient in two extreme situations. First, when in comparison with another adjacent or second operation, it operates at too small scale; that is, expansion of the second operation at expense of the first would reduce unit cost. Second, when it operates at too large a scale in given operations, expansion of the said operation, e.g. a new clinic, would reduce unit cost in the long run. In the second case, this may require new long-term investments and

reorganization.

Identification and measurement of levels and composition of costs in relation to labor productivity and scale of operations are, therefore, critical elements of a cost-effectiveness analysis. Their study in Profamilia is the prime objective of this analysis.

A supply and demand framework, outlined here in general terms, is employed to determine resource productivity in terms of sales of contraception.[15]

Accordingly, demand (QD) for contraceptives in a given operation is depicted by:

QD = d (population size, population characteristics, promotion activities, the "full price" [FP] of service to clients) (4.1)

That is, the quantity of fertility control demanded (QD) in a given catchment area is a function of:

a) population size, which influences demand for contraception and potential scale of operations;

b) population characteristics, which determine the demand for children, fecundity, and attitudes toward family planning (Easterlin and Crimmins 1983), all of which determine demand for contraception;

---

15 An operation is usually characterized by sales of several contraceptives. The framework as outlined, may relate to a particular contraceptive or to a constant "mix" of contraceptives.

c) promotion activities such as Information, Education, and Communication (IEC) activities; and

d) the full price of service to the client, which is determined by fees (when applicable) and ease of access to outlets and support services.[16]

Effective demand levels vis-a-vis the capacity of an operation are important to cost-effectiveness because of returns to scale, associated with fixed cost elements, as suggested above, are a major means of reducing unit cost per user. Demand levels are therefore a major concern to program planners and managers. Demand levels can be influenced by (a) the size and nature of a catchment area allocated to an operation, and (b) by promotion of consumer demand in that area through IEC activity, and lowering of the full price of service. Both options require a delicate balance amongst resources allocated to delivery, IEC, and to reduction of the full price of contraception to the consumer.

The supply of contraceptives in the community concerns a program's capability to influence and accommodate potential clients by affecting the full price (FP) of contraception, or the clients' perceived access to service. This price can relate to, but should not be confused with, cost of delivery. The price can be lowered when the program has more and better resources for delivery. Generally, for a given external program budget, the following relationship holds:

---

16 The "full price of service" relates to many aspects of clients' perceptions of cost of, and comfort with, service. Therefore, the nature of inputs, e.g. female vs. male workers, might be considered in order to assess their impact on the full cost of contraception to the consumer, especially in the absence of fees for service.

FP = s (QD, resources allocated to delivery, input prices,

infrastructure, fees, natural environment) (4.2)

That is, the price is a function of:

a) quantity demanded (QD), which determines the actual scale of an operation: when it is "too high" for the (short run) supply efforts of a particular operation, it may induce a high price to consumers through queuing and high costs of operations; when it is "too low" it may induce high unit cost of operations because of high (long run) fixed costs;

b) resources allocated to delivery, which determine how well consumers can be accommodated; clients can be accommodated with more and better resources, especially when the fees clients pay do not cover the marginal costs of the service;

c) input prices, which determine the level of real resources available for delivery. The higher the prices, the lower the level of real resources available to the program;

d) infrastructure, which enhances a program's potential by augmenting productivity of other resources;

e) fees which deter clients by increasing the FP of service;[17]

f) natural environment, which if harsh, may be detrimental to accommodating clients with given budgets.

A third relationship concerns mobilization of community resources,

---

17 Fees have the potential increase availability and quality of service, and attract consumers. This issue is not considered here explicitly. "Resources allocated to delivery" can be regarded as including revenues from fees.

which are included under infrastructure:

$$I = i \text{ (program inputs for resource mobilization, community infrastructure)} \quad (4.3)$$

This quantity is determined by:

a) the inputs the program allocates to mobilize resources, such as points of sale or outlets in the community. The higher the input levels, the higher the level of resources mobilized;

b) the infrastructure, health and other community facilities, which determine the potential for resource mobilization.

The discussion thus concerns the question how the program can maximize the protection it delivers through allocation of program resources between promotion, delivery, and resource mobilization, so that delivery unit cost is minimized.[18]

4.4. Allocation Across Programs and Across Methods within Programs

Profamilia's programs are distinct. As discussed above, they serve different populations and at different unit costs. A key allocation question is therefore where should Profamilia's management invest the additional or marginal peso or dollar it receives in donations?

---

18 When all costs and institutions participating in delivery are considered, the third relationship can be integrated in relationship 4.2. This may be warranted also for the subsequent statistical analysis because it is difficult to separate statistically the impact of the environments and the community's contribution to infrastructure from the impact of the community's characteristics through demand for contraception.

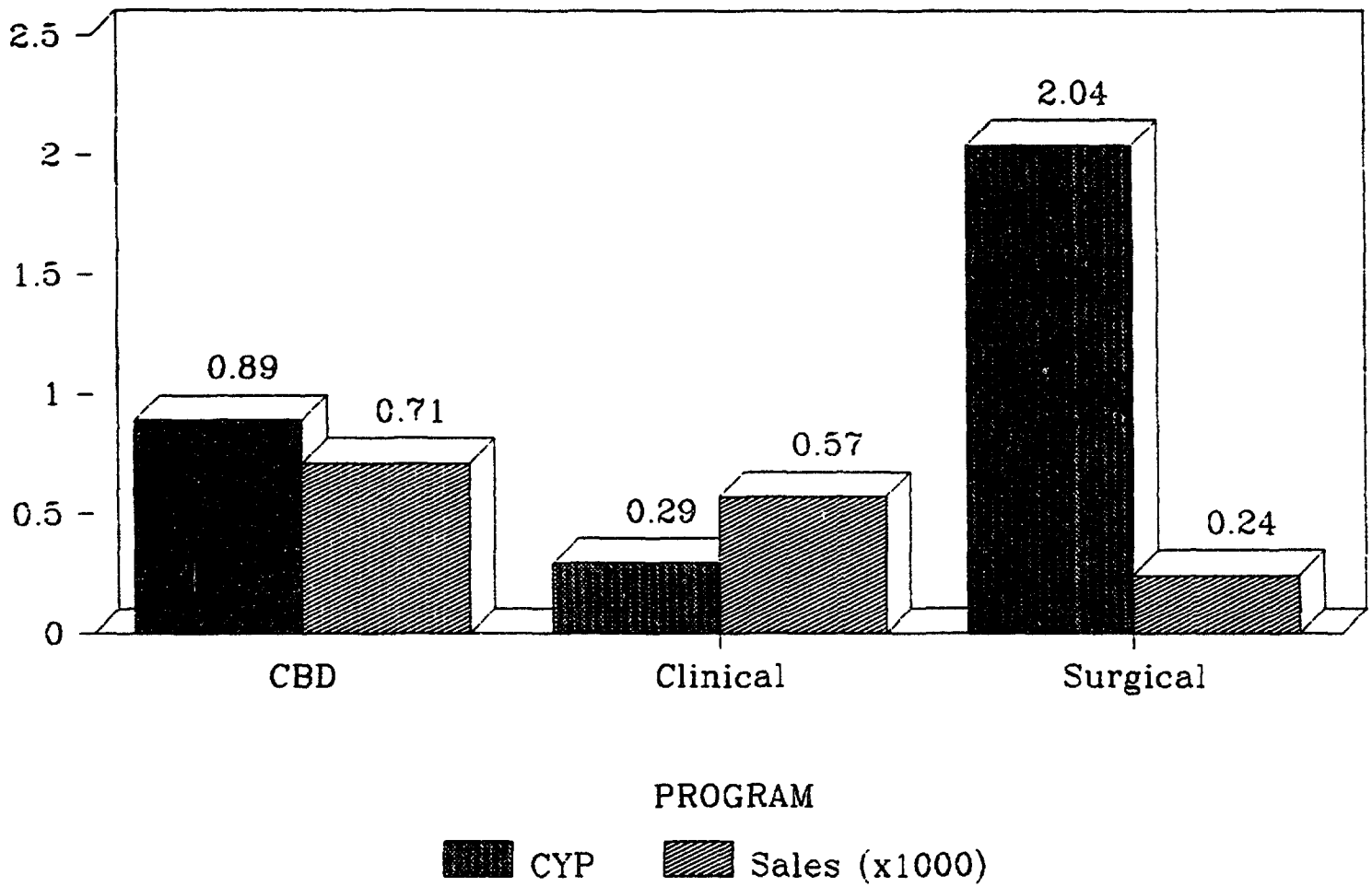
Barring equity issues, optimal allocation decisions call for a situation where there is no preferred gain in protection from allocating the marginal peso in any particular sub-program or method. The operational guidelines leading to this situation are not straightforward, because each such unit of resources yields not just CYP through different methods, but also revenues which can be reinvested. Moreover, different methods are used by couples with different levels of pregnancy risk due to their age.

This issue is well illustrated in Figure 4.2. On the average, 1000 pesos (gross) yield the most CYP in the Surgical Sub-Program and the least in the Clinical Sub-Program. This amount recovers 710 pesos in the CBD Program, 570 pesos in the Clinical Sub-Program, and 230 pesos in the Surgical Sub-Program. The programs also serve different age groups.[19]

---

[19] The current fee structure is taken as given, although it is a crucial policy instrument.

Figure 4.2. CYP and Value of Sales (x1000) per 1000 Pesos by Sub-Program



Each external peso allocated to a particular program has a "multiplier effect". It generates sales of contraceptives and protection throughout the program, directly in the operation receiving allocation, and indirectly through revenues reinvested in all operations. Adjusted Total CYP (ATCYP) of this marginal peso is given by:

$$ATCYP = [(a_i/mc_i) \times (\tilde{a}_i \times \beta_i \times \ddot{Y}_i)] / [1 - \hat{E}_i\, p_i\, (a_i/mc_i)]^{20} \quad (4.4)$$

where:

a_i = the share of the operation, characterized by method or method mix, in total cost;

mc_i = the marginal cost of each unit of output in this operation;

$\tilde{a}_i$ = CYP or length of protection associated with a unit of output i;

β_i = efficacy of unit when adequately used;

$\ddot{Y}_i$ = standardized "risk of pregnancy" coefficient for the average user;

p_i = the average fee charged to a consumer per unit of the operation;

The first parameter reflects the basic allocation decision of Profamilia's management. The second parameter is derived from the cost

---

20 For a full discussion, see Chernichovsky and Anson (1991).

functions of Profamilia's operations. The next three parameters are determined by the method mix in each program and the fee charged for each method. The last is determined by Profamilia's management.

Clearly, identical reasoning applies to allocation of resources among methods within each sub-program.

4.5. Statistical Approach

The statistical analysis is based on observed co-variations in output, input, and costs across Profamilia's operational units in each of its sub-programs. The basic assumption underlying this approach is that what works best in one operational unit, can be adopted by another. Given the non-experimental nature of the available cross-sectional data, an attempt is made to statistically control for as many social and other environmental variables as possible, as they may affect resource productivity and costs across units. Consequently, data on population characteristics and natural environment are included in the analysis, in addition to data on resources and output.[21]

---

21 The analysis applies to entire populations of Profamilia's field workers and clinics. Hence, the statistical estimates depict the actual situation. The t and F-statistics should be used for their predictive value, and measurement of strength of the estimated relationships.

5. THE CBD PROGRAM

5.1. Objectives and Framework of Analysis

Profamilia's primary and almost exclusive resources in the CBD or outreach program are its staff of field workers and supplies. How Profamilia recruits and allocates them, who they are, and how they are supported in the community, all influence contraceptive supply and demand which in turn determine the effectiveness and the cost-effectiveness of these workers' operations.

The objective in this chapter is to examine field worker characteristics, allocation and support strategies, for their cost-effectiveness, and thereby, whether and how Profamilia might improve the cost-effectiveness of its outreach operations. The chapter falls into two major parts. The first is an application of the conceptual framework discussed in the previous chapter to outreach operations, and the second comprises a statistical analysis of pertinent data.

5.2. Field Worker Operations: A Model and Hypotheses

The resources available to field workers are their own time and the community resources they have available or can mobilize to assist them: medical infrastructure and distribution points. Let us assume that field worker potential production in the community (U_s) is a function of time spent in delivery and coordination of sales (t_d) and of infrastructure (I):

$$U_S = f(t_d, I).^{22} \qquad (5.1)$$

This is a technological relationship representing a worker's potential in the community: the number of clients or would be clients he or she can service, given the particular nature of the community and the mix of methods delivered.[23] This function is depicted by curve f() in the upper right quadrant of figure 5.1. It corresponds to relationship 5.1 and incorporates 4.3. It is further assumed that all workers share the same production function or technology, that each strives to maximize output, and that the maximum can be reached by exhausting all working time.

Clearly, the greater the output per worker, the lower the unit cost per average user or unit of CYP delivered by the worker. A worker is considered a "quasi-fixed" input in the short run; the marginal cost of his or her operation entails primarily costs of supplies and possibly some travel costs.[24] Optimal output and minimal unit cost would be achieved at output

---

22 For clarity of discussion, the number of variables in this and other functions which follow in this section, is kept to a minimum, without loss of generality.

23 As resource mobilization enhances worker productivity by providing more help in the community, f() may be viewed as the a function expressing optimal solutions for allocation of time between delivery and resource mobilization. See Annex 2 and Chernichovsky (1991B). It is further assumed that workers wish to deliver the most efficacious method mix within their capacity. They may be constrained by availability of medical infrastructure and consumer preferences.

24 Wages are considered a fixed cost because the workers do not work part time and are not paid on that basis.

level U_{sm} where the worker reaches maximum potential.[25]

Let us further assume that the potential demand, delineated by number of would-be users (U_d) in an individual worker's catchment area, is a function of number of eligible couples, or ELCOs (E), their socioeconomic characteristics (SE), and field worker time allocated to promotion or IEC (t_p):

$$U_d = g(E, SE, t_p) \qquad (5.2)$$

This function is delineated in the lower left quadrant of figure 5.1. It corresponds to relationship 4.1. Clearly, the number of would-be users cannot exceed the number of eligible couples (which may be estimated from population size) in any catchment area ($U_d <= E$). The upper limit of demand is E. Its lower limit is U_{d1} (the intercept) or the level of latent demand that exists with no promotion efforts, when $t_p=0$, as can be shown at the base of $g(E_3)$. To the extent that g() is indeed a function of t_p, it forms another production function representing a worker's ability to promote sales through better marketing in a given catchment area delineated by E. The marginal productivity of this effort must be falling because of the upper limit set by numbers of ELCOs. As in the case of f(), it is assumed that all workers share the same function.

Individual worker productivity can mean both more effective supply

---

25 The underlying assumption is that while an individual worker cannot be hired on a part-time basis, workers can be hired and dismissed, so that those remaining on the job would produce each at point U_{sm}.

efforts, shifting f(), and more effective promotion efforts, shifting g(), per unit of time invested in any activity. Some particular personal worker traits may be useful in supply efforts, and others in promotion efforts. A more productive worker can deliver more with given resources, or meet the same demand levels with fewer resources.

As under full employment conditions,

$$t_d + t_p = T, \tag{5.3}$$

where T is total working time available to a worker, there is a trade-off between the two time allocation options. This trade-off is depicted by the 45^o (negatively sloping) line in the lower right quadrant of figure 5.1. The 45^o line in the upper left quadrant represents all points where supply equals demand.

Two fundamental regimes can be identified in this model. The first is depicted in figure 5.1 with the aid of $g(E_3)$. In this case the worker cannot satisfy latent demand in his or her catchment area. Promotion activities would be wasteful for as long as latent demand exceeds maximum potential supply ($U_{dl} > U_{sm}$). Staff works to capacity and unit costs are minimal, but demand is not fully exploited. This situation should be indicative of a program which does not have sufficient resources to hire enough workers and provide sufficient supplies to service its entire potential population.

The second regime is depicted with the aid of $g(E_o)$, $g(E_1)$, or $g(E_2)$, indicating situations where minimum latent demand in the worker's catchment area is less than the worker's maximum capacity to serve, $U_{dl} < U_{sm}$. In this case the worker can sell more contraception than is needed to satisfy latent demand, and therefore can allocate time to demand promotion. This situation should be indicative of a program which can afford to hire more workers than needed to satisfy latent demand. Therefore, accounting for costs of supplies, the program should promote demand. This can be done in the case of Profamilia through IEC activity. Clearly, under such circumstances the program may satisfy demand but risk worker unemployment and higher-than-warranted unit cost of delivery.

The optimal situation under the second regime would be the singular supply and demand situation depicted by point O^o, where a worker is assigned to a population in which he or she can allocate all working time to supply and demand in a way that $U_d^o = U_s^o$, and $t_d^o + t_p^o = T$.

Two non-equilibrium situations may prevail. The first is portrayed by point O' associated with function $g(E_1)$, indicating excessively low demand. A worker produces more than the quantity demanded. This is wasteful, more resources are allocated to delivery than are used. The worker should increase promotion efforts at the expense of delivery efforts, until reaching equilibrium or close to it. The second situation is delineated by point O'', associated with function $g(E_2)$, indicating excessively low supply, $U_d > U_s$. This is wasteful in terms of program resources; the worker spends too much time in promotion. It is also socially wasteful in terms of client

queuing time. The worker may fine-tune time allocation; more to delivery and less to promotion, keeping fully employed and lowering delivery costs as well as the social cost entailed in queuing.

Given the worker's productivity potential, delineated by f(.), there may be only one demand function $g(E^0,.)$ which makes possible a full equilibrium such as depicted by O^0. Particular functions may be such that the worker's marginal promotion efforts do not "match" their marginal delivery efforts. For example, suppose that in a given range of operations there is excess supply. A worker may decide to reduce delivery efforts by one hour, and increase promotion efforts by the same amount of time. The two outcomes may not match; the excess supply situation may persist because the marginal increase in demand is still smaller than the marginal decrease in supply. If workers are assigned relatively low target populations, their marginal productivity in promotion may begin declining at relatively low levels of time allocation to promotion, and it may fall fast. The likelihood of excess supply is greater in such situations. If more functions permitting equilibrium exist in addition to $g(E_o)$, the equilibria points would be traced by the line EE in the lower left quadrant.

It should be further noted that under circumstances of excess supply, there is little or no savings to Profamilia even when workers are more productive. The worker is paid in any case. Only under demand situations $g(E>E_o)$ indicating likely queuing, a more productive worker would produce more and benefit the program.

Two basic allocation problems are presented here. The first is the assignment of workers to population and environment. This is done by program management. The second is the worker's time allocation. This is most likely to be a personal decision to be monitored by management.[26]

It must be recognized that in any of the situations discussed above, workers may misallocate their time: too much in delivery and too little in promotion, or vice versa.

According to the model, the logical sequence of efficient resource allocation by program management should be as follows:

a) satisfy latent demand for as long as possible with available resources by hiring workers and letting them work to capacity. Then, if more resources are still available,

b) continue hiring workers, reducing further the catchment area per worker, and start promotion of demand through IEC, while balancing time allocated to promotion and time allocated to delivery.[27]

The empirical analysis aims to test two alternative hypotheses derived from this framework. These are:

a) Profamilia's field workers are underutilized (situation such as O'), implying that:

   . worker productivity is influenced by demand conditions:

---

26 These allocation problems are handled separately and in detail by Chernichovsky (1991B).

27 It is assumed that fees for service are set. Hence, whatever maximizes output or delivery, maximizes revenues.

only more demand through a larger target population or IEC activity will generate higher productivity; and,

- productive workers would work less, but without cost savings to Profamilia.

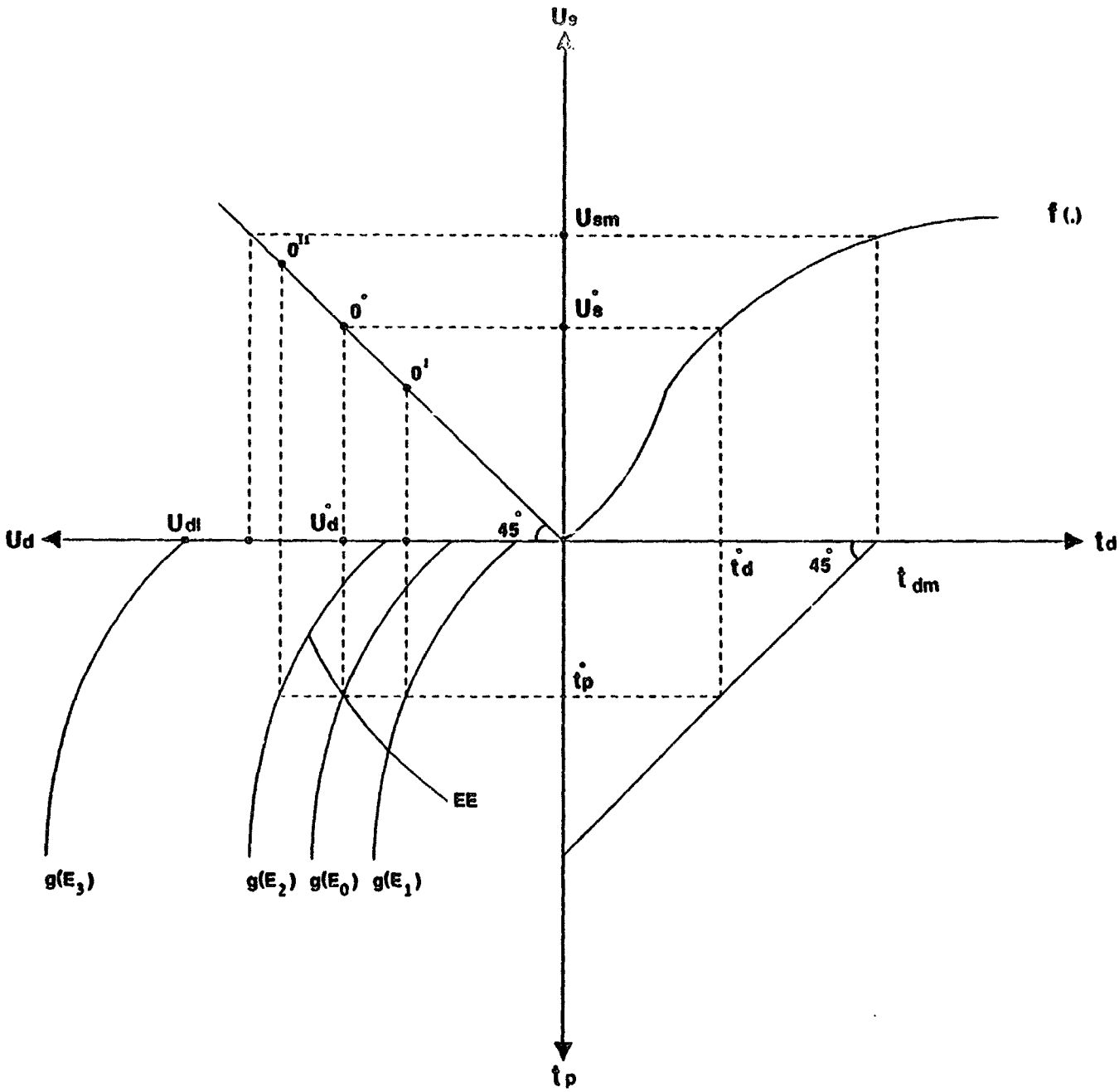
b) Profamilia's field staff work to capacity (situations O^{p} or U_{sm} and above), implying that:

- demand conditions do not affect worker productivity; and,

- relatively productive workers, including those who mobilize more resources in the community, would produce more and at lower unit costs.

Each hypothesis has different implications on how Profamilia might increase the efficiency of its operations.

Figure 5.1: Field Worker Productivity: Interaction between Supply and Demand in a Catchment Area



5.3. Data and Specific Hypotheses

The data for the analysis concern the operations of the ninety-seven instructors, or field workers, who coordinate the CBD Program (see Section 3.2). Two performance or output measures are available for each worker: (a) sales of contraceptives, and (b) the monetary value of these sales. Those, coupled with cost data for the operation of each worker, are related to explanatory variables which are studied for their effect on worker output or productivity in view of the model just presented.[28] The variables are grouped by their operational significance. These groups concern program design and targeting, personnel policy, pricing policy, and method mix.

Under program design we incorporate variables that relate to the structure of the program and the organization of its resources. These are:

a) size of population served per field worker;[29]

b) number of points of sale in the community through which any field worker operates; and,

c) number of workers supported by a clinic (in a clinic's catchment area).

As for the first variable, more people per field worker may imply higher potential demand. In a situation like $U_{dL} > U_{sM}$ (figure 5.1) and above, the

---

28 See Table 3.2.

29 It should be noted that unlike the other demand-related variables, population size is viewed as a variable representing the upper limit to the supply efforts in a given area. Other variables are more qualitative in nature. For example, a higher percentage of mothers in a given population would boost demand in a given catchment area, and thereby, ease the field worker's task by concentrating demand.

hypothesized effect of this variable is nil, as demand cannot be met by supply. It may be even negative, if workers tend to overly extend themselves. If the average situation is depicted by $U_{dL} < U_{sM}$, there will be an increase in output when workers are allocated a larger target population which brings about more effective demand. The effect of population size per worker is thus a priori unknown.

Points of sale are an added resource to the field worker, part of the infrastructure available to him, augmenting his or her productivity through increasing access to the population. Therefore, a positive association between sales of contraceptives and points of sale is hypothesized, when demand is not fully satisfied in the worker's catchment area.

Number of field workers served by a clinic is meant to measure whether or not, and how, the clinical infrastructure available to the average field worker, influences his or her productivity through its effect on both workers and clients. A clinical base means availability of vehicles and other forms of support. In addition, it means wider options and some measure of medical security for clients (e.g. referral to clinics for clinical methods and general medical advice). It is thus hypothesized, that to the extent that clinical infrastructure constrains worker productivity, the more workers per clinic, the less each worker's productivity. To the extent proximity to clinics affects demand, clinics may boost demand for worker output, on the one hand, because of availability of medical attention, and lower it, on the other hand, through substitution. That is to say, clients may opt for clinical methods, and even non-clinical methods through clinics rather

through community outlets.

Under targeting, which concerns fine-tuning operations to nature of population and natural environment, the following variables are discussed:

a) percentage of mothers in the population;[30]

b) average household monthly income; and

c) percentage of illiteracy among women aged 12 to 59.[31]

The first two variables are hypothesized to have a positive effect on demand for contraceptives in a given population, and hence on field worker productivity by a more concentrated demand in the same population, requiring less effort per client. The effect of the last variable is a priori unknown; while educated women may be more able to take advantage of a program, they may have less need for it (Schultz and Rosenzweig, 1982).

For the natural environment two variables are examined:

a) area size in square kilometers; and

b) average altitude in meters.

It is hypothesized that all other things equal, larger areas and higher

---

30 Data on number of women 15-49 married or in consensual unions were not available at the time of this study. The "percentage of mothers" was chosen upon the alternative, % of all women 12-59 in the population, as representing better demand for contraception. The selected variable underestimates the demand for contraception by excluding demand of non-mothers, but does not include groups who have no demand altogether to the extent that the alternative variable does.

31 See Table 2.1. Another factor affecting demand for Profamilia's services is availability of government services. A future discussion might use DHS disaggregated population data, and data on availability of government services.

altitudes can diminish worker productivity as he or she needs to spend more energy to cover a particular population.

Personnel policy is discussed through the impact of worker characteristics on their effectiveness and cost. This is a critical aspect, as an estimated 61% of total operating cost (not including supplies) of the CBD Program are labor costs (Villamil, 1987, Table 7). Worker characteristics pertain to:

a) age;

b) gender;

c) marital status;

d) level of education; and

e) experience.

In many ways, these are the basic inputs in the CBD program.[32] All are hypothesized to affect both supply and demand (functions f (.) and g (.) in Figure 5.1). It is hypothesized that older and more experienced workers who know their population and environment better are more productive. They are possibly more costly. Profamilia maintained, at least at the inception of the program, that female workers are more productive than their male counterparts because of the nature of family planning activity. Worker education is hypothesized to promote productivity. It is usually associated also with higher wages. It is assumed that any variable which is associated with a higher (%) gain in productivity than (%) addition in wages, increases

---

[32] It should be kept in mind that field workers do not sell contraceptives directly, but through points of sale or outlets. Worker characteristics matter, nonetheless, as workers are highly involved with both the sellers and buyers of contraceptives in the community.

efficiency.

Prices are naturally a significant variable affecting consumer demand and the program's revenues. Higher prices are hypothesized to deter demand. But they may lead to higher net revenues where consumer response to a higher price is not offset by the fall in the quantity of sales. Actual prices charged for contraceptives were not available. For each worker an implicit average price was computed by dividing the value of his or her sales of any particular method, by the quantity of sales.

Method mix is a crucial variable, as different methods have different delivery costs and cost recovery potential, provide varying levels of protection, and attract users of different age groups.[33]

Unfortunately, population and environmental data are available only on a provincial level for twenty-two of Colombia's twenty-three provinces. As a result, two levels of statistical analysis are discussed: individual-worker level, and province-level. In the latter, number of workers and characteristics of the average worker (in the province) are included in the analysis. As the individual-level analysis excludes community level data on population characteristics, this analysis is meant to establish and confirm the findings about worker characteristics, points of sale, and contraceptive prices.

---

[33] Consumer preferences (for which no data is available here) should be considered as well. It is assumed throughout the discussion that the program satisfies those preferences at given fees for contraceptives, but can still promote (at the margin) methods that increase program efficiency.

5.4. Estimation Procedure

Information about a field worker's allocation of time to alternative activities is missing from the data. This eliminates the possibility of fully exploring the model presented in Section 5.2, particularly the element of resource mobilization or the establishment of sales points in the community. It is possible, nonetheless, to study through correlation of different variables with sales, whether or not Profamilia's field workers operate under excess supply or excess demand conditions and the probable impact of the variables on sales.

In line with the discussion in Section 4.3, the following functional relationship has been used for statistical estimation:

$$\text{Natural logarithm of } M_{jk} = A_{oj} + \Sigma\alpha_{ij} \text{ Natural logarithm of } X_{ik} + v_{kj}$$

where M_j refers to sales of specific method (j), or alternatively, to total value of sales of all methods by field worker k. A_{oj} is a shift parameter, and X_i refers to each of the explanatory variables summarized in Table 5.1. The term v_{kj} is a random error term. α_{ij} measures the influence of each variable on output: the % change in output associated with a given % change

in input.

This function is a "reduced form" of relationship (4.1) incorporating relationship 4.2. as discussed in section 4.3. "Points of sale" are assumed exogenous to the field workers' decision making.[34] That is, relationship 4.3 is disregarded. The estimated coefficients (α_{ij}) indicate, therefore, interactions between supply and demand or the "net effects" of the explanatory variables through the estimate coefficients reported in Tables 5.2 and 5.3.[35]

---

[34] As noted earlier, pertinent data on a field worker's time allocation, is missing.

[35] It can be demonstrated that estimated coefficients that would pertain to structural relationship 4.1 retain their sign; they are, however, downward biased.

Table 5.1: List of Variables by Operational Category and Conceptual Relationship

Policy and Program category / variable	Relationship
Program Design	
population size per field worker	4.1; f ( )
population characteristics	4.1; f ( )
points of sale	4.2; g ( )
no. of field workers served by clinic	4.1; f ( )
Personnel Policy	
gender of field workers	4.1 and 4.2; g ( ) and f ( )
age	4.1 and 4.2; g ( ) and f ( )
marital status	4.1 and 4.2; g ( ) and f ( )
level of schooling	4.1 and 4.2; g ( ) and f ( )
Targeting	
social environment	
% of mothers in population	4.1; f ( )
average household income	4.1; f ( )
% of illiteracy among women 12-59	4.1; f ( )
natural environment	
area size (sq. km.)	4.2; g ( )
altitude (m.)	4,2; g ( )
Pricing Policy	
prices of contraceptives	4.2; g ( )
Method Mix	4.4

Table 5.2: Regression Coefficients (Natural Logarithm) Quantity of Sales of Contraceptives, Regional-Level Estimates for CBD Program (t-Statistic in Parentheses)

	QUANTITY OF SALES			Total
	Pills (cycles)	Condoms (units)	Sperm. (units)	Value (pesos)
Program Design				
Population Size+	-0.94	-0.20	-0.81	-0.31
	(-3.20)	(-.38)	(-1.09)	(-2.17)
Number of Instructors+ in the province	0.47	-0.64	-0.11	1.22
	(1.81)	(-1.30)	(-.16)	(9.35)
Number of points of sale+ per instructor	1.56	1.33	2.20	0.14
	(4.71)	(2.20)	(2.45)	(.87)
Number of clinics+ in the province	-0.16	1.06	0.62	-0.45
	(-0.39)	(1.47)	(.63)	(-2.32)
Price of contraceptive+	-5.70	-3.80	-12.09	1.97
	(-2.28)	(-.85)	(-.55)	(1.55)
Natural Environment				
Area size (sq. km.)+	0.31	-0.32	0.42	0.13
	(1.71)	(-1.06)	(.86)	(1.47)
Average altitude (m.)+	0.17	-0.06	0.27	0.03
	(2.00)	(-0.36)	(1.31)	(.85)
Worker characteristics				
% male	0.23	-0.23	0.75	0.03
	(0.25)	(-0.13)	(.32)	(.07)
% married	-0.13	0.99	0.59	-0.79
	(-0.30)	(1.32)	(.55)	(-3.76)
Mean years of schooling+	0.16	0.036	0.26	0.03
	(2.52)	(.31)	(1.54)	(1.04)
Mean years of experience+	0.06	-0.03	-0.07	0.05
	(1.33)	(-.04)	(-.64)	(2.62)

(continued)

Population Characteristics				
% of mothers in pop. of 12-64	19.93 (2.16)	-0.42 (-0.03)	30.10 (1.32)	19.21 (-0.96)
Average household income+	0.48 (0.50)	0.19 (0.09)	-4.87 (-2.05)	0.67 (1.44)
% women with no education	0.60 (0.10)	-7.50 (-1.29)	4.85 (.60)	-1.46 (-.92)
Constant	21.98 (1.58)	17.96 (.62)	73.86 (1.14)	-2.38 (.04)
N	22	22	22	22
Adj. R squared	0.8	0.34	0.36	0.97
F	6.9	1.8	1.8	44.7

+ Natural Logarithm of

Table 5.3: Regression Coefficients (Natural Logarithm), Contraceptives Sales, Individual Worker-Level Estimates for CBD Program (t-Statistic in Parentheses)

	DEPENDENT VARIABLES			
INDEPENDENT VARIABLES	Pills (cycles)	Condoms (units)	Spermicides (units)	Value of Sales (pesos)
Worker Characteristics				
Age	-0.578	-0.57	-0.016	-0.370
	(-1.95)	(-0.06)	(-0.02)	(-1.38)
Gender (male=1)	-0.245	0.017	-0.024	0.004
	(-1.43)	(0.07)	(-0.08)	(0.02)
Marital status (married=1)	0.258	0.153	0.350	0.267
	(1.92)	(0.80)	(1.58)	(2.20)
Experience (years)	0.050	0.054	0.024	0.047
	(3.42)	(2.61)	(1.00)	(3.62)
Program Design				
Number of Points of Sale	0.922	0.820	0.752	0.880
	(9.03)	(5.53)	(4.46)	(9.49)
Contraceptive Price	-5.053	0.183	-0.102	-1.089
	(-4.13)	(0.12)	(-0.24)	(-1.07)
Constant	27.750	5.380	5.867	15.563
	(5.63)	(1.32)	(2.12)	(3.99)
N	95	95	95	95
Adj. R-square	0.57	0.29	0.17	0.55

Note: Contraceptive price for value is defined as the average of the field worker's prices for all three methods, with each weighted by the share of that method in total CYP which he or she delivers. For number of units of individual methods sold, the price for the single method alone was used.

5.5. Productivity and Effectiveness of Field Workers

In terms of program design, all other things being equal including number of field workers, the larger the population in a province, the lower the volume and value of pill sales (Table 5.2). By the same token, the more field workers in a province, ceteris paribus, the more contraceptives sold and the more revenues generated. This finding suggests that attempts to allocate, on the average, workers to "too large" populations may induce negative marginal productivity, as workers are overly extended. That is, worker productivity and overall cost-effectiveness cannot be increased, on the average, by assigning workers to larger than current populations. Alternatively, Profamilia has exploited this allocation criterion probably to its full potential and beyond. Profamilia's field workers are not underworked and demand promotion activity (IEC) would be redundant.

A significant program design variable explaining sales is the number of contraceptive outlets or points of sale (Tables 5.2 and 5.3).[36] By the estimates reported in Table 5.3, a 10% increase in the number of outlets under the control of a field worker is associated with an approximately 8% increase in his or her output, based on individual-level estimates. It is noteworthy that the impact of this variable is retained in the provincial-level estimates (Table 5.2) when population size, number of workers, and

---

[36] Note that in Table 5.3, the individual worker is the unit of observation and analysis. The reader is reminded that an outlet or point of sale is a household or a shop owner who either buys or accepts a consignment of contraceptives from the field worker. This is the field workers' distribution channel.

some relevant population characteristics largely affecting demand, are statistically controlled. The measured effect is consistent with the hypothesis that points of sale enhance worker productivity through supply, in a situation where there is effective demand to exploit.[37] It also suggests that one way workers can enhance program resources is by mobilizing more community resources through points of sale. Here again, whatever increases worker productivity or supply increases output as well.[38]

Clinical support is not an inhibiting factor in field workers' sales. The estimated coefficients on the quantities sold (Table 5.2) are all insignificant, except total! suggesting that the same clinical infrastructure may support more workers than at present, without hindering, on the average, the quantities of contraception sold by the average worker. Or, in other words, there are still economies to exploit as far as clinical support is concerned. However, the more clinics, ceteris paribus, the lower the value of sales. This suggests that where clinics are more readily available, field workers may refer users of relatively efficacious methods to the clinics. Clients, for their part, may opt for close-by clinics rather than for CBD outlets. As a consequence, clinics may also depress CBD sales.[39]

---

[37] The provincial data suggest that in terms of value of sales, more posts may be associated with somewhat lower prices. This may indicate competition between posts.

[38] As there is no knowledge of the effort required to "produce" more sales outlets, no analysis is presented here on the optimal allocation of a worker's time between delivery and mobilization of points of sale. See Annex 1. An attempt to explain number of contraceptive outlets by population characteristics did not yield meaningful statistical results.

[39] In this regard, the actual output of the CBD program is underestimated and undervalued because its referrals to clinics and presumably to more efficacious methods, are not counted as output of this program.

Worker characteristics are discussed with the aid of Table 5.3. Gender has no measurable association with worker performance. Contrary to Profamilia's original notions, male field workers do as well as females in selling contraceptives. Marital status has an effect; married workers sell more pills in particular and hence generate more CYP and revenues.[40] These variables are probably associated with culture; married workers apparently appear more "credible" in the promotion of family planning than unmarried.[41]

Of the field worker characteristics studied, experience is the most significant in its influence on sales.[42] The data indicate that ten percentage points in worker experience around the mean - or about seven months of additional experience - is associated with an approximately two percent increase in all measures of output. Experience may be serving as a proxy for knowledge of the market and consumer behavior.

This issue introduces conceptual problems which have no clear solution, and which we do not introduce into the discussion.

[40] With regard to the marriage status, the results of Tables 5.2 and 5.3 conflict. As the data in Table 5.2 represent effects estimated on the basis of aggregate data, we base our conclusions on Table 5.3.

[41] Note that two field worker characteristics of interest do not appear in the lists of independent variables: "years of schooling" and "number of children". These variables were available for just seventy-six of the ninety-five field workers. Regressions including these variables indicated that neither were significant for any of the output measures (with the exception of a positive influence of number of children on condom sales) and that their presence had a negligible effect on the measured influence of the other independent variables. Some unreported variants of the estimates suggest that female field workers do somewhat better than males in the sale of spermicides.

[42] The zero-order correlation coefficient between age and experience is relatively low (0.33), indicating that experience is not simply masking a positive age and marital status effect.

As for the variables for targeting, the percentage of mothers in the population has a positive effect on sales of pills, the major method, and insignificant statistically for the two other minor methods, condoms and spermicides (Table 5.2). The coefficients on the composite price variable in "value of sales" equation suggest that sales may be promoted by relatively lower prices.[43]

Literacy among women appears to have no measurable effect on demand for contraception in the CBD program. At the same time, household income has a negative and statistically significant effect on sales of spermicide, and, with rather limited significance, on the value of sales. This finding suggests the possibility of lower prices in high-income areas.[44]

There is a positive association between "altitude" and sale of pills (Table 5.2). This finding is inconsistent with the relevant hypothesis that work may be harder in hilly areas. It may well be that this variable is a poor measure of variations in altitude in any given area of field worker operations and it may represent a host of other factors associated with

---

43 The price variable controlled for in this equation is a weighted average. Relatively low prices for pills, the most common method, and high prices for other less common methods may yield the same average prices for different method mixes, and therefore induce more CYP because the more efficacious method, which is allocated a higher weight, has a lower price. Indeed, there is a negative correlation between the proportion of mothers and prices of pills (-0.43).

43 The data suggest that where demand is higher the price is in fact lower, and that the effect of income may be associated with the effect of lower prices. The simple correlation coefficient of income with the mean price is -.28. This may indicate that Profamilia may be competing with other conceivably private providers, in better-off areas.

given geographical areas.

5.6. Contraceptive Prices

The effect of contraceptive prices on sales is of particular interest, as prices are more amenable to short-run policy change than any other variable.[45] The data indicate a powerful negative association between price and quantity of pill sales, suggesting that a 10% decrease in pill price will increase sales by about 50%! Sales of both condoms and spermicides are also negatively associated with their price, but the association is much weaker, perhaps indicating acceptor preferences for certain brands (as implied by the wide variation in spermicide prices).[46] While the estimate on sales of pills suggests a high price elasticity (or quantity response to price) of demand for pills, the estimate on total revenues does not suggest the same as would be expected given the share of pills in sales. It is hard therefore to deduce price elasticities from the estimates.[47] The

---

[45] The prices used in the analysis are implicit average prices calculated, for any one field worker, by dividing total value of sales by total quantity for each contraceptive. This calculation leads to a built-in negative correlation between prices and quantities.

[46] Attempts to estimate cross-elasticities, the effect of the price of one method on the quantity demanded of another, did not yield statistically significant results, and therefore remain unreported. Relatively higher pill prices seem to depress condom sales. Hence the price variable may represent some general deterrent effect of prices of the common method on demand for contraception in general.

[47] The measured effect is too powerful, and may incorporate several factors biasing it. The data suggest a negative association between prices and exogenous variables which have a positive influence on demand: proportion of mothers in the population and average level of household income. That is, prices are on the average lower where demand is presumably higher in the first place. The estimated coefficient is therefore higher (in absolute terms) than it should be (see Annex 3). Lower prices - even

insignificant estimated effects of prices on total value of sales (Tables 5.2 and 5.3) in view of the built-in positive correlation between value (V =PQ) and prices, suggest a demand elasticity higher than 1:value of sales decline with higher prices. The number of users declines in any case.

The finding concerning a negative (partial) correlation of "population size" with "sales of pills", on the one hand, and a positive correlation of low prices and percentage of mothers in the population with such sales, on the other hand, suggests that workers can, on the average, handle better concentrated demand in given populations. This highlights a particular feature of the field worker's production technology, given their allocation. While they cannot cope with larger catchment areas, measured by population size, they can deal with higher demand in concentrated areas. This helps explain also the profound measured effect of points of sale on output. These points are a means to augment the worker's span of operations.

---

where coupled with higher demand - do not bring about higher revenues, as suggested by the insignificant price coefficients on total revenues. It may well be the case that in high demand areas competition with Profamilia is fiercer, leading the organization to lower prices in these areas.

5.7. Program Costs and Wage Determination

The composition of the cost of the CBD Program is as follows:

Labor	140.1	million pesos	(36.0%)[48]
Supplies	158.9	" "	(40.9%)
Overhead and other	89.8	" "	(23.1%).

There may be under-reporting in the last category due to the clinical support given to the CBD Program that is not included in these cost figures.[49] Labor costs are by-and-large a fixed cost in the operations of any one field worker as discussed above. An increase in his or her productivity, *ceteris paribus*, would entail largely the marginal cost of supplies, and reduce overall unit cost. Of course, any suggested changes in number of workers and their "quality" would entail changes in labor cost. Knowledge of how different variables relate to labor costs, on the one hand, and to output, on the other hand, is crucial to an understanding of how to influence the cost-effectiveness in the outreach program through personnel policy.

Thus far we examined the effect of different variables, including number of workers and their characteristics, on output. The same needs to be done with regard to labor cost.

---

48 These costs include cost of medical personnel contributing to the CBD program.

49 Capital costs are included in Profamilia's accounting system.

While wages are known, their relationship to worker characteristics and operations, has yet to be established. To this end we estimated a wage equation, with the natural logarithm of a worker's wages as the dependent variable.[50] The estimated coefficients are reported in Table 5.4.

The level and statistical significance of the constant indicate that there is a relatively fixed wage base, irrespective of any other variable.[51] Moreover, most earning variations are explained by regional differences, which may reflect wage rates in local labor markets (that are all lower than wage rates in the capital, Bogota).

As expected, seniority, measured by age and experience, contributes to earnings. At the same time, married workers appear to earn less than their unmarried colleagues.[52] While marital status correlates with age (r^2=.27), this is not sufficient to explain this particular finding.[53]

---

50 There may not be an explicit wage policy in Profamilia vis-a-vis the variables discussed here. Yet, co-variations between wages and worker characteristics do emerge in the data. These may reflect systematic decisions by management that are not part of a clearly stated policy.

51 The reader is reminded that since we deal with the entire population of field workers, the reported statistics should be used just for their predictive value.

52 There is no information about hours worked by field staff. It is assumed that all work full-time. Given the unstructured nature of this work, it is quite possible that married workers work fewer hours than unmarried workers, and therefore earn less.

53 One possible explanation would be that married workers in the CBD program are secondary workers in their families. This is usually the case for married women. There is, however, no correlation in the data between marital status and gender.

It is also of interest that the number of points of sale is negatively associated with wages. One possible explanation to this association is that Profamilia's management may consider expost, relatively high numbers of points of sale and high volumes of sales as lower need for workers and hence depress their wages.

Table 5.4: Regression Coefficients (Natural Log of) Worker Wages

	Coefficient	T- Statistic
Personal Characteristics		
Male (=1)	-0.042	-0.77
Age	0.005	2.64
Married (=1)	-0.110	-2.60
Experience (years)	0.018	4.10
Program Design		
No. of Contraceptive Outlets	-0.001	-1.91
Region:*		
Atlantic (=1)	-0.217	-3.58
Central (=1)	-0.363	-6.47
Oriental (=1)	-0.356	-4.91
Pacific (=1)	-0.412	-7.07
Constant	14.033	158.31
N	94	
Adj. R-square	0.51	
F	11.9	

* "Bogota is the excluded region.

5.8. Cost-Effectiveness of Field Worker Operations

The findings reported in the last three sections suggest marginal changes that can improve the cost effectiveness of the CBD Program.

Relatively costless and therefore clearly cost-effective changes would involve: (a) a modified personnel policy; (b) promotion of distribution outlets; and (c) finer targeting of field worker operations. With an improved personnel policy, given Profamilia's current wage structure, the program could save by increasing the percentage of married field workers and introducing a long-term policy of reducing the worker's average age without sacrifice of average experience. That is, Profamilia's management might try hiring young people and reducing turnover. It could thereby gain in efficiency by lowering the wage bill and, at the same time, increase productivity.

Field workers should be encouraged to work with more points of sale in any given population. While there are no data about the cost of such a policy, the powerful association of points of sale with worker output renders such a policy likely to be cost-effective.

For finer targeting, Profamilia might consider reallocating field workers from areas of relatively unfavorable demand conditions, where the percentage of mothers in the population are relatively low, to areas where

those percentages are higher. Such a policy must be handled with care, as the marginal gains in sales of contraceptives where there are relatively more mothers may be small compared with the loss in areas left without adequate field worker coverage altogether. The program should clearly be reorganized so that each worker produces $U_{sm} = U_{dl}$ (Figure 5.1). With the budget for the CBD Program given, such a reorganization would imply that some areas remain uncovered by the program. Such areas could be those with low demand, or areas close to clinics, as productivity there seems less than elsewhere.

If the situation is indeed of "too large" populations ($U_{dl} > U_{sm}$, Figure 5.1) as is suggested by the data, then the major challenge is to allocate workers towards the level U_{sm} vis-a-vis population per worker. If, in the average situation, the program hires another full-time worker, so that each sells less than his or her maximum potential, say U^o_s, the costs to the program are the wage rate of the added worker and the loss of the current worker's production measured by the segment ($U_{sm} - U^o_s$), as the two workers now share the same population and level of effort (t^o_d). The production gain ($2U^o_s - U_{sm}$) should be weighed against the additional wage expenditures.

Since there is no evidence of a lack of effective demand for Profamilia's CBD services, but rather a resource constraint, there is no scope to promote demand in the short run through IEC.

5.9. Method Mix

As alternative methods used by clients of different ages, have different CYP coefficients and cost recovery potential, changing method mix at the margin may increase program efficiency, as outlined in Section 4.4. To establish the relative efficiency of methods in terms of "Adjusted Total CYP" in the CBD Program, all relevant data are compiled in Table 5.5.

The CBD program yields a total of 1.42 ATCYP, adjusted for method efficacy and average age of users. The highest contribution is made through the pill. However, if all marginal funds are invested just in one method, they ought to be invested in spermicides. That is, it pays on the margin to promote the most spermicides in the CBD Program and the least condoms, subject to the program's ability to modify population behavior accordingly.

Table 5.5: Adjusted Total CYP Gained by Investment in any Method in the CBD Program.

	Parameter*	Pill	Condom	Spermicides
Share in Total Cost (%)	a_i	83.70	12.00	4.30
Marginal cost (pes.)	mc_i	52.60	27.85	26.47
Price to client (pes.)	p_i	52.50	11.60	18.40
CYP per unit	α_i	0.77	0.01	0.12
Efficacy	β_i	0.97	0.88	0.79
Relative risk	r_i	0.96	0.91	0.91
Adjusted Total CYP	$ATCYP_i$	1.240	0.036	0.144
ATCYP if the last 100 pesos are invested the specific method		1.48	0.30	3.36

Note: ATCYP are computed on the assumption that all funds are invested in all methods according to shares a_i. Relative risks are based on mean age of new acceptors: pill - 26.1, condom - 29.5, and spermicides - 29.5. For further elaboration, see Chernichovsky and Anson (1990).

5.10. Conclusions and Implications: the CBD Program

Several major conclusions and operational implications emerge from the analysis of the CBD Program:

* The number of field workers in an area as measured by the size of its population, is positively associated with contraceptive sales. This implies that, on the average, Profamilia allocates workers according to demand and increasing the number of field workers would enhance sales of contraceptives.

* The average field worker appears to be over-extended in delivery efforts. As delivery of contraceptives is the worker's major task, it would therefore not be advisable to allocate additional IEC activities to them, at least in the short run. Evidence suggesting that female education levels in the target population do not have a measurable effect on sales, provides further support for this conclusion.

* The proportion of mothers in a region's population is positively correlated with sales. Marginal gains in worker productivity can, therefore, be achieved through (marginal) allocation of workers to areas where there are higher concentrations of mothers in the population.

* The number of points of sale supervised by a field worker, correlates strongly with contraceptive sales. While there are no data available on the program costs of these sale points, their impact on worker productivity suggests they may be a major means to increase cost-effectiveness.

* The experienced and married workers sell more than their junior and unmarried colleagues. While experienced workers are paid more than inexperienced workers, married staff are paid, on the average, less than unmarried staff. Reducing worker turnover, i.e retaining experienced staff (who are also more likely to be married), should, therefore, increase productivity and possibly cost-effectiveness.

* The price of contraceptives affects sales; relatively high prices have, as expected, a deterrent effect on sales of contraceptives, and by implication on equity of delivery. It is hard to infer from the data the sensitivity of consumer demand to the price Profamilia's clients pay.

* Spermicides are the most cost-effective method in the CBD Sub-Program. Subject to consumer preferences, current contraceptive prices, and marginal costs, Profamilia should, therefore, try to promote this method at the margin.

* The clinical infrastructure available to an average worker does not have a measurable effect on worker productivity. Hence, all the marginal changes suggested above can be achieved without expanding the clinical infrastructure supporting the CBD Sub-Program. The implied increase in number of field workers per clinic would reduce average fixed costs of contraception in the CBD Sub-Program.

6. THE CLINIC-BASED PROGRAMS

6.1. Objective and Framework of Analysis

Profamilia's Clinical Sub-Program and Surgical Sub-Program are both conducted within Profamilia's clinics. The two sub-programs are therefore studied together.[54] As in the case of the CBD Program, the objective of the discussion is to establish whether Profamilia's management could increase the internal efficiency of these two Clinic-based Sub-Programs through improved targeting or location of clinics in the population, levels and combinations of inputs, and method mix. The discussion follows the framework outlined in Chapter 4. More focus, however, is paid to relationship 4.2, handling it as a cost of delivery function. (see Section 4.3).

6.2. Clinics Resources, Environment, and Productivity: Data and Hypotheses

The data pertain to thirty-eight clinics. The output measures for the Clinical Sub-Program are sales of pills, condoms, spermicides, and consultations which may result in IUD insertion and sterilization. For the Surgical Sub-Program, the output measure is the number of surgeries or sterilizations. For the two sub-programs, total revenues are available as well. The explanatory variables concern the same groups of operational variables discussed in the previous chapter. Instead of studying, however,

---

54 For list of clinics by type, per Profamilia's classification, see Annex 1.

just labor characteristics in relation to personnel policy, levels and combinations of all inputs, including capital, are examined here.[55]

The "design variables" for each clinic concern:

a) average population covered by a clinic;[56]

b) number of workers, by type;[57]

c) clinic size in square meters; and

d) value of equipment.

As the clinics operate in relatively dense urban areas, covering large populations, it is not expected that population size would constrain clinical operations.

All labor and capital inputs (levels) are expected to be positively correlated with output levels, if there is enough demand for clinical services. Still, productivity and unit cost are not independent of scale of operations. Because of fixed factors and cost elements especially in clinics, output may not increase proportionally to the increase in some or even all inputs (and costs). Efficiency issues concern also the combination or ratio

---

55 Clinics not providing a particular service, e.g. sterilization, are excluded from the analysis of that service.

56 These are provincial averages: population in province divided by number of clinics in province.

57 Some adjustment of the labor input data has been needed because data on allocation of nurses between the two sub-programs was not available. We obtain "blocks" or bundles of clinical-labor inputs based on fixed ratios between MDs and nurses of different types in different program. Clinics vary in the number of "blocks" and in their adherence to these ratios between different types of nurses and MDs. See Annex 4.

of input, as they have different marginal productivity and wages or unit costs.

The nature of population which relates to targeting of operations is examined through the same demand-related (province-level) variables used in the discussion in the preceding chapter:

a) percentage of mothers in the population;

b) average household monthly income; and

c) percentage of literacy among women ages 12-59.

The first two variables are expected to have a positive effect on demand for contraception. The effect of the last is a priori unknown. In addition to the above variables, price levels and method mix are examined for their potential effects on program cost-effectiveness.

6.3. Costs of Clinic-Based Operations

The costs of the clinic-based operations have been divided between the two sub-programs on the basis of their two major output measures: consultations and surgeries. Total cost of consultations for 1986 is 445.2 million Colombian pesos, and of surgeries 403.9 million pesos.[58]

---

[58] The costs of the program refer here just to the costs of running the clinics, and not to general administration costs pertaining to Profamilia. Cost of the consultations also includes over-the-counter sales costs and laboratory costs (Villamil, 1987, pp. 10-12). Although costs are divided by the different sub-programs, there may be some overlap between the cost of various services. For example, if some personnel, such as nurses, work in two sub-programs, it is not clear whether and exactly how their costs are

Variable costs are identified by input categories; labor, disposables and other procured services, travel, IEC, capital, and laboratory. Labor is by far the largest cost component in both sub-programs (Table 6.1). It constitutes 74% of consultation costs and 53% of surgery costs, or 64% of total costs of the Clinic-based Sub-Programs. Disposables (including surgical supplies) and services (cleaning etc.) are a relatively high component in the Surgical Sub-Program, 41%, compared with only 15% of clinical consultation costs. Laboratory costs are associated only with consultations, and constitute 9% of total costs for consultations.

---

divided. Also, the same building and equipment may serve both sub-programs. Depreciation, for example, appears most likely just in the Clinical Sub-Program.

Table 6.1: Cost Components of Clinical Operations

	Consultations	Surgery	Total
Labor	73.77%	52.58%	63.69%
Disposables/services	14.74%	40.66%	27.07%
IEC	0.55%	0.95%	0.74%
Travel	0.44%	2.33%	1.34%
Capital	0.88%	3.30%	2.03%
Laboratory	9.07%	-	4.76%
Other	0.44%	0.18%	0.32%

Source: Profamilia internal documents

6.4. Estimation Procedure

In line with the approach taken earlier, a "reduced form" of relationship 4.1 is estimated to examine the influence of various factors hypothesized to affect the productivity of clinics. The general relationship estimated in is:

$$\ln(Y) = a_0 + [a_1 * \ln(\text{No. of Bs})] + [a_2 * \ln(K_1)] + [a_3 * \ln(K_2)] + [a_4 * \ln(\text{non-clinical personnel})] + [a_5 * \ln(\text{clinic area})] + [a_6 * \ln(\text{value of capital})] + [a_7 * \ln(\text{population size})] + a_8(\text{population characteristics}) + u.$$

"Y" stands for quantity of services or contraceptives delivered or value of sales.

The term "B" stands for the number of "blocks" of clinical labor inputs (MDs and nurses) measured by number of MDs in each Clinic-based Sub-Program; K1

stands for the actual ratio of certified nurses to MDs; and K2 for the ratio of non-certified nurses to MDs. "u" is a random error term.

Relationship 4.2 is considered a strict cost function, assuming that whatever contributes to lower unit costs of delivery contributes also to the program's ability to subsidize clients and serve them better.

The estimates are based on individual observations of clinics on which full data are available for any particular discussion. Findings are reported in Tables 6.2 and 6.3 for the Clinical and Surgical Sub-Programs respectively.

6.5. Productivity and Effectiveness of Clinical Operations

From the program's design variables, population size has been eliminated from the reported estimates because of statistically insignificant coefficients or estimated effects in preliminary estimates. This is consistent with the hypothesis that in urban areas, although presumably competing with other providers, e.g. government clinics and private providers, Profamilia's clinics do not face a constraint in demand (approximated by population size) for their services; the clinics operate to the extent their budgets or supply efforts permit.

For the Clinical Sub-Program, the coefficients (Table 6.2) for the clinical labor inputs or "block" suggest that an increase of 10% in these inputs is associated with a 7% increase in sales of pills and 6% in IUD

insertions.[59] As expected, given the nature of the Clinical Sub-Program, the association between clinical inputs and sales of condoms and spermicides is less pronounced, as they are sold over the counter.

For the Surgical Sub-Program (Table 6.3), the MD-nurses "block" has a statistically weak positive association with surgeries. The coefficients are also relatively low: a 10% increase in clinical labor inputs is associated, on the average, with a 4% increase in number of surgeries.

Of significance to the discussion are the coefficients on the ratio of certified nurses to MDs, as they imply potential increases in output without increasing outlays. For the Clinical Sub-Program the coefficient suggests that an average increase in this ratio, of say 10%, is associated with an average increase of above 5% in output (Table 6.2).[60] In the Surgical Sub-Program, improving the ratio of certified nurses to MDs by 10% might enhance productivity by 3%. The 10% increase in the ratio of non-certified nurses to MDs, is associated with a 5.5% higher number of surgeries (Table 6.3).

"Large" and "medium" clinics do better than smaller clinics, all other things being equal.[61] Medium clinics, however, out-perform even the large

---

[59] See Annex 4 for determination of "Block".

[60] The ratio of non-certified nurses to MDs was eliminated from the analysis of the Clinical Sub-Program and is not reported because of a nil effect and statistical insignificance.

[61] "Size of clinic" follows the convention used by Profamilia. It is a general characterization of clinics, with no clear operational definition. It does not indicate just size.

clinics in the Clinical Sub-Program. As the larger clinics specializing in surgeries are located in urban centers, it is most likely that estimated effects represent both size of population in specific areas, and possibly some qualitative aspects preferred by clients that can be met by the larger clinics. In this regard, it should be noted that the larger clinics provide a variety of services, including legal advise, and raise more revenue.

Other personnel (administrative) and capital inputs (such as clinic area and the value of equipment in use) do not relate statistically to output, and have been dropped from the final and reported estimates.

Two population attributes have an effect on the Clinical Sub-Program productivity: female education and average household income. All other things being equal, clinics operating in areas with educated women do better, on the average, than clinics operating in areas with higher levels of illiteracy. In view of the previous evidence suggesting a lack of demand effect that might be associated with population size, but a positive supply effect related to labor inputs, the finding about education, suggests some qualitative aspects that may be operating on both supply and demand: clinics in areas with better educated women may benefit from both higher demand, for the same size of population, and more productive clinics, as personnel may be more inclined to serve.

At the same time, clinics operating in higher income areas, do worse only in regard to sales of pills and over-the-counter sales. It appears that for these services, which are least subsidized, higher income groups

may prefer private pharmacies.

Prices of contraceptives and fees-for-service have been eliminated from the equations for the Clinical Sub-Program because fees for individual methods and services are not available, and there is price discrimination among clients for which no data are available.[62] Some of the effect of prices is implied, however, from the impact of other variables on gross revenues. The positive effect of other variables on volume of contraceptive sales and consultations is reduced when revenues are used as the dependent variable. This suggests that higher sale volumes are supported by lower price levels, and that in the relevant range there are relatively high price elasticities for contraceptive services: lower prices are associated with higher revenues. At the same time, larger clinics appear to charge more; they generate more revenues than implied by their volume of services when compared with smaller clinics. This suggests, again, that there are qualitative differences between clinics of different sizes, and that these differences apparently attract educated clients who can and are willing to pay more for services in the larger clinics.

In the Surgical Sub-Program there is a negative association between the implicit average price of surgery (revenue from surgeries/number of surgeries) and number of surgeries (Table 6.3). The price elasticity appears low; that is, Profamilia could raise revenues by smaller subsidies or higher prices to clients than it is charging. It would sacrifice,

---

[62] It is impossible to isolate the price of a consultation from the price of an IUD insertion. Consultations serve as general medical advice as well as referral to all other methods.

though, some surgeries thereby.

Table 6.2: Regression Coefficients, (Natural Logarithms) of Clinical Sub-Program (t-statistics in parentheses)

	SALES					REVENUES	
	Pills	Condoms	Sperm.	IUDs	Consul-tations	Over the Counter	Consul-tations
Program Inputs							
"Block": physicians and nurses+	0.7152	0.6795	0.4865	0.6348	0.5366	0.2195	0.3301
	(1.84)	(1.54)	(1.46)	(2.47)	(1.94)	(0.69)	(1.41)
Ratio of certified nurses to MDs+	0.5801	0.7583	0.7059	0.7657	0.5581	0.2054	0.5313
	(2.41)	(2.78)	(3.44)	(4.82)	(3.24)	(1.04)	(3.68)
Clinic Type							
Large	1.3167	1.4548	1.3613	1.1646	1.9513	2.2105	2.5924
	(1.14)	(1.10)	(1.38)	(1.52)	(2.35)	(2.33)	(3.72)
Medium	1.3417	0.9466	0.2654	0.6273	0.8589	0.8143	0.4964
	(3.90)	(2.42)	(0.90)	(2.76)	(3.49)	(2.88)	(2.40)
Population Characteristics							
%women with educ.	3.0695	4.2377	5.8521	5.1283	4.2767	5.2520	5.1619
	(1.23)	(1.50)	(2.75)	(3.12)	(2.40)	(2.57)	(3.45)
Income	-2.8209	-1.5561	-1.0325	-0.1376	-0.6419	-1.8872	-0.4615
	(-2.72)	(-1.32)	(-1.17)	(-0.20)	(-0.86)	(-2.22)	(-0.74)
Constant	34.9315	23.2042	19.1815	8.3375	14.6459	30.6737	19.1370
	(3.44)	(2.01)	(2.21)	(1.24)	(2.01)	(3.68)	(3.13)
N	31	31	31	31	31	31	31
Adj. R-square	0.606	0.515	0.613	0.758	0.742	0.670	0.819
F	8.702	6.321	8.929	16.649	15.404	8.817	23.621

+Natural Logarithm

Table 6.3: Regression Coefficients (Natural Logarithms) of Surgical Program (t-statistics in parentheses)

	Number of Surgeries
Program Inputs	
"Block": physicians and nurses+	0.4066 (1.52)
Ratio of non-certified nurses to MDs+	0.5539 (2.51)
Ratio of certified nurses to MDs+	0.2886 (1.68)
Clinic Type	
Large	1.9390 (2.99)
Medium	0.9477 (4.72)
Population Characteristics	
%women w/o education	1.2801 (0.87)
Income+	-0.3683 (-0.56)
Price+	-0.3545 (-2.55)
Constant	9.3174 (1.48)
N	26
Adj. R-square	0.856
F	19.6

+Natural Logarithm

6.6. Variable Labor Costs and Efficiency of Worker Allocation

As fixed ratios are assumed between MDs (M) and nurses (N), there is no scope to assess the marginal productivity of each type of clinical labor in conjunction with its own wage rate, and thereby to evaluate which input might be more efficient at the margin. Yet, some inference can be drawn from the estimated coefficients on "blocks" of labor inputs, and the ratios between the different types of medical staff.[63]

The marginal product of the combined input, "nurses-MDs", is falling, especially in the Surgical Sub-Program; the increase in output across clinics is less than proportional, on the average, to any increase in the combined number of MDs and nurses. That is, the average clinic operates, as it should from an efficiency perspective, within a range of decreasing marginal productivity and hence rising unit costs, vis-a-vis its clinical labor inputs. The Clinical-based Sub-Programs can be expanded with the available infrastructure, through higher budgets for clinical staff and higher average and marginal (unit) costs of service.

However, the data indicate, as previously seen, that some efficiency

---

[63] The reader is reminded that as outlined in Annex 4, nurses have been "assigned" to the two sub-programs in the clinics, according to number of MDs. The estimated coefficients provide a predicted number of nurses by number of MDs in each clinic. This is the "Block" of MDs and nurses. At the same time, the actual number of nurses in the clinic deviate from the predicted number. The ratio between the actual number and the predicted number is assigned to the predicted number for a given activity, surgeries or consultations. This yields an "actual" number in the activity that is divided by MDs in the activity, yielding K_j.

can be gained by increasing the ratio of nurses to MDs in the two sub-programs. Taking the data at face value, we can assess the percentage changes of MDs and nurses to increase output by say, R% , with no change in the average budget.[64] Given their relative wages, a 10% gain in consultations, for example, can be gained with an approximately 2.4% decrease in number of MDs and a 7.2% increase in number of nurses, without any increase in budgetary outlays (Table 6.4). The same gain in output might be achieved by a 25% increase in the number of non-certified nurses and an 8.5% reduction in the number of MDs.[65] The results are different for the Surgical Sub-Program. A 10% gain in output might be achieved by increasing the number of certified nurses by 8% and decreasing the number of MDs by 1.8%.

---

64 Note that this discussion refers to small marginal changes. See Annex 5.

65 A combination of the two changes would be possible. An explicit solution is beyond the scope of this discussion, however, as we examine the direction of marginal changes and not necessarily their magnitude.

6.6. Variable Labor Costs and Efficiency of Worker Allocation

As fixed ratios are assumed between MDs (M) and nurses (N), there is no scope to assess the marginal productivity of each type of clinical labor in conjunction with its own wage rate, and thereby to evaluate which input might be more efficient at the margin. Yet, some inference can be drawn from the estimated coefficients on "blocks" of labor inputs, and the ratios between the different types of medical staff.[63]

The marginal product of the combined input, "nurses-MDs", is falling, especially in the Surgical Sub-Program; the increase in output across clinics is less than proportional, on the average, to any increase in the combined number of MDs and nurses. That is, the average clinic operates, as it should from an efficiency perspective, within a range of decreasing marginal productivity and hence rising unit costs, vis-a-vis its clinical labor inputs. The Clinical-based Sub-Programs can be expanded with the available infrastructure, through higher budgets for clinical staff and higher average and marginal (unit) costs of service.

However, the data indicate, as previously seen, that some efficiency

---

[63] The reader is reminded that as outlined in Annex 4, nurses have been "assigned" to the two sub-programs in the clinics, according to number of MDs. The estimated coefficients provide a predicted number of nurses by number of MDs in each clinic. This is the "Block" of MDs and nurses. At the same time, the actual number of nurses in the clinic deviate from the predicted number. The ratio between the actual number and the predicted number is assigned to the predicted number for a given activity, surgeries or consultations. This yields an "actual" number in the activity that is divided by MDs in the activity, yielding K_j.

Table 6.4: Percentage Changes in Clinical Personnel to Produce a 10% Increase in Output without Budgetary Consequences

	Physician	Surgeons	Certified Nurse	Non-Certified Nurse
Clinical Sub-Program				
Pills	-2.36%		7.24%	
Condoms	-1.04%		3.19%	
Spermicides	-1.36%		4.17%	
IUDs	-1.00%		3.06%	
Consultations	-2.58%		7.91%	
Surgical Sub-Program				
1. Alternative 1		- 1.47%	8.05%	
2. Alternative 2		- 8.55%		24.64%

6.7. Fixed Capital Costs and Scale of Operations

Determination of the optimal size of the average clinic is important from an efficiency perspective, as it leads to the best organization and use of overall resources, including fixed inputs and administrative costs.

The data suggest that clinics operate within a range of decreasing marginal returns vis-a-vis clinical labor inputs, especially with regard to the Surgical Sub-Program. This is sound economic practice. At the same time, capital inputs - clinic area and equipment value, and administrative staff - do not seem to constrain productivity. This suggests that, on average, clinics operate in the range of decreasing average fixed costs.

That is, the Clinic-based Programs have rising marginal cost of their prime labor inputs and presumably decreasing average fixed costs.[66] Are total unit costs per operation rising or falling, on the average?

One way to answer the question, is to relate total costs directly to output. Cost functions have been estimated separately for the consultations in the Clinical Sub-Program, and for surgeries in the Surgical Sub-Program. The general function for examination has been the following:

$$\text{Tot. cost} = \beta_0 + \beta_1 (\text{level of output}) + \beta_2 (\text{level of output})^2 + \beta_3 (\text{"medium size" clinic} = 1) + \beta_4 (\text{"large size" clinic} = 1) + v.$$

---

66 Costs of supplies are by definition proportional to output.

Allowance is made for type of clinic, because of possible qualitative differences among the different types. The estimated coefficients are shown in Table 6.5.

Table 6.5: Regression Coefficients of Program Cost
(t-Statistics in parentheses)

	Clinical Sub-Program		Surgical Sub-Program	
	(1)	(2)	(1)	(2)
Consultation or surgeries	1098 (14.41)	2901 (7.94)	2709 (2.81)	2029 (1.80)
(Consultations or Surgeries)^2	-0.0032 (-3.71)	-0.0226 (-2.62)	0.6667 (5.78)	0.6219 (5.01)
Type1: Large Clinics (=1)	- -	105432 (3.19)	- -	9517783 (3.31)
Type2: Medium Clinics (=1)	- -	-1004477 (-0.65)	- -	660896 (0.42)
Constant	2388481 (4.61)	1959507 (1.72)	2113436 (1.99)	2188365 (2.35)
N	38		38	38
Adjusted R-Square	0.97		0.94	0.95
F	749		333	221

The coefficient on "Consultations" is positive and on "Consultations"^{2} negative for the Clinical Sub-Program, suggesting that total cost per unit is decreasing; the more consultations a clinic has, the lower average total cost of a consultation, on the average. This result is consistent with the

findings discussed in section 6.4. While there are decreasing returns to "blocks" of clinical labor inputs, there is scope for more use of existing capital. The rising unit cost due to clinical staff inputs are offset by decreasing costs of other inputs.

Hence, more demand can be accommodated at decreasing total average costs - combining all costs - in the Clinical Sub-Program; more clients can be managed at lower unit cost per client. This sub-program can do so through changes in ratios of medical staff, without budgetary outlays, and by increasing only medical inputs, with the appropriate outlays, in existing clinics, on the average.

For the Surgical Sub-Program, the coefficients on "Surgeries" and on "Surgeries^2" are positive, as are the coefficients on "Type1" and "Type2". These coefficients imply that the larger the surgical operations, the higher the average cost of surgery, and that the larger clinics are more expensive. This is consistent with the findings reported in section 6.4 of relatively strong decreasing marginal productivity of clinical staff in the Surgical Sub-Program. The implied rising marginal and average variable costs are not offset, on the average, by any decreasing fixed costs per unit of output. This result is probably strongly influenced by the fact that MDs in the Surgical Sub-Program are paid "by piece", and therefore there is less scope in this sub-program than in any of the others to exploit economies that would be associated with the "quasi-fixed" nature of the cost of medical staff when paid fixed salaries.

6.8. Method Mix

The importance of the method mix is from a cost-effectiveness perspective, discussed in section 4.4. Comparisons among methods within the same program, require information about the marginal cost and marginal revenue for each method.

As cost data are not given separately for each method, estimates are used for the marginal cost of each method. It has been assumed that capital costs, IEC costs, and overhead costs are fixed costs, and thus should be excluded from marginal cost calculation. Therefore, these cost elements are deducted from cost of both consultations and surgeries.

The marginal costs of a method include the costs of the contraceptives and the labor costs of consultations.[67] Costs of contraceptives are available, but those of consultations are not. To estimate the marginal cost for each method in consultations, a linear specification of the following function was estimated using regression analysis:

$$\text{Cost of consultations} = a_0 + a_1 \times \text{pills} + a_2 \times \text{condoms} + a_3 \times \text{spermicides} + a_4 \times \text{IUDs} + a_5 \times \text{surgeries} + w.$$

---

[67] Based on Profamilia data, the costs for contraceptives were: 36.42 Colombian pesos per cycle of pills, 7.9 per condom, and 6.6 per unit of spermicide. See Annex 5.

The marginal cost of consultation for each method would be the coefficient corresponding to that method.[68]

The marginal cost of a method include the cost of supplies plus imputed cost of consultation. The revenues for each method are estimated on the basis for the unit price for each method plus the average consultation fee to the client.[69] Table 6.6 shows the marginal costs and revenues for each method offered in the Clinical-based Sub-Programs.

To which method within the Clinic-based Programs should an additional peso be budgeted? The data in Table 6.7 provide a summary of all relevant data per relationship 4.4.

---

[68] Chernichovsky and Zmora, 1986. See Annex 6 for the estimates.

[69] Prices were based on the CBD prices for pills, condoms and spermicides, and the average revenue for sterilization (see above). For IUDs the price, not including consultation, was assumed to be nil or 0 .

Table 6.6: Marginal Cost and Marginal Revenue, by Method

Marginal	Marginal Cost	Revenue	Subsidy
Pill	192	109	83
Condom	67	33	34
Spermicides	65	39	26
IUD1*	4599	1691	2908
IUD2*	1205	595	610
Surgeries	8350	2270	6080

* IUD1 uses "new IUD consultations" as the output unit.
IUD2 uses "total IUD consultations" as the output unit.

Table 6.7: Clinical Program: Adjusted Total CYP and Relevant Data by Method in Clinic-based Programs (per 100 pesos invested)

	Pill	Condoms	Spermicid.	IUD	Surgery
Share in Total Cost% - a_i	4.14	1.86	2.61	26.68	64.70
Marginal cost (pesos) - mc_i	192	67	65	1205	8350
Marginal Revenue (pes.) - p_i	109	33	39	595	2270
CYP per unit - α_i	0.077	0.010	0.118	2.500	12.500
Efficacy - β_i	0.970	0.880	0.790	0.970	0.990
Relative risk - τ_i	0.96	0.91	0.91	0.96	0.89
Adjusted Total CYP $ATCYP_i$	0.0022	0.0003	0.0047	0.06703	0.1100
ATCYP if the last 100 pesos are invested the specific method	0.055	0.017	0.180	0.251	0.170

Note:ATCYP are computed on the assumption that all funds are invested in all methods according to shares a_i. Relative risks are based on mean age of new acceptors: pill - 26.1, condom - 29.5, spermicides - 29.5, IUD - 26.1, and female sterilization - 30.4. For further elaboration, see Chernichovsky and Anson (1990).

The method with the largest protection per 100 pesos allocated to the clinical-based activities is sterilization.[70] However, on the basis of "objective efficiency" sterilization is a relatively "poor" method, being even less efficient than spermicides, for two reasons: it has the highest subsidy, both in absolute and relative terms, and it has a poor "relative risk" coefficient because of the relative high age of users. The marginal peso has the highest return in IUD, followed by Spermicides.

---

70 All IUD consultations, old and new, were assumed to produce identical CYPs of 2.5 CYP per insertion. This is in contrast to Profamilia's assumptions that only new acceptors of IUD "produce" CYPs. For 1986 Profamilia reports 45,906 insertion of IUDs to new users and 129,311 to old ones (Ojeda, 1986; Table 1, p.2; Table 10, p.10).

6.9. Conclusions: The Clinical-based Sub-Programs

Several conclusions and operational implications emerge for the Clinical-based Sub-Programs.

* The size of population in the average clinic's operational area, does not correlate with the clinic's output. Output does correlate, however, with number of clinical staff. Hence, there is sufficient demand for clinical operations; they are constrained by availability of such staff.

* The relatively educated and the less affluent populations appear to take more advantage of Profamilia's clinic-based operations than less educated and better off populations. Therefore, better utilization especially of the Clinical Sub-Program, can be achieved through improved targeting of relevant operations in favor of the former populations.

* The marginal costs of the Clinical Sub-Program, delivering mainly IUD, are lower than the marginal costs of the Surgical Sub-Program providing sterilizations. The activities of the former can be expanded within the same clinical infrastructure, and hence at lower than current unit cost of mainly IUD services. There is, therefore, scope to accommodate use of the services of the Clinical Sub-Program at relatively low marginal costs and lower overall unit costs.

* The clinical sub-program is more cost effective than the Surgical Sub-Program because the latter involves a relatively high subsidy to sterilization. Moreover, the acceptors of this method have a higher mean age, and consequently a lower risk of pregnancy.

* The ratios of nurses to physicians correlates with output of clinics; higher nurses/physicians ratios are associated, on the average, with higher output. There is scope, therefore, in both the Clinical and Surgical Programs to increase output with no additional outlays, and therefore improve efficiency, by trading physicians in favor of nurses.

* The fees for service affect the number of acceptors at least in the Surgical Sub Program; fees are negatively associated with number of surgeries. The sensitivity of this number to the fee appears low, however. While direct measurement of the potential effect of fees in the Clinical Sub-Program was not possible, the data suggest that relatively high levels of sales are supported by low price levels. Profamilia may, therefore, be able to finance a necessary expansion of its relatively efficient Clinical Sub-Program by raising its average fee for service, especially in the Surgical Sub-Program where the subsidy element is high, and the demand elasticity appears low. While prices will deter some demand, revenues would

increase and enable to service new and possibly outlying populations.

7. RELATIVE (SUB) PROGRAM EFFICIENCY

The discussion thus far has treated the different sub-programs separately, studying ways to improve each sub-program's internal efficiency. The question of how to gain in efficiency by allocation across programs still remains to be answered.

To establish the efficiency of allocation across programs, including the CBD, Adjusted Total CYP (ATCYP) for the entire Profamilia program have been calculated (Table 7.1) on the basis of relationship 4.4.

For each sub-program the ATCYP is the average of the individual methods weighted by the share of the method in the cost of that sub-program. That is, the relevant ATCYP figures represent ATCYP that can be achieved with 100 pesos invested across programs and in each sub-program. When all activities are looked at combined, pill delivery through the CBD program, is most efficient, followed by sterilization and IUD.

When comparing sub-programs, the calculations show that the CBD sub-program relatively the most cost-effective operation. It is followed by the Clinical Sub-Program. The Voluntary Sterilization is the least cost-effective sub-program, once cost recovery and mean age of users is considered.

Table 7.1: Adjusted Total CYP and Relevant Data for Profamilia Sub-Programs

	Clinical-based Programs					CBD		
	Pill	Condom	Spermic.	IUD	Steril.	Pill	Condom	Spermic.
Share in Total Cost	2.07%	0.93%	1.31%	13.34%	32.36%	41.85%	6.00%	2.15%
Marginal Cost (P.)	192.00	67.00	65.00	1205	8350	52.60	27.85	26.47
Marginal Revenue (P.)	109.00	33.00	39.00	595	2270	52.50	11.60	18.40
CYP per unit	0.77	0.01	0.12	2.50	12.50	0.77	0.01	0.12
Efficacy	0.97	0.88	0.79	0.97	0.99	0.97	0.88	0.79
Relative Risk	0.96	0.91	0.91	0.96	0.89	0.96	0.91	0.91
$AICYP_i$	0.0020	0.0003	0.0042	0.0592	0.1100	1.240	0.036	0.144
AICYP for program	0.28				0.16	1.42		
	0.17					1.42		

Note: see tables 5.5 and 6.7.

8. CONCLUSIONS

In 1986, Profamilia's three sub-programs delivered approximately 1 267,919 Couple Years of Protection (CYP) to the population of Colombia at a cost of 1,252.8 million Colombian pesos ($US 6.43 million). The program recovered about 647.3 million pesos ($US 3.32 million), or about 50% of its costs, which makes it comparatively unique among family planning programs.

According to Profamilia's account, the sterilization program provides the largest share of CYP, 61.0%, followed by the CBD Program, 11.4%, and the clinical provides the remaining 27.6%. The CBD and the Clinical Sub-Programs provide the major share of revenue, 42.6% and 42.3%, respectively. In terms of total costs, the CBD Program accounts for the smallest share, 9.9%; the Clinical 47.3%, and the Voluntary Sterilization Sub-Program 32.8%.

The data reflect key policy and management decisions: allocation of resources among programs, fee setting, and allocation of resources within programs. A major issue is whether Profamilia can do better with the resources available to it. For example, how should it allocate resources to maximize the protection it offers, thus increasing the cost-effectiveness of its operations by reducing the unit cost of protection?

To answer these questions, we examine Profamilia's resource allocation and costs in relation to output (quantity and value of contraceptive sales) in conjunction with population characteristics, method mix, and program

design. We study the cost-effectiveness of Profamilia's overall service delivery and each sub-program separately, employing a cross-sectional economic analysis of the operations of 97 field workers and 38 clinics comprising the program.

The data show a positive correlation between labor input and output in all operations. Profamilia's operations are thus mainly constrained by resource availability, with more resources the program could deliver more protection. No program activity, particularly in the Clinical Sub-Program and the CBD Sub-Program, appears bound by a lack of effective demand. Moreover, these two sub-programs can be expanded with the available clinical infrastructure. For this reason and the quasi-fixed nature of labor cost in these two sub-programs, higher levels of output are associated, on the average, with lower unit costs of contraception. The same does not hold for the Surgical Sub-Program because of its comparatively high marginal cost in part associated with the payment method "by surgery" to surgeons.

Of the different sub-programs, the Clinical Program, delivering mainly the IUD, and the CBD Program, delivering mainly the pill, are the most cost-effective. The Voluntary Sterilization Program is the least cost effective because of the relatively high cost of sterilization, the high subsidy element, and the high mean age of acceptors. Given the relative efficiency of the sub-programs and the viability of expanding each program's operations, overall program efficiency could be improved as a result of studying the client needs and preferences and considering within this context, a shift of resources from the Voluntary Sterilization Program to the CBD and Clinical

Programs.

Given that the program uses fees for service extensively, these should be considered as a vehicle to improve its performance. Since the evidence suggests that more demand could be satisfied with more workers in all sub-programs, and that lower prices may not necessarily reduce revenues, there may be scope to raise prices in order to finance additional staff, and increase overall sales. This would be the case if access rather than prices is a barrier to higher levels of sales. The evidence about the positive impact of points of sale in the community on sales of contraceptives in the CBD Sub-Program, supports the notion that access is important. In that event, higher fees may even improve equity.

Profamilia could raise fees for sterilization at some loss of acceptors of this method, and thereby shift resources to the other sub-programs. That is, by reducing the current cross subsidy from the other programs to sterilizations, Profamilia should be able to improve its overall efficiency.

The issues concerning fees merit more research, especially in conjunction with data on consumer demand.

There is scope to increase the cost-effectiveness of any of the three sub-programs individually by more careful targeting of operations, better mix of labor inputs, and improved use of community resources.

Productivity of outreach operations is higher where there is a higher concentration of mothers in the population, and of clinical operations where the population is more educated. At the margin, targeting or shifting limited resources towards those populations could therefore increase the cost-effectiveness of the different programs.

In the CBD Sub-Program the experienced and married workers distribute (through outlets) more contraceptives than their junior and unmarried colleagues. While experienced workers are paid more than inexperienced workers, married staff are paid, on the average, less than unmarried staff. Retaining experienced staff (who are also more likely to be married), should, therefore, increase productivity and possibly cost-effectiveness. This could be done by raising wages. In the Clinical-based Sub-Programs the ratio of nurses to physicians correlates with output of clinics; higher nurse/physician ratios are associated, on the average, with higher output. There is scope, therefore, in both the Clinical and Surgical Sub-Programs to increase output without additional outlays, and thereby improve efficiency, by trading physicians in favor of nurses.

Community resources tend to augment program resources in outreach activity. The number of points of sale administered by a field worker correlates strongly with contraceptive sales. While there are no data available on the program costs of these sale points, their impact on worker productivity suggests they may be a major means to increase cost-effectiveness in the CBD Program.

The implications of this study suggest marginal changes in resource allocation and management of the Profamilia program. They must stand a more refined evaluation of consumer demand.

REFERENCES

Chernichovsky, D. and Zmora I. (1986) "A Hedonic Prices Approach to Hospitalization Costs", J. of Health Economics, 5: 179-191.

Chernichovsky, D. (forthcoming, 1991) "Effectiveness, Cost, and Cost-Effectiveness of Family Planning Programs; Methodology and Operational Guidelines".

Chernichovsky, D. and Anson J. (1990) "Cost Recovery and the True Cost-Effectiveness Ratio of Contraceptive Delivery". Mimeo. World Bank. Washington, D.C.

Chernichovsky, D. (forthcoming 1991B) "Optimal Allocation of Extension Workers in Family Planning Outreach Operations"

Corporacion Centro Regional de Poblacion (1986), Encuesta de Prevalencia Demografia y Salud 1986.

Easterlin A.R. and Crimmins M.E. (1985) The Fertility Revolution: A Supply-Demand Analysis. University of Chicago Press, Chicago & London.

Ojeda, G. (1986), "Informe de Actividades de Servicio 1986", Boletin de Evaluacion Y Estadistica, Profamilia, Vol. 44.

Ojeda, G., J. Amadeo and A. Monroy (1981), Cost per Couple-Year of Protection: The Case of Profamilia 1977-1980.

Rosenzweig, M. and T. Schultz (1982), "Child Mortality and Fertility in Colombia: Individual and Community Effects", Health Policy and Education, 2: 305-348.

Villamil, R. (1986), "Informe Financiero", Boletin de Contabilidad, Profamilia, Vol. 15.

ANNEX 1
Clinics by Type

Type1: Large Clinics
Bogota
Bogota Male Clinic
Cali (including the Male Clinic)
Medellin (including the Male Clinic)

Type2: Medium Clinics
Armenia
Barranquilla
Bucaramanga
Cartagena
Cucuta
Ibague
Manizales
Monteria
Neiva
Palmira
Pasto
Pereira
Santa Marta
Sincelejo
Tulua
Valledupar

Type3: Small Clinics
Apartado
Bello*
Barrancabemeja*
Buenaventura
Caldas-Antioquia
Castilla-Antioquia
Florencia
Girardot
Kennedy-Bogota
Ocana*
Popayan
Quibdo
Quirigua-Bogota
Quiroga-Bogota
Riohacha
Rionegro
San Andres*
Soledad-B/quilla
Tumaco
Tunja
Villavicencio

*No data for the analysis are available on these clinics, and they are not included in the analysis.

ANNEX 2

The Worker's Optimal Time Allocation between Delivery and Resource Mobilization.[71]

Let us assume that a worker's production function is denoted by:

$$U=f(t_d, I, PC)$$

where:

U = measure of output

t_d = time allocated to delivery

I = community and other infrastructure

PC = worker characteristics.

Let us further assume that:

$$I = I(t_m, CC)$$

where: t_m = time allocated to mobilization of resources in the community

CC = community characteristics

A worker can allocate his or her total time (T) so that:

$$T = t_d + t_m + t_e$$

where:

t_e = time allocated to demand promotion.

Let us assume that t_e is a constant. Hence $dt_d = -dt_m$. That is, whatever time is allocated to delivery is withdrawn from resource mobilization. The optimal allocation rule between the two activities is:

---

71 See Chernichovsky (1991B).

$$dU/dt_d = U/\partial t_d - (\partial U/\partial I)DI/Dt_d = 0,$$

Namely, the gain in marginal productivity due to additional time in delivery should match the loss in productivity due to less activity in resource mobilization.

ANNEX 3

Potential Bias in Demand Elasticity Estimates

Suppose that we have a family of demand curves for contraception characterized by D_1 and D_2 in the figure below. D_2 indicates that higher demand is associated with higher income.

The data indicate that prices are lower in higher income areas; P_1 is associated with D_1 and P_2, with D_2. Consequently, the estimated price elasticity is influenced by the slope of AB rather than AC. The demand elasticity is much higher along AB for the relevant range, indicating the bias in estimates.

ANNEX 4

Allocation of Nurses to Clinical Operations

While information is available separately for physicians in the Surgical and Clinical Sub-Programs, no such data exist for nurses; only the total number of nurses in each clinic is available for the two sub-programs. As there is a high correlation between certified and non-certified nurses, and physicians, it is assumed that proportions between nurses and physicians in each program follow some fixed ratio, but there is a variance about this ratio across clinics.[72] Consequently, to estimate the allocation of nurses between the Surgical and Clinical Sub-Programs, the following function has been estimated:

$$\text{Nurse type}_k = (a_1 * \text{MDs in consultation}_k) + (a_2 * \text{MDs in surgery}_k)$$

$(_k = 1....37)$

The results are reported in the Table below.

---

72 The first order correlation matrix is:

	MDs	Surgeons	Cert. Nurses
Cert. Nurses	0.95	0.97	—
Non-Cert. Nurses	0.84	0.93	0.88

Regression Coefficients of Nurse to Physician Ratio (t-values in parentheses)

	Non-Certified Nurse	Certified Nurses
MDs in Surgical Program	1.6720 (6.12)	0.5194 (4.13)
MDs in Clinical Program	-0.2262 (-1.61)	0.2455 (3.79)
N	37	37
Adj. R-square	0.8837	0.9571
F	141.83	414.47

Accordingly, there are about 1.7 certified nurses and 0.5 non-certified nurses, on the average, for every MD in the Surgical Sub-Program, and 0.25 non-certified nurses to every MD in the Clinical Sub-Program.[73] These estimates yield predicted values for nurses in each sub-program for each clinic on the basis of numbers of MDs in each sub-program. The sum of these values naturally deviate in most instances from the actual number of nurses. Consequently, the number of nurses was adjusted in each clinic so that the ratio of numbers of nurses in the different programs is the ratio of the predicted values.

---

[73] As the coefficient for MDs and non-certified nurses in surgery is negative but not significantly different from zero, it was assumed that non-certified nurses did not work in the Clinical sub-program, but only in the Surgical sub-program.

ANNEX 5

Reallocation of MDs and Nurses for Higher Output without Budgetary Consequences

Let us denote:

$$K = N/M$$

and $Y = AK^a$,

where

Y = level of output,

N = number of nurses,

M = number of MDs, and

a = the percentage change in output due to a percentage change in K.

Hence,

$$(dK/K) = (dY/Y)/a.$$

Let's denote:

$[(dy/y)] = R$,

r = the rate of change in no. of nurses,

t = the rate of change in no. of MDs.

Hence,

$$(dk/k) = r-t = R/a. \qquad (1)$$

As in our case a is known and >0, suppose we wish raise output of R% by increasing the number of nurses (N) by r% and decreasing the number of physicians (M) by t% with no budgetary consequences. We need to establish r and t.

In order to retain the same budget:

$$(r)(N)(W_N)=(t)(M)(W_M) \qquad (2)$$

$$r=(t)(M/N)(W_M/W_N)=t(1/K)(W_M/W_N)$$

Let us denote

$$B=(1/K)(W_M/W_N)$$

By substitution of (1) into (2):

$$r-rB = R/a$$

$$r = R/[a(1-B)].$$

ANNEX 6

Marginal Consultation Cost of IUD, Surgeries and of Sales of Contraceptives

Regression Coefficients: Marginal Consultation Cost of IUD, Surgeries and of Sales of Contraceptives

	Marginal Cost of Consultation	t-value
Pill	167.94	1.50
Condom	377.84	2.79
Spermicide	-280.36	-1.79
IUD	4266.03	4.68
Surgery	1724.98	3.06
Constant	1005878.58	1.25
N	38	
Adj. R-square	0.9356	
F	109.09	

Regression Coefficients: Marginal Cost of Surgery and Number of Surgeries

	Marginal Cost of Surgeries	t-value
Surgery	7689.22	18.78
Constant	-2000448	-1.91
N	37	
Adj. R-square	0.9071	
F	352.51	

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS742	The Cost of the District Hospital: A Case Study from Malawi	A. J. Mills	August 1991	O. Nadora 31091
WPS743	Antidumping Enforcement in the European Community	Angelika Eymann Ludger Schuknecht	August 1991	N. Artis 37947
WPS744	Stainless Steel in Sweden: Anti-dumping Attacks Good International Citizenship	Gunnar Fors	August 1991	N. Artis 37947
WPS745	The Meaning of "Unfair in U.S. Import Policy	J. Michael Finger	August 1991	N. Artis 37947
WPS746	The Impact of Regulation on Financial Intermediation	Dimitri Vittas	August 1991	W. Pitayatonakarn 37666
WPS747	Credit Policies in Japan and Korea: A Review of the Literature	Dimitri Vittas	August 1991	W. Pitayatonakarn 37666
WPS748	European Trade Patterns After the Transition	Oleh Havrylyshyn Lant Pritchett	August 1991	N. Castillo 37947
WPS749	Hedging Commodity Price Risks in Papua New Guinea	Stijn Claessens Jonathan Coleman	August 1991	S. Lipscomb 33718
WPS750	Reforming and Privatizing Poland's Road Freight Industry	Esra Bennathan Jeffrey Gutman Louis Thompson	August 1991	B. Gregory 33744
WPS751	A Consumption-Based Direct Tax for Countries in Transition from Socialism	Charles E. McLure, Jr.	August 1991	CECSE 37188
WPS752	Inflation and Stabilization in Yugoslavia	Roberto de Rezende Rocha	August 1991	L. Ly 37352
WPS753	The CMEA System of Trade and Payments: The Legacy and the Aftermath of Its Termination	Martin Schrenk	August 1991	CECSE 37188
WPS754	Estimating Returns to Scale with Large Imperfect Panels	James R. Tybout M. Daniel Westbrook	August 1991	S. Fallon 37947
WPS755	Hedging Crude Oil Imports in Developing Countries	Stijn Claessens Panos Varangis	August 1991	D. Gustafson 33714
WPS756	Taxes Versus Quotas: The Case of Cocoa Exports	Arvind Panagariya Maurice Schiff	August 1991	S. Fallon 37947
WPS757	Managing the Transition: Enhancing the Efficiency of Eastern European Governments	Eric Rice	August 1991	P. Infante 37642

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS758	Is There Excess Co-Movement of Primary Commodity Prices? A Co-Integration Test	Theodosios B. Palaskas Panos N. Varangis	August 1991	D. Gustafson 33714
WPS759	The Profamilia Family Planning Program, Columbia: An Economic Perspective	Jesus Amadeo Dov Chernichovsky Gabriel Ojeda	August 1991	O. Nadora 31091