Methods for Costing Family Planning Services

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Introduction

Purpose of the Manual

The purpose of this manual is to describe procedures for estimating the economic costs of family planning services. Economic costs measure the costs of all resources used by the program, regardless of who pays for them. Information on economic costs of services can help managers to decide which methods to provide, how to provide them, and, if the program charges for services, how much to charge.

A fair question for the reader to ask is, Why do we need a manual specific to family planning services? After all, several excellent manuals for costing health services already exist, including "Estimating Costs for Cost-Effectiveness Analysis: Guidelines for Managers of Diarrhoeal Diseases Control Programs,"[1] "Cost Analysis in Primary Health Care"[2] and "Cost-Effectiveness Analysis."[3] One might argue that the techniques presented in these manuals could be adapted to most costing situations encountered in family planning.

Our answer is that the ways in which family planning programs are organized, as well as the measurement of what they produce, present unique problems that are not adequately covered in manuals written for costing health services. Family planning programs may offer pregnancy protection through several different service delivery channels. For example, a single program may provide services through clinics, through community-based distribution (CBD) posts, through thousands of outreach workers who visit clients in their homes, or through commercial sector outlets such as pharmacies or small retail shops. Moreover, family planning clinics may offer a wide range of **non-**family planning services, including prenatal check-ups, gynecological examinations, screening for sexually transmitted diseases, pediatric visits and general consultations.

The central purpose of the manual, then, is to provide guidance on how to apply costing techniques to each service delivery channel within a family planning program. A second rationale for the manual centers on the problem of how to measure and compare the outputs or impacts of varied distribution systems. Although all distribution channels theoretically work toward the same goal—namely, to provide contraceptive protection to clients — they produce their outputs in different ways. For example, clinics provide health services such as Pap tests, medical exams and lab tests in addition to (or in support of) family planning. Pharmacists and chemical vendors sell contraceptive methods at retail outlets. Community-based distributors provide contraceptive methods through

small shops, health posts or their own homes; some CBD programs may employ outreach workers who provide methods to clients in their homes. The manual outlines a methodology for converting these disparate outputs into a common measure, which can permit direct comparisons of costs across the various methods and distribution systems used by a program.

Another feature of this manual is that it employs a "bottom-up" approach to costing. Instead of starting with the total cost of a program and then breaking total costs into costs of projects or activities, our methodology focuses on costs at the individual service delivery point, and the allocation of these costs to different methods. The first step is to list all of the services that should be costed; next, all of the resources that are used to produce each service are identified. The total cost of each service is then calculated by adding up the individual costs of all resources used.

Although this manual focuses almost exclusively on cost issues related to family planning, we do not mean to imply that cost is necessarily the most important factor to consider in making programmatic decisions. Many other issues may be at least as important as costs, including freedom to choose the method of one's choice, access to services, quality of care, and a host of other political and ethical considerations. The role of cost data is to inform the decision-making process by providing managers with information they can use to help decide between various courses of action.

Who Should Read this Manual

We have written the manual for two audiences. We believe that anyone interested in resource issues related to family planning will benefit from becoming more familiar with the concepts presented in this manual. For example, program managers may want to use the manual to help identify and categorize the problems they face in allocating scarce resources. The manual also may help to convince clinic managers to use cost information as one important indicator of the efficiency of their facilities. Finally, service providers may develop a better understanding of how to use resources more efficiently to improve the delivery of family planning services.

However, the primary purpose of the manual is to provide a concrete approach for collecting and analyzing cost information. Our primary audience, then, is the group of professionals who actually will use the manual to organize and conduct costing analyses of family planning programs. Our assumption is that they will have some technical grounding in economics or finance, and that much of the content of the manual will be familiar to them. With this audience in mind, we decided not to write the manual in the style of a "cookbook," where every step would have to be painstakingly identified and described. Rather, our approach recognizes that considerable creativity is required to apply costing techniques in this manual to specific situations. Specifically, the analyst will

need to capture the full range of relevant inputs and costs, design relevant comparisons for program decision-making and adapt the costing procedures to the particulars of a given application.

Organization of the Manual

Chapter 1 of the manual discusses the uses of cost analysis. Chapter 2 outlines a conceptual framework for thinking about family planning programs as production units, in which inputs are used to produce family planning services. In Chapter 3, we review the fundamentals of cost analysis, focusing especially on definitions of various types of costs and ways to classify costs. Chapter 4 provides guidance on the mechanics of gathering cost data, and Chapters 5 and 6 explain how to allocate costs to family planning services in clinical and non-clinical delivery systems. Chapter 7 relates costs to outputs and Chapter 8 presents some examples in which information on costs is used to make resource allocation decisions.

Chapter 1 The Users of Cost Analysis

Cost information can provide answers to many different types of questions. Some of these questions relate to broad policy concerns. For example, governments and donors may want to project the costs of achieving a certain level of contraceptive use in a country or region. Another common concern of governments and donors is the comparison of the returns from investing in family planning with the returns from investing in other development interventions, as is done with cost-benefit analysis (CBA).

This manual focuses on the costs that programs incur to produce family planning services through specified delivery systems; therefore, the uses of cost analysis that we choose to emphasize are related to decisions about resource allocation.

Consider some representative issues:

- A clinic is thinking about expanding so that it can conduct all of its own laboratory work rather than contracting out some of this work to a local laboratory.
- The manager of a program with outreach workers (or many service delivery points) wants to determine the least costly way of transporting supervisors to the field: Should supervisors use cars or public transportation?
- The same program manager wants to determine whether additional outreach workers should be hired in an effort to increase contraceptive use.
- A program is facing reductions in donor support. Which components (e.g., commodities, equipment, or information, education and communication) of the cost of a service would be most affected? How much would it cost for the program to replace inputs that currently are donated?
- The same program begins charging fees for services. How should prices be set? Which components of the total cost of a service should be recovered? Should different fees be collected in different categories of clinics?

The remainder of this chapter discusses some of the ways that cost information can be used to answer these and other policy questions. The discussion is organized into three sections, which correspond to the three principal uses of cost analysis:

- comparing the costs of service delivery units and the products they produce

- evaluating whether changes should be made in the service delivery system, including the method mix, the outlets providing methods, in medical services themselves (exams, lab tests, follow-up schedules) or in the quantity and type of supporting services, such as training and IE&C

- evaluating aspects of the financial sustainability of programs

Comparing Costs of Service Delivery

Cost studies can provide decision-makers with information on how and why the costs of contraceptive services vary at a given point in time. For example, two clinics may provide IUDs, but the cost of providing them in one clinic is higher than in the other clinic. This variation could be explained in several ways:

- the costs of resources to produce services are higher in one clinic than in another (e.g., medical staff receive higher salaries in urban clinics than in rural ones)

- one clinic uses physicians to provide services while the other uses nurses, who are paid less than physicians

- staff spend more time providing the same services in one of the two clinics

- demand is lower for services in one clinic than in the other so that clinic costs are allocated across a lower output

A study of the cost components of the two clinics would be a good starting point for an analysis of reasons for variations in total costs.

Evaluating Whether Changes Should Be Made

Cost information is useful for determining whether to add new methods, additional service delivery outlets, or an entirely new service delivery system. For example, when a new method of contraception becomes available, decision-makers need to determine whether to introduce it, and if so, how widespread distribution should be, to whom the method should be provided and where to provide it. Such decisions require information on the additional amount of contraceptive protection delivered by adding the method to the existing mix and on the additional costs to the program.

Some new delivery systems may be successful at selling or distributing methods, but this does not mean that they are also successful in getting more couples to use contraception or to use more effective methods. A new delivery system may sell a lot of contraceptives but most of the buyers may be previous users of other programs or, if they are new to contraception, they may have gotten services elsewhere if the new delivery system had not been introduced. In such a case, the delivery system would have added to its own output but not to the use of family planning.

The program managers may also want to know if the new method or the new delivery system can provide contraception at lower cost than a method or system that it replaces. Even if a new method does not add to contraceptive protection, its introduction may reduce costs if it replaces higher-cost methods. However, if the new method does not add to contraceptive protection (either by adding new users or by shifting users to more effective methods), and costs more than other methods, then economic considerations would indicate that it should not be added to the method mix.

Program managers need to consider trade-offs between costs and quality. However, a reduction in costs does not necessarily mean a reduction in quality. For example, there is growing concern that some efforts to ensure high quality services have resulted in medical barriers to contraceptive use. These services may, in fact, reduce quality. Quality of care can be improved by reducing excess medical protocols, such as reducing the number of recommended IUD follow-up visits. Fewer recommended follow-up visits could reduce clinic congestion, lower the costs to women of follow-up visits, and free up resources for more productive purposes. Cost information can be used to show the value of resources that could become available if a less stringent follow-up norm were adopted. However, the program needs to weigh the saving of resources against any negative health consequences to women from a revised follow-up schedule.

Other examples for which cost savings can be realized (recognizing that health consequences must also be considered) include the following:

- removing the clinic visit requirement for acceptors of oral contraceptives in community-based distribution programs (which is often done in some sub-Saharan African countries)
- distributing more cycles of oral contraceptives to pill users during resupply visits
- foregoing lab tests and some medical exams for acceptors of hormonal methods

Programs also need to decide how much to spend on training activities and on IE&C. Training programs strengthen the skills of service providers while IE&C activities increase the demand for services. Programs must make decisions about allocating funds for these activities as well as for service delivery. Programs need to consider, for example, how much to spend on training programs, how frequently training needs to be given, and what are the alternative ways of providing training.

Evaluating Financial Sustainability of Programs

Many family planning programs in developing countries receive assistance from foreign donors. Donors provide, among other things, contraceptive commodities (pills, condoms, IUDs, etc), disposable medical supplies, medical equipment and support for program promotion and training. Some donors provide supplements to salaries in certain countries. Cost analysis can help program managers to identify which resources are donated and to calculate the percentage of the cost of each service covered by donors,

by client fees and by other locally generated resources. It also can be used to answer the question of what would happen to the program if some or all of the donor support were terminated.

Recently, a major emphasis in the international donor community has been to encourage programs to recover a portion of the costs of services through fees charged to clients. But how do managers decide on an appropriate price for the various services? With information on the cost components of a service, a manager has several available pricing options:

- to charge a fee equal to the cost of the commodity alone
- charge the cost of the commodity plus the cost of personnel who deliver the contraceptive
- charge a fee equal to total cost, including all of its components

Of course, other factors such as equity should be considered in determining how much to charge. Decisions on pricing also require information on the impact of instituting or raising fees for services. For example, raising prices may affect the efficiency of resource use; if fewer women attend a clinic, then clinic costs are divided across a smaller output, which increases average costs. Higher prices also can lead to lower contraceptive prevalence if clients who discontinue do not get services from another source.

Finally, program managers may want to forecast demand for services and the costs of meeting that demand. Computer models such as Target-Cost can estimate the number of users it would take to reach target fertility rates, assuming a given method mix, source mix, and baseline contraceptive prevalence rate. Information on program costs per client can be multiplied by the estimates of future users to produce estimates of the costs that the program will have to meet in future time periods. Managers may also want to project their costs to allow planning for varying scenarios of revenue sources.

In making forecasts, one must remember that per unit costs may rise or fall over time, depending on such factors as level of demand for services and increasing expertise of clinic staff. In clinics with excess capacity, an increase in output can result in lower per-unit costs underutilized resources are used more often.[4] On the other hand, programs that have already provided contraceptives to the “easy to reach” groups may find that the additional costs of recruiting and serving new groups may be very high.

Chapter 2 Framework for Calculating Costs

As the costing literature has grown, so has the range of techniques used for measuring costs. As we discussed in the previous chapter, cost studies are carried out for many purposes, and results are presented in a variety of ways. Some programs focus on cost per acceptor or new user, while others may look at cost per user or cost per couple-year of protection (CYP). One problem caused by these different approaches is that the term "cost" has lost some of its precision. It is difficult (if not impossible) to know whether the costs calculated in a given study can be meaningfully compared to those in other studies. [5]

In this manual, we lay out a costing methodology that aims to be inclusive, identifying and valuing all of the resources used to produce family planning services. Our goal is to provide a straightforward way to calculate the total costs of goods and services. Once all of the resources have been identified and costed, subsequent analyses can break down total costs into other categories of interest.

At the outset, then, we must be clear about what we mean by family planning programs and family planning costs. Family planning services can be delivered through programs set up exclusively for that purpose, or can comprise part of a broader package of services, which may include maternal and child health, as well as other services. This manual focuses only on delivery of family planning services.

We begin the chapter by discussing some examples of the different ways family planning services can be organized. We then describe family planning programs as production systems, similar to other organized entities that transform raw materials into goods and services. The chapter concludes with a brief introduction to an approach for calculating costs per CYP, which relates costs and contraceptive protection to the time periods in which they occur.

Diversity of Contraceptive Provision

Many people think of family planning in terms of contraceptive commodities — pills, IUDs, condoms, Norplant — rather than in terms of services, of which the commodity is just one part. But from a costing perspective, variation in costs from one delivery system to another is a function of several factors. Therefore, the answer to the question "What does family planning cost?" should not be focused on commodities alone, but rather on

the combination of commodities and the way in which the program delivers the commodities. To illustrate this distinction, consider the following ways that oral contraceptives (OCs) are provided to women in developing countries.

OCs at hospitals or clinics

This delivery system often requires an initial visit to the hospital or clinic, where the client receives counseling about the risks and benefits of pill use in relation to other methods. She may or may not undergo a medical exam (vital signs, pelvic examination, Pap smear); she is then told how to use the pill and receives one or more cycles. At subsequent visits to the hospital or clinic, the client receives additional cycles, perhaps another medical exam and further counseling.

For both of these types of visits, staff time will usually be the costliest input. Other costs incurred would include those associated with the use of equipment and building space. The cost of the pills and related supplies (latex gloves, cotton strips) is likely to be relatively low.

OCs through social marketing programs

Contraceptive Social Marketing (CSM) programs use many sales techniques borrowed from the private sector and are able to compete with commercially-priced brands because these programs often receive donated or discounted commodities along with other donor support. Typically, CSM program costs include commodity procurement, market research, packaging and promotion costs. CSM programs then sell the products to wholesalers, who bear the costs of shipping commodities to retail outlets (usually pharmacies). Some CSM programs, however, employ their own in-house sales personnel. Other costs of CSM programs typically include labor to manage the flow of commodities and to design the marketing plan, commissions and bonuses paid to sales representatives, office equipment and furniture, supplies for packaging and expenses related to administrative staff.

OCs through community-based distribution (CBD)

CBD programs provide commodities through a network of distributors who provide methods directly to the public. These distributors can be salaried health professionals or unsalaried community residents with little or no medical training. CBD's niche is that it makes contraceptives available to clients at health posts or other small retail outlets usually located in areas distant from commercial providers of pharmaceuticals. Some CBD programs also provide methods to women in their homes. CBD program activities include educating and motivating clients to use OCs, transporting OCs to distributors and then to the client, and training and supervising the distributors. Costs include contraceptives, labor and vehicles to move the contraceptives, labor to promote use and educate clients and to supervise distributors, and supplies (flip charts, folios) to educate clients and distributors. Generally, CBD programs do not involve any medical costs, although CBD workers may refer clients to a health care system that can provide medical back-up.

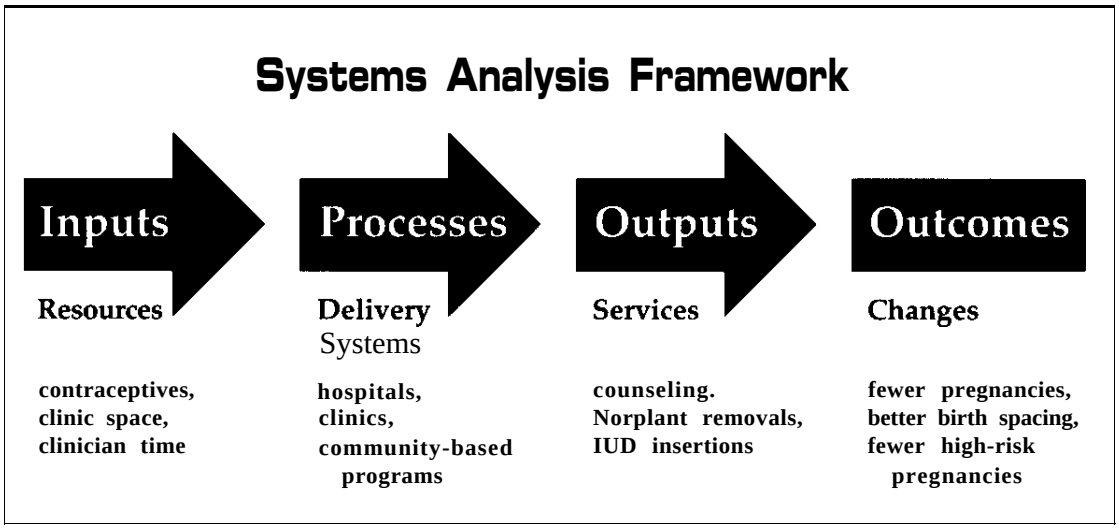
Family Planning Programs as Systems

The previous section discussed the reasons why it is important to think of family planning services as combinations of commodities and delivery systems. Now we turn our attention to the question of how family planning programs produce these services.

Many family planning programs fit the standard economic definition of the "firm," which is any entity that turns "inputs" into "outputs."[6] Some of the inputs (or resources) used by family planning programs include clinic space, a clinician's time, medical supplies, equipment, advertising, administrators' time and contraceptives. The outputs of these programs are services that are intended to help clients to avoid unplanned pregnancy. The outcomes of program services include increases in contraceptive use, declining fertility rates and increasing birth intervals.

A conceptual framework known as "systems analysis" can help to break down a program into a series of simple input-output relationships.[7] Figure 2.1 shows how a family planning program could fit into a systems analysis structure.

Figure 2.1



Inputs are transformed into outputs through processes or actions; outputs lead to changes in behavior that ultimately bring about an outcome, which is the reason for the program's existence in the first place.

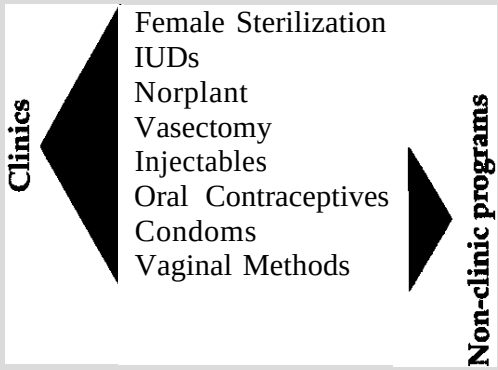
In the family planning context, resources such as labor, materials and capital are fed into various contraceptive delivery systems, which in turn produce the services used by family planning clients. It is expected that the net result of these services is that fewer pregnancies will occur, and those that do occur will be spaced further apart; eventually, both fertility rates and the number of high-risk pregnancies will decline. The following section expands upon these basic elements of a systems analysis of a family planning program.

Inputs: labor, capital and materials

In a simplified framework, all resources used to produce family planning services fall into one of three broad categories: labor, capital and materials or supplies. "Labor" can include, among other things, clinic staff who insert IUDs, supervisors who oversee CBD activities or secretaries providing support services. "Capital" could be clinic buildings, operating room equipment for sterilization (including operating tables and laparoscopes) and vehicles used to distribute contraceptives. "Materials" could include contraceptives, anesthesia for sterilization, and gauze and bandages for Norplant insertions.

Figure 2.2

Combinations of Methods and Available Delivery Systems



Processes: delivery systems

Family planning programs typically channel resources into two basic types of "delivery systems:" clinical and non-clinical. Clinical settings include hospitals, integrated primary-level health facilities and family planning clinics. Non-clinical delivery systems can include community-based distribution (CBD), contraceptive social marketing (CSM), commercial outlets (e.g., pharmacies) and home visits. Methods requiring medical intervention (IUDs, Norplant, voluntary sterilization) are provided only in clinical settings. OCs, condoms and vaginal methods can be supplied in both clinical and non-clinical settings, but are the primary methods in non-clinical settings. (See Figure 2.2)

Outputs: family planning services

In each delivery system, inputs are combined or processed in ways to produce family planning services. Some examples of these would be counseling, sterilizations performed, IUDs inserted and cycles of OCs sold. These services can be described as including two elements: the contraceptive method itself and a range of accompanying activities carried out by program staff, who promote contraceptive methods, provide them, and encourage clients to use them properly These accompanying activities are intended to have three primary effects: to increase the number of couples who choose to regulate their fertility; to minimize the difference between the method's theoretical efficacy and its efficacy in actual use; and to encourage method continuation by ensuring that clients are satisfied with the service.

Another way to think about the outputs of family planning programs is in terms of protection provided against the risk of conception. Many studies have used an indicator called the "couple-year of protection" (CYP), which is defined as the amount of contraceptive commodity and/or service necessary to protect a couple from pregnancy for one year. This indicator expresses in common units the protection provided through each combination of method and delivery system.

Using cost per CYP, program managers can compare the costs of different combinations of contraceptive methods and delivery systems and determine how to maximize the amount of contraceptive protection that can be provided for a given level of resources. However, it must be noted that contraceptive acceptors influence the number of CYPs through their decisions on when to begin using a method and how long to continue using it. Therefore, CYPs are at least partially an outcome measure. In Chapter 7, we discuss the efforts of the EVALUATION project to refine the CYP and to make it more of an outcome measure.

Outcomes: lower fertility rates

An outcome would be an increase in the percentage of couples protected against the risk of pregnancy through use of contraception. If contraceptive use increases, then fertility rates will eventually decline (unless changes occur that support higher fertility rates, such as a decline in the period of time that a woman breastfeeds or earlier age at marriage).[8]

For the purposes of this manual, we consider only the fertility reduction outcomes of family planning programs, although the approach used in this manual could be expanded to include impacts on other aspects of women's lives or those of their families. For example, other outcomes of family planning programs could include reductions in the number of high-risk pregnancies, fewer sexually transmitted infections because of increased condom use, or improvement in the health of children through lengthening the interval between births.

An increase in the output of family planning services from one delivery system does not necessarily mean that contraceptive use increases or that fertility rates fall. If a delivery system serves clients who were previous users of the same methods or other methods of equal effectiveness and duration of impact, then there will be no net increase in contraceptive protection. On the other hand, if a delivery system serves clients who have never used family planning before (and who likely would not have used family planning at all if the delivery system had not been introduced) then the introduction of the delivery system has a net impact even if the number of clients served is low.

Contraceptive methods vary greatly in the amount of protection they provide per unit of contraceptive delivered. Methods also differ in how the timing of services (and therefore costs) relates to the protection provided. The next section discusses why costs should be calculated over the period of method use.

Measuring Costs over Time

Contraceptive services and their associated costs generally occur at the same point in time. For example, when a woman is sterilized, she receives the service on a particular day, and the costs of the procedure are incurred on that same day. But when we shift our focus away from specific services, and instead look at a client using a contraceptive

method over a period of time, then it is apparent that the **protection** afforded does not always match up neatly with the costs incurred to maintain the protection. The duration of contraceptive protection, as well as the timing of costs, depend on the method selected and the decision to continue using it. In the case of female sterilization, protection will typically last for 10 to 20 years, depending upon how young a woman is when she gets sterilized.

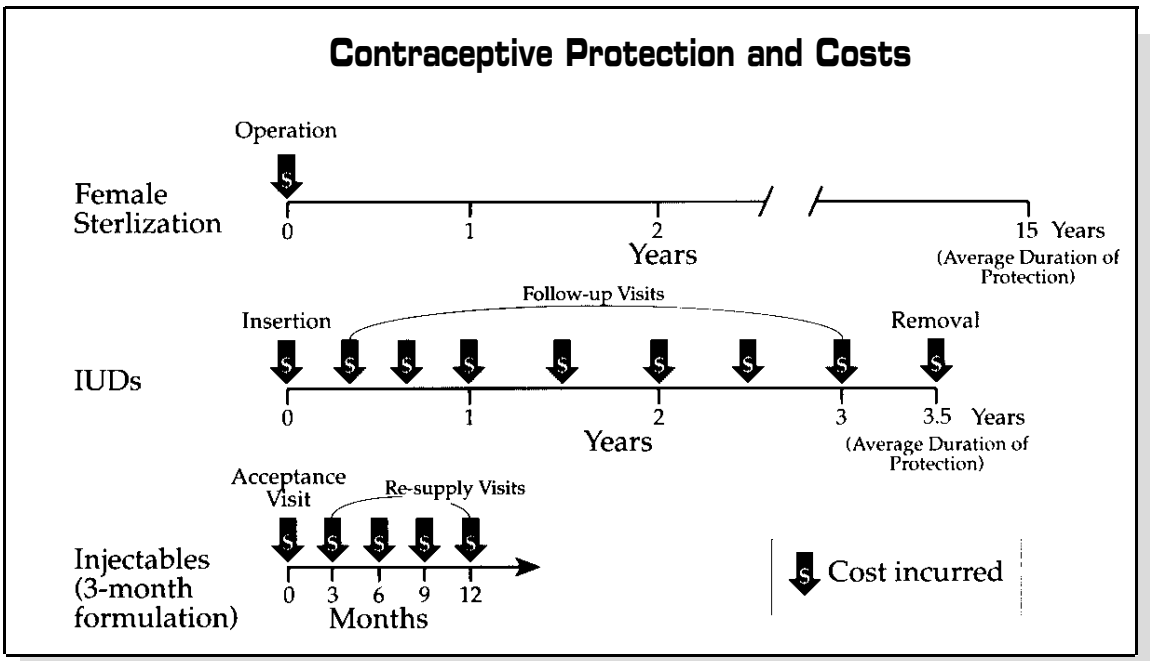
Our costing approach is tailored to these distinct patterns of method use. In practice, this means that for **clinic-based** delivery systems, the average costs of clinic visits are multiplied by the number of visits that are made during the period of method protection. The product is then the total cost of providing contraceptive protection. For **non-clinical** delivery systems, the same approach may be followed, or the average cost of distributing one unit of a contraceptive may be multiplied by the number of units needed to provide protection for a specified time period.

Some methods require users to re-stock their supplies of the contraceptive. For example, if a woman wants to continue using OCs, injectables, condoms or vaginal methods, she must visit some type of distribution outlet (i.e., a clinic, pharmacy, or a CBD post), or must be visited by a CBD or outreach worker. Each of these visits has a cost attached to it. Consequently, some costs will be incurred as long as the woman continues to use the method, and these costs will coincide with the renewal of contraceptive protection.

For other methods, like the IUD and Norplant, a cost is incurred when the device is inserted. In addition, there may be costs for follow-up visits, and eventually there should be a removal cost. The big difference between these methods and resupply methods is that once the IUD or Norplant is inserted, additional clinic visits are not usually needed to maintain protection from pregnancy In other words, the protection provided by such methods is largely independent of the costs of subsequent care. It is possible, therefore, to imagine a situation in which costs are incurred only at the initial acceptance visit and at removal, while protection lasts for many years.

In the case of surgical sterilization, most costs are incurred “up front.” A typical client will undergo some laboratory tests and counseling to ensure that she or he is an appropriate candidate for the procedure, the client may be sterilized, and then may or may not have a post-operative visit. In the case of a sterilized woman, the protection provided by this method lasts for the duration of her reproductive life, which depends on her age at the time of her surgery.

Figure 2.3



For acceptors of Norplant and the IUD, the number of follow-up visits may vary substantially among clinics, depending on each client's recommended follow-up regimen. For example, in some clinics in Latin America, women may make as many as three follow-up visits in the year following IUD insertion, while in other parts of the developing world, women return for follow-up less frequently. For acceptors of injectables, re-supply visits must occur at regular intervals to maintain contraceptive protection. Upcoming chapters will discuss how to use the systems analysis framework to relate costs of inputs to outputs and outcomes.

Chapter 3 Fundamentals of Cost Analysis

Opportunity Costs

An important distinction to make at the outset is the difference between a financial cost and an opportunity (or economic) cost. When most people think of costs, they think of financial costs, which are basically the same thing as expenditures. Programs expend financial resources for many reasons: to meet payroll, to rent buildings, and to purchase medical supplies and equipment. Financial costs include all outlays made by the program to purchase goods and services, but do not include the costs of items for which the program does not have to pay.

Alternatively, when economists assign a cost to a good or service, they think in terms of opportunity costs. An opportunity cost is the value of the most productive alternative use of the same resources. This perspective is broader than the financial cost framework, because it includes all resources consumed in producing family planning services, regardless of who pays for them.

If a program purchases an input at market prices, then the opportunity cost of that input is equal to its financial cost. An example would be the cost of disposable gloves that clinic physicians use when inserting IUDs or Norplant — the money used to purchase the gloves could have been used instead to purchase other goods or services. In situations where market prices are distorted, the financial cost of an item may not be equal to its opportunity cost. For example, many developing countries levy tariffs on imported goods, which may cause the financial cost to exceed the opportunity cost. Likewise, the costs of imported inputs may be distorted by exchange rates, which do not reflect the underlying market price of foreign exchange.

But many family planning programs receive donated inputs. Should programs be concerned about the cost of donated contraceptives or the cost of volunteer labor or of donated foreign technical assistance? The decision on whether to include the costs of donated inputs depends on whether they are critical for program survival. For example, family planning programs obviously could not function effectively without contraceptive commodities; therefore, we recommend that the cost of donated contraceptives always be included in costs of family planning services.

For donated inputs that have been classified as critical, the next step is to assign a cost to the input. The question to ask at this step is whether the cost to the donor reflects the cost that the organization would pay if the donated input were no longer available. For example, many programs receive foreign technical assistance to help improve program

performance. If this assistance were withdrawn, it would be unlikely that a program would continue to pay the high costs of international consultants' time and travel. A more likely result would be that the program would substitute less costly domestic technical assistance. The cost that would be included in the estimates would be the cost of the domestic technical assistance.

Program Costs vs. User Costs

Another distinction made in this manual is between costs borne by programs and costs borne by users (apart from service fees). Costs of family planning include both production costs and distribution costs. Programs may use inputs to both produce and distribute services to the user, or the user may use her or his own resources to obtain services.

This distinction can apply to contraceptive methods. For example, the costs to the user of obtaining services may vary by method, because some methods imply frequent re-supply (i.e., OCs and condoms) while other methods like IUDs and Norplant may require little or no further action (and no more costs incurred) by the user. Therefore, while the total cost of providing a method like Norplant may be similar to the total cost of providing OCs at the same clinic, a greater proportion of the cost burden is borne by the user of OCs than by the user of Norplant — the client must travel to the clinic more often, thus incurring user costs, for example.

This distinction between program costs and user costs can also apply to delivery systems. In fixed service delivery points such as clinics, the user bears the costs of traveling to the clinic to obtain the method. In house-to-house delivery, the program bears that cost. The total costs of fixed and outreach programs may be the same but the cost burden falls differently on programs and users.

In this manual, we focus explicitly on program costs. This does not mean that we consider user costs to be unimportant. User costs will influence the demand for family planning methods, and programs that ignore these costs may overemphasize methods with low costs to the program and high costs to users. Nonetheless, programs work within budget constraints and must sometimes make difficult decisions about which family planning services to produce; information on program costs will be useful in making these decisions.

Cost Classification

Input costs can be classified and calculated in several different ways. The decision about how to classify costs depends on the objectives of the cost analysis. In this section we discuss four pairs of terms commonly used to classify costs: direct and indirect costs, joint and non-joint costs, average and marginal costs, and capital and recurrent costs.

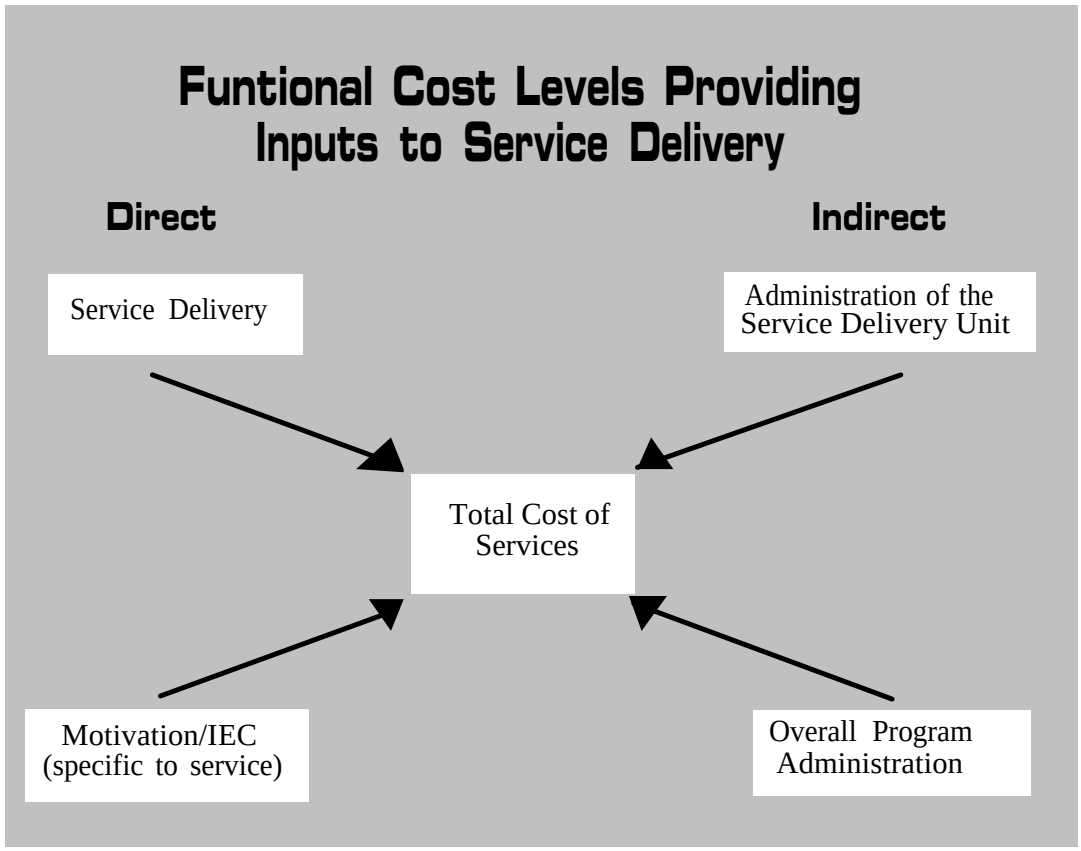
Direct and indirect costs

In any production process, it is possible to identify certain inputs that contribute directly to the production of output, and other inputs that are associated with supporting the direct activities. These two types of costs are termed "direct costs" and "indirect costs."

- **Direct costs** correspond to resources that can be explicitly identified with a service or product. Examples include salaries of clinic nurses, costs of contraceptive commodities, and costs of transporting employees of a CBD program.

- **Indirect costs** cannot be directly identified with a service or product, but are the costs of supporting the direct activities. These costs typically are incurred to administer or evaluate programs. They can include accountant salaries, office supplies used by clinic administrators, and costs associated with collecting service statistics. As shown in Figure 3.1, indirect costs may also be incurred at different administrative levels, such as within an "umbrella" organization that manages several clinics, or within the hierarchical structure of ministries of health in many countries.

Figure 3.1



Some examples may help clarify this distinction. A small-scale vertical program may have only one level of administration above the service delivery level, while a program run by the ministry of health may have several levels of administration that extend all the way up to the office of the minister or the country's political leader. The problem is deciding which layers to include in your costs. Should you include supervision of field workers? What about the salaries of the evaluation staff? Your decision will depend on the question you are addressing. If, for example, the program is considering expanding the number of outreach workers, then it will likely need to increase the size of the supervisory staff but probably will not need additional evaluators or administrators. Therefore, the salaries of evaluators and administrators would not be included in the frame of the cost analysis.

Joint and non-joint costs

For the purpose of making cost allocation decisions, it is often necessary to classify costs as either "non-joint costs," which are cost of resources that are used only for one client, and are either fully consumed or thrown away at the end of the visit; or "joint costs," which are costs of clinic resources used by more than one client. For example, an IUD insertion would involve non-joint costs such as the cost of the IUD itself and all of the disposable medical supplies (cotton balls, antiseptic solutions, etc.), while the joint costs would include costs of staff salaries, equipment and clinic space.

Non-joint costs can be allocated 100 percent to the visits in which they are incurred. Therefore, in the example of the IUD insertion mentioned above, the non-joint cost would equal the cost of the IUD plus the cost of the total quantity of cotton balls and antiseptic solution used up during the insertion.

Joint costs cannot be directly charged to visits as non-joint costs can be, but must be distributed among visits using allocation criteria. In order to figure out how much of a joint cost should be allocated to any given service (such as the IUD insertion), the analyst must identify ways to measure, directly or indirectly, the amount of joint cost incurred. Chapters 5 and 6 discuss various approaches to allocating joint costs in clinics and in non-clinic based distribution systems.

Average and marginal costs

"Average cost" is defined as the total cost divided by the number of units of output, whereas "marginal cost" is the additional cost required to produce one more unit of output.

The issue of when to focus on average costs and when to focus on marginal costs relates directly to the research question being asked. For example, if you want to determine the reasons for variations in the cost of sterilization at two or more clinics, then you should compare costs per unit of sterilization, or average costs. If, however, you want to determine the impact on CYPs and costs of expanding the number of hours that staff at the clinic are available to perform sterilizations, then you would look at the marginal costs of service expansion.

Economists make additional cost distinctions — they refer to long- and short-run average and marginal costs. In the short run, a clinic may increase the number of sterilizations performed by expanding the hours that the clinic is open. In the long run, the program may expand services by increasing the number of operating rooms that are equipped to provide sterilization. In the first case, only labor and materials would be increased to provide additional sterilizations. In the long run, these inputs plus capital could be expanded to produce additional sterilizations.

Recurrent and capital costs

The key issue in distinguishing between recurrent and capital costs is the life expectancy of project inputs. "Recurrent costs" usually are defined as the costs associated with inputs that will be consumed or replaced in one year or less, while "capital costs" are defined as the annual costs of resources that have a life expectancy of more than one year, such as equipment or buildings. Recurrent and capital costs may be either direct or indirect.

In a family planning setting, examples of recurrent costs can include contraceptive commodities, medical materials and supplies, office supplies, utilities and staff salaries. Capital costs can include clinic space, operating room equipment for sterilization and vehicles for transporting commodities. Staff training also can be classified as a capital cost if the new skills are expected to last for one year or more. The costs of refresher training courses that occur throughout the year should be classified as recurrent.

The distinction between recurrent and capital costs is generally well-understood by managers of family planning programs in developing countries. Some donors prefer to use their resources to purchase capital items, and encourage programs to cover costs that recur from year to year. Indeed, some might define as self-sufficient a program that is able to cover its recurrent costs. This is an easily understood objective for most programs, although usually it is difficult to achieve.

Calculating recurrent and capital costs

The distinction between recurrent and capital costs is especially helpful during the phase of a study when the analyst is collecting cost information. Calculating recurrent costs is relatively simple if it is known that market prices accurately reflect the underlying opportunity costs of resources. The cost is simply the amount of the input used for a given period of time, multiplied by its unit price. For example, if a clinic uses 2,500 client registration forms during an average month of operation and these forms cost the clinic 2 cents apiece, then the recurrent costs of forms per month would be 2,500 times $0.02, or $50. (In Chapter 4, we discuss how to determine recurrent costs when market prices do not accurately reflect underlying opportunity costs.)

Calculating capital costs is somewhat more involved. The objective is to be able to express all costs in annual terms, which means spreading out the costs of capital goods over time periods corresponding to their useful lives. For example, if a CBD program purchases a vehicle that will last for five years, then the simplest assumption is that 20 percent of its value is depreciated each year. If the purchase price of this vehicle is $20,000, then the annual cost of depreciation would be $4,000.

In addition to depreciation, the analyst must consider the opportunity cost of capital. Assume that when the vehicle was purchased, the entire cost was financed and now interest is being paid on the loan. Those interest charges are costs. Another way to look at this is to assume that the vehicle was fully paid for up front and there is no loan. But an opportunity cost still is incurred, because the money used to purchase the vehicle could have been used for other productive purposes (at minimum, it could have been earning interest in a savings account). An example of a capital cost calculation is presented in Chapter 4.

Chapter 4 Collecting Cost Data

The purpose of this chapter is to discuss procedures for collecting cost data. We explain where to find information on costs of personnel, supplies, equipment and buildings. We also provide some useful guidelines for situations in which information is not readily available or in which precision is less important. (Much of the material in this chapter is based on existing manuals. A list is given at the end of this chapter.)

Depending on the purpose of your cost study, you may or may not need to collect information on costs of all resources used to produce services. For example, if your study question is whether to expand the CBD or the social marketing program in a particular area, you would need only to include costs of additional inputs required for program expansion. It would not be necessary to include costs of program infrastructure that already exist. In other cases, your research question may require you to collect data on all costs. For example, a clinic manager may be concerned that the average cost of an IUD acceptor visit is higher at a particular clinic than at other clinics. Your approach in this situation would be to analyze variations in the components of total costs, which would require you to obtain information on all costs.

For the sake of completeness, this chapter provides guidance on collecting cost information for all types of inputs. We recommend that you spend more time and energy collecting information on the larger cost items, and spend less effort on items that account for a smaller proportion of total costs. It is simply not worth the effort to demand precise estimates of the costs of insignificant inputs.

Sampling Considerations

The first step in collecting cost information is to decide where to gather data. Some public-sector providers like ministries of health operate multiple service points of the same type (e.g., health posts, small clinics). It would obviously be impractical to collect data in every facility, because they can number in the hundreds. In such cases, sampling may be required.

Sampling is a discipline in itself, and a detailed discussion of sampling issues is beyond the scope of this manual. However, some basic points should be kept in mind when deciding whether and how to choose a sample. First, you should decide whether sampling is even warranted, given the number of service points in the system. It may be feasible instead to collect information at every facility

If you decide sampling is needed, the sampling approach will depend on your research question. For example, if you are trying to measure average costs in the system as a whole, then you should select a **representative** subset of all service points. In this case, you need to have a sense of the factors that might cause costs to vary from one service point to the next. Some of these factors include size of facilities, location (urban/rural), and populations served (dispersion and economic/cultural differences). Additional critical factors might include seasonal variation (roads may be impassable during the rainy season); days of the week service is available (many clients prefer to visit clinics on Mondays or Fridays); or time of day service is provided (clients often begin to queue up well before the facility opens in the morning, but in the afternoons the clinic may be empty).

Different research questions could require different sampling strategies. For example, if the program plans to increase services in rural areas, you would only need to sample rural facilities for a study on the expansion.

If a program includes many different types of service points and you want to have cost estimates for each type, your sample may become very large. In order to keep study costs at a reasonable level, though, it may not be possible to include all types of service delivery points in your analysis. We suggest that you use common sense and focus on the most important delivery systems. For a more detailed treatment of sampling considerations in the context of family planning programs, we recommend the excellent chapter in Fisher, et. al., *Handbook for Family Planning Operations Research Design,* second edition, published by the Population Council.

Non-Joint Costs: Visit-specific Supplies and Materials

Since our output measure in clinics is defined as one visit, we want to identify and collect separately the costs of supplies and materials used up during each type of visit, An example of a visit-specific supply cost would be the cost of an IUD inserted by a clinician. A distinction can be made between visit-specific materials and supplies costs, and the costs of supplies and materials used jointly for general program purposes (for example, the disinfectant used to clean the floors). The costs of these joint supplies are collected separately (see section below).

Visit-specific materials and supplies costs are collected using a form for each unique type of visit that clients make. For example, in a family planning clinic offering temporary and permanent methods, separate forms would be needed for IUD insertions, IUD follow-up visits, IUD removals, OC acceptance visits, OC follow-up visits, female sterilization evaluation visits, female sterilization surgery visits and female sterilization post-surgery visits, plus any other type of visit made by clients.

Each form should list all the materials and supplies used up in a visit of that particular type (see Figure 4.1). In order to decide which materials should be included on which forms, you should interview the clinic staff that actually provide the service, or possibly you can arrange for a clinic staff member to observe a few visits of each type. Information on the quantity of each item used can be obtained in the same ways, i.e., through interviews with service providers, or by directly observing several visits of each type. The exact number of observations needed to produce a reliable mean is only a guess, but 20 visit observations should suffice in most situations. If some visit types are made infrequently, you may have to settle for fewer observations.

Figure 4.1

Visit-specific supplies and materials costs

Clinic: No. 1, Central City
Visit Type: IUD insertion

Item	Quantity	Unit Cost	Total Cost
IUD	1	$0.85	$0.85
Disposable gloves	2	0.35	0.70
Cotton balls	5	0.02	0.10
Methiolate (cc)	10	0.05	0.50
Total			**$2.15**

The staff person who handles purchasing can provide information on the unit cost of each item, which when multiplied by the quantity used will give the total cost. If the supplies are donated, use the cost that the program would have to incur to purchase the same items (this may or may not be the same as the cost to the donor) plus any shipping costs. To obtain the total materials and supplies costs for that type of visit, add the costs of all items on the form and calculate an average cost for the 20 or so observations you have collected, or alternatively use the information provided by clinic staff.

Non-Joint Costs: Non-salary Payments to Labor

Some programs use non-salary mechanisms to pay for certain types of labor services. Like visit-specific supplies and materials, these costs can be identified directly with specific visit types. For example, in the Dominican Republic, physicians who work for

PROFAMILIA, the local International Planned Parenthood Federation affiliate, are paid a fixed fee for each type of service they perform. The fees vary depending on the degree of technical expertise required, and the fees are renegotiated periodically Information on the amount of such payments should be available from the program administrator.

Another example of non-salary payments to labor are the sales commissions paid to distributors in many CBD programs. Usually, the program establishes for each brand a percentage breakdown that specifies how much revenue the distributor can keep and how much is retained by the program. Once again, this information should be relatively easy to obtain from the program administrator.

Joint Costs: Salaries and Benefits

In many programs, salaried employees contribute to the production of several different services; therefore, employee expenses fit the definition of joint costs. Salaries and benefits usually represent the largest cost component of family planning programs. In other primary health care programs, they typically represent from one-third to three-quarters of the total program costs.[3] Clearly, you will need to devote considerable time and effort to identifying precisely all personnel-related costs.

Every employee who is connected with the program in any way should be listed according to job function and location (see Figure 4.2). The list should include, in addition to physicians and nurses, all clerical, administrative and maintenance staff, plus any volunteers or consultants. Sometimes staff from other divisions or organizations provide support to family planning programs; these individuals should be included as well.

Figure 4.2

Salary and Benefits Costs

Program: MCH/Family Planning
Clinic: No.1, Central City

Employee	Elena	Emilia	Laura	Maria
Job Title	Doctor	Nurse	Education Specialist	Receptionist/ Secretary
Base Monthly Salary	$970	$700	$430	$270
Fringe Benefits (50%)	485	350	215	135
Total Cost per Month	**$1,455**	**$1,050**	**$645**	**$405**

The next step is to determine the cost to the employer of each employee's compensation for some unit of time (i.e., monthly or annually) including all fringe benefits such as vacation and sick leave, social security, and pension. The computation of personnel costs can be streamlined by aggregating similar types of employees into categories and calculating their costs all at once.

Benefits in an employee's compensation package will vary depending on the locale. For example, in some Latin American countries employees customarily receive one months pay as a year-end bonus, while in Indonesia, an individual's income taxes may be paid by the employer. Other examples of fringe benefits include subsidies for housing and education or the use of a car and driver.

Figure 4.2 shows a simple format for collecting personnel cost data. In this example, the "total cost" line is equal to the base monthly salary plus fringe benefits. This form obviously will need to be adapted to specific costing situations.

Joint Costs: Other Recurrent Costs

Other recurring joint costs can include materials and supplies, and the cost of operating and maintaining buildings, equipment and vehicles:

Miscellaneous materials and supplies: This category includes all recurrent items that are not visit-specific, including such items as office and cleaning supplies. Many programs will have expenditure records that can be used as an approximation of indirect materials and supplies usage, assuming that patterns of use and resupply are fairly constant throughout the year. You should try to average at least six months of expenditure data rather than to use the expenditures for any one month. This avoids the possibility of choosing a month when expenditures were much higher or lower than normal.

Some programs may not keep records or the records may not be accessible. If this is the case, you may need to track usage over some time period by doing an initial inventory and a final inventory [(initial inventory - final inventory) + Additions to stock = usage]. If necessary these figures can be increased by some factor to reflect waste, spoilage, misuse or theft.

Building operation and maintenance: The costs of operating a facility include costs of utilities and maintenance. For utilities, it is better to use the actual expenditures on electricity, water, gas and telephone.

However, some programs may not bear the cost of certain utilities, such as electricity and water. If you believe that the program may have to pay such costs in the future, you should attempt to locate a facility of similar size and client volume, and use that facility's expenditure on utilities as an approximation of the program's resource consumption. If no expenditure information is available for the program or for a proxy facility, some manuals suggest using 2 to 4 percent of building investment cost as the cost of utilities and maintenance combined. If the facility is in poor condition or is used intensively, these factors should be increased to 8 or 9 percent.[12]

The term "maintenance" used in this sense refers to housekeeping (e.g., cleaning) and minor repairs. Major maintenance such as painting or replacing a part of the structure ought to be capitalized and added to the annual capital cost of the building. If the program employs a cleaning service, the expenditure for each facility can be used as the cost. If the program employs its own housekeeping and maintenance staff, their salary and benefits costs should be included.

Equipment operation and maintenance: The usual source of data on equipment operation and maintenance is the expenditure records of the program. If no records are available, the next best alternative is to ask the person responsible for maintaining equipment whether the program has spent funds on maintenance in the previous year and where those expenditures might be recorded. As a last resort, the World Health Organization (WHO) and World Bank propose the following approximations of annual cost of equipment operation and maintenance.[12]

Furniture and general office equipment: 5 percent of the original investment cost of the item

Audio-visual and office equipment: 10 percent of original cost

Technical/medical equipment: 10 to 20 percent of original cost

These estimates are recommendations and obviously will vary depending on local circumstances. One general rule is that the percentage used to estimate the costs of operation and maintenance increases with the mechanical complexity of the item.

Vehicle operation and maintenance: The costs of operating a vehicle include expenditures on gasoline, oil and tuneups (e.g., filters, plugs, belts). Many programs monitor vehicle costs closely and may have fairly detailed expenditure records. In those situations where data are suspect or nonexistent, you should ask for information from the person in charge of the motor pool. This person should be able to provide an informed guess about the costs of operating and maintaining vehicles. If neither of these approaches am feasible, the following estimates (based on distance traveled) can be used.[13]

Gasoline: (km traveled per month/km per liter) x cost per liter

Oil: 15 percent x annual expenditure on gas

Spare parts/labor: 24 percent x purchase price of vehicle

Insurance: highly variable, check with local insurers

Capital Costs

Capital goods are defined as items that have a useful life of more than one year. Because a capital good can last for several years, its purchase price is not equal to its cost. Rather, the true cost of capital will be spread out over the useful life of the item.

The technique we use to estimate capital costs is called "annualization." Essentially, we calculate the amount of the good that is used up (depreciated) in the period of time corresponding to the cost study. Depreciation is only one part of the annual cost of a capital good. The other part is an allowance that represents the interest that could have been earned if the program had invested the funds used to purchase the item. This component is usually referred to as the "opportunity cost of capital."

Although this seems complicated, the mechanics of annualization are made relatively simple by standard tables like the one presented at the end of this chapter (Table 4.1).

To use the annualization table, we need the following information for each capital good:

Estimate of the replacement cost

Estimate of the useful life

In addition, we need an estimate of the discount rate, which is the rate used for economic appraisals of projects in the country where you are working. The discount rate should reflect the rate of return on investments that the program could have made. One source for this information could be the economic planning office within the finance ministry. Otherwise, you can contact local representatives of development organizations (e.g., U.S. Agency for International Development or the World Bank) to determine the discount rate that they use for project planning purposes.

Cost of buildings: replacement cost

To determine the replacement cost for a building at its current site, you need to determine the cost of the land and the current construction cost for a similar building. The original construction cost **should not** be used. If current construction costs are not available, the cost per square meter of similar types of construction in the area may be used. This information can sometimes be found in recent government contracts for similar buildings or from construction trade groups.

If you are unable to locate information on construction costs, you can use the annual rental cost as an estimate of the annual capital cost of the building. By definition, rent includes both the costs of depreciation and the opportunity cost of capital, as well as the rental value of the land.

Cost of buildings: useful life

Buildings last for different periods of time, depending on the physical location of the building, climate, quality of construction and how a building is used. However, most costing manuals agree that 20 years should be used as an estimate of useful life. An exception to this rule should be made if a building is clearly a temporary structure. In this case, useful life can be determined by asking the builder how long such a structure is intended to last.

Cost of vehicles: replacement cost

All vehicles used by the program should be listed. Do not limit the listing to cars and trucks. Motorcycles, bicycles and other modes of transport should be included as well.

The replacement cost is the current cost of purchasing a similar vehicle, not the original purchase price. Many programs receive donated vehicles. In this situation, you should use the current cost to the donor or the lowest cost alternative. Other useful sources of information on vehicle costs include the purchasing office of government ministries and local dealers.

Cost of vehicles: useful life

It is not possible to use standard estimates of useful life for vehicles because the local conditions will determine how long each type of vehicle lasts. The best sources for this information are program staff who use and maintain the vehicles. Try to get several opinions from different sources and estimate an average service life for each type of vehicle.

Cost of equipment and furniture

All equipment and furniture used in the program should be inventoried. We can make a distinction between equipment and furniture that is used specifically for program activities (i.e., examination tables and autoclaves) and equipment and furniture needed to support the program activities (i.e., office furniture and typewriters). One manual suggests that rather than listing and annualizing the costs of all furniture and equipment, these costs can be approximated by multiplying the cost of the building by 8 percent.[1] We recommend that this approach be used only as a last resort.

The equipment and furniture inventory should be organized by service delivery program (clinic, outreach, CBD, etc.) and by the area in the clinic or program where the item is physically located (e.g., reception, waiting room, examining room). Be sure to include any donated items in the inventory as well, along with the name of the donor (to allow you to find out how much the donor would pay to replace it).

Equipment replacement cost: The replacement cost is the current cost of purchasing a similar item—the original purchase price should not be used. Many programs receive donated equipment. Use the current cost to the donor (or the lowest cost alternative) in this situation. A particularly useful source of the costs of medical equipment is UNIPAC, a clearinghouse for medical equipment located in Denmark. Other sources of information include local suppliers and purchasing offices of government ministries

Equipment useful life: The number of years of estimated useful life will vary depending on the type of item and the way in which it is used. Commonly-used estimates found in other manuals are eight to 10 years for medical and office equipment and

furniture. For most purposes, an estimate of 10 years of useful life will suffice. As was the case with vehicles, the best source for this information is the staff who use and maintain the items. Try to get several opinions from different sources and estimate an average service life for each type of item.

Annualizing Costs of Capital

Calculating an annualized cost of a capital input is straightforward. Basically, we calculate an average annual depreciation and an average opportunity cost of capital, then add them together.[3] One way that this can be accomplished is by using the following formula:

$$\text{Annual cost of capital} = RC \div \frac{[(1+r)^n-1]}{[r(1+r)^n]}$$

where **RC** = the replacement cost of the item
r = the discount rate
n = the life expectancy of the item (in years)

For example, suppose that a sterilization clinic has an operating table that has a replacement cost of $1,500 and an estimate useful life of seven years. The discount rate that you choose is 5 percent. The annual cost of capital would then be calculated as follows:

$$\$1{,}500 \div \frac{[(1.05)^7-1]}{[.05(1.05)^7]} = \$259.23$$

An easier way to get this estimate is to use an annualization table (see Table 4.1). The table provides annualization factors for combinations of useful life and discount rates. To use the table, simply find the applicable discount rate column, then locate the row that corresponds to the estimated useful life of the capital item. In this example, the appropriate factor to use is 5.786. Divide the current value of the item by the factor. The result, $259.23, is the same as obtained above with the formula.

Figure 4.3 shows how costs of equipment used in an examination room could be annualized. In this example, we assume a discount rate of 6 percent.

Figure 4.3

Costs of Capital Items

Clinic: No. 1, Central City
Cost Center: Examination Room

Description of Item	Replacement Cost	Estimated Useful Life (years)	Factor*	Annual Cost
Examination cable	$1,200	10	7.360	$163.04
Examination lamp	325	10	7.360	44.16
Desk with chair	250	5	4.212	59.35
Instrument table	620	10	7.360	84.24
Diagnostic equipment	470	5	4.212	111.59
Total Annual Cost				**$462.38**

* See Table 4.1 for factors, assuming a 6 percent discount rate

Some Final Hints

If the replacement cost of the item is less than $100, do not annualize the cost-it is not worth the trouble. Instead, treat the item as a recurrent cost.

If the clinic or program has several of the same type of item, add their costs and annualize the total cost of all the items. For example, assume that a recovery room in a sterilization unit has eight beds, which each cost $1000. Sum their costs ($8,000) and annualize the cost in one step.

Sources Consulted In Preparing Chapter Four

Bitran, R. "Short Guidelines for Costing Selected Primary Health Care Projects in Developing Countries," Resources for Child Health Project (REACH), undated.

Primary focus: to define the inputs used in various types of health programs.

Brenzel, L. "ANE Bureau Guidance for Costing of Health Service Delivery Projects." Resources for Child Health Project (REACH), September 1988.

Primary focus: to calculate the costs of establishing new programs, including the costs of initial inventory stocking and site preparation for program buildings.

Forsythe S, Schwartz. E. "AIDSTECH Costing Guideline, Draft 5," AIDSTECH Project, Family Health International, 1991.

Primary focus: to estimate the costs of producing the various outputs produced by AIDSTECH-supported projects.

Phillips M, Shepard D, Lerman S et al. "Estimating Costs for Cost-Effectiveness Analysis." WHO Program for Control of Diarrhoeal Diseases, 1988.

Primary focus: to provide guidance for performing cost-effectiveness analysis of diarrhea control programs.

Reynolds J, Gaspari KC. "Cost-Effectiveness Analysis." Primary Health Care Operations Research Project (PRICOR), May 1985.

Primary focus: Cost-effectiveness analysis in primary health care programs.

Stover J, Knowles J, Wagman A et al. "TARGET-COST A Model for Projecting the Family Planning Service Requirements and Costs to Achieve Demographic Goals." The Futures Group, December, 1991.

Primary focus: preparing cost data to be entered in the TARGET-COST model.

Table 4.1
Annualization Factors

Discount Rate

Numbre of remaining years of useful life

n	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.902	3.808	3.717	3.630	2.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870
21	18.857	17.011	15.415	14.029	12.821	11.764	10.836	10.017	9.292	8.649	8.075	7.562	7.102	6.687	6.312	5.973	5.665	5.384	5.127	4.891
22	19.660	17.658	15.937	14.451	13.163	12.042	11.061	10.201	9.442	8.772	8.176	7.645	7.170	6.743	6.359	6.011	5.696	5.410	5.149	4.909
23	20.456	18.292	16.444	14.857	13.489	12.303	11.272	10.371	9.580	8.883	8.266	7.718	7.230	6.792	6.399	6.044	5.723	5.432	5.167	4.925
24	21.243	18.914	16.936	15.247	13.799	12.550	11.469	10.529	9.707	8.985	8.348	7.784	7.283	6.835	6.434	6.073	5.746	5.451	5.182	4.937
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
26	22.795	20.121	17.877	15.983	14.375	13.003	11.826	10.810	9.929	9.161	8.488	7.896	7.372	6.906	6.491	6.118	5.783	5.480	5.206	4.956
27	23.560	20.707	18.327	16.330	14.643	13.211	11.987	10.935	10.027	9.237	8.548	7.943	7.409	6.935	6.514	6.136	5.798	5.492	5.215	4.964
28	24.316	21.281	18.764	16.663	14.898	13.406	12.137	11.051	10.116	9.307	8.602	7.984	7.441	6.961	6.534	6.152	5.810	5.502	5.223	4.970
29	25.066	21.844	19.188	16.984	15.141	13.591	12.278	11.158	10.198	9.370	8.650	8.022	7.470	6.983	6.551	6.166	5.820	5.510	5.229	4.975
30	25.808	22.396	19.600	17.292	15.372	13.765	12.409	11.258	10.274	9.427	8.694	8.055	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979

Chapter 5 Cost Allocation in Clinical Settings

In the Chapter 3 discussion of joint and non-joint costs, we said that non-joint costs correspond to resources that are completely consumed during a visit, and thus can be explicitly identified with that visit. In other words, non-joint costs are allocated 100 percent to the visit. Joint costs, on the other hand, usually will require an allocation to be made because they cannot be directly matched with visits.

For example, an examination table might be used by various types of clients, including family planning patients, gynecology patients and pediatrics patients. Clients are seen for different reasons, such as initial visits, follow-up visits or family planning discontinuation visits. It is not readily apparent how to charge off the cost of this table to these different types of visits. The purpose of this chapter is to introduce a methodology for allocating joint costs to particular visit types.

Occasionally you may encounter a program that pays some of its inputs on a "fee-for-service" basis. This is the case with PROFAMILIA, a private family planning organization in the Dominican Republic, which pays its physicians a set fee for each type of service provided. A fee-for-service payment system essentially transforms labor costs into non-joint costs. However, the fees paid to physicians may or may not reflect the opportunity costs of similar services provided in the market; some adjustments to these fees may be needed.

Below we present some examples of how to allocate joint costs. The first scenario would not likely be encountered in practice, but we present it here because it helps to illustrate some basic cost allocation concepts. Next, we present two options for allocating joint costs, which we have actually used in costing projects in Ecuador, the Dominican Republic and Honduras.

Scenario 1: Inputs paid on a Fee-for-Service Basis

Suppose that all inputs in a clinic were compensated on a fee-for-service basis. Service providers and program administrators would receive a set payment for each type of client served, and equipment and space would be leased to the program by some entity which charged a pre-negotiated fee each time these resources were used in a visit. Under this scenario, calculating the cost for a particular type of visit (for example, an IUD insertion) would simply require adding up the individual cost elements as shown in Figure 5.1.

Figure 5.1

Costs of an IUD Insertion

Type of Resource	Cost of Resource (in dollars)
Staff Cost	
Physician	$20
Nurse	5
Materials Costs	
IUD	1
Other materials	3
Eiquipment/Infrastructure Costs	
Examination Table	5
Examination Lamp	4
Physical Space	6
Utilities	2
Total Cost for Insertion	**$46**

Although one would not expect to find a program where all resources were compensated in this way, some programs do pay contractors a fixed fee for certain types of clinic services. An example of such a program is PROFAMILIA (the Colombian IPPF affiliate), which contracts out sterilizations to private physicians, paying them a fixed fee for every procedure performed.[14]

Scenario 2: Inputs paid Based on Time of Usage

Most family planning programs purchase labor and capital for fixed periods of time, rather than on a fee-for-service basis. Clinic staff receive salaries based on the number of hours per day that they are at the clinic ready to serve patients. Likewise, programs generally purchase equipment and space for specified time periods. These periods can be explicit (as is the case with most lease agreements) or implicit (such as the useful life of a purchased input).

The cost per unit of time associated with labor and capital inputs compensated in this way does not vary with the quantity of output they produce. A salaried physician receives the same pay whether she sees five or 50 patients per day. Likewise, the rental charge for clinic space is the same amount per day, regardless of fluctuations in the number of clients that visit the facility. When these types of inputs are used to provide more than one type of service, we are faced with the need to allocate their costs among the services produced.

Allocating Joint Costs To Clinic Visits

Allocating joint costs equally across visits: The simplest allocation technique assumes that all clinic visits (regardless of visit type) use up the same amount of joint resources This assumption is more valid in some clinics than in others. As a rule, clinics providing a few similar types of services will show less variation in joint costs per visit than clinics providing a large number of different services. To make this assumption, therefore, you would need to know that the use of clinic inputs did not vary much across different types of visits. This could be determined through interviews and direct observation of service providers.

Figure 5.2 gives an example of joint costs allocated using the equal joint costs assumption. When this assumption is used, any variation in total visit costs will be due entirely to differences in non-joint costs, such as fee-for-service labor or disposable supplies. The equal joint costs technique is admittedly somewhat crude, but may be the best approach in situations where time or resource constraints prevent a more detailed approach.

Figure 5.2

Joint Costs

Joint Costs	Dollars
Salaried personnel	$3,555
Office supplies	60
cleaning supplies	40
Utilities	80
Equipment operation & maintenance	25
Building rent	280
Annual cost of equipment	125
Total Joint Costs	**$4,165**

Number of Clinic Visits by Method

Method	Visits Produced
IUD insertion	90
IUD follow-up	170
IUD removal	45
Gynecology examination	125
Prenatal examination	95
Total visits	**525**

Conclusion: Average joint costs per visit would be equal to total joint costs divided by total visits $\frac{\$4,165}{525 \text{ visits}} = \$7.93 \text{ per visit}$

This approach has several advantages: It is quick, easy to understand and apply, and can produce reasonably accurate estimates in certain situations. But in clinics providing services that vary widely in content and duration, this method can introduce significant error into cost estimates. Specifically, the costs of visits that consume more resources (e.g., IUD insertions) would be underestimated, while the costs of visits that consume fewer resources (IUD follow-up and prenatal visits) would be overestimated. As stated earlier, the analyst must know what type of services the program produces and also should employ a dose of common sense: If the objective of the study is to produce precise estimates of costs per visit, then a more rigorous allocation technique ought to be used.

Allocating joint costs based on visit duration: In most clinics, joint costs consumed during visits do vary from visit to visit, depending on the contraceptive method used and the purpose of the visit. The second allocation option captures these differences in visit costs by using the duration of client contact with various cost centers as the mechanism for allocating joint costs. (A cost center is an area within a clinic that is identified with a specific function, such as a reception area, an examination room, or a laboratory.)

This approach assumes that clients incur joint costs in direct proportion to the duration of contact they have with each clinic cost center. For most joint costs, this assumption makes very good sense. A 15-minute IUD insertion clearly consumes a larger share of a nurse's salary than does a five-minute OC revisit. Non-contact time — time spent waiting for clients, preparing for clients, cleaning up and keeping records — is distributed to visits in the same proportion as the contact time.

In order to use the visit duration technique, you first must collect information on the duration of client contact with each clinic cost center. The duration of client contact with each center depends on the type of visit as well as on factors such as the patient load on that particular day. New acceptors will tend to have more contact with the education and examining room centers than will clients making follow-up visits, while all visits will tend to be longer on days where patient load is higher because clients will spend more time in the reception area.

Data on the allocation of staff time can be collected in many different ways, each of which has specific advantages and disadvantages (See Figure 5.3). The first two approaches obtain data retrospectively through interviews with providers or through self-administered questionnaires that focus on the number of hours spent on various tasks.

The remaining approaches collect time allocation data prospectively. These can include staff filling out daily timesheets, Patient Flow Analysis (PFA) or time-motion studies. PFA, developed by the U.S. Centers for Disease Control and Prevention, measures the duration of client contact with clinic personnel but does not provide information on how staff use the time when they are not seeing patients. Data are collected on forms that clients carry with them throughout the visit. The major advantage of PFA is that standard data collection forms and analysis routines already exist, and only minor modifications in coding of visit types is needed to be able to adapt PFA to specific situations. Alternatively an analysis of client flow, not dependent on PFA, can be carried out, and the necessary forms and analysis routines can be developed.

Observational time-motion studies are still more comprehensive, and have the advantage of providing objective information on actual time inputs, including client and non-client contact time; consequently, it is possible to determine how much staff time is not allocated to job-related activities. However, such data collection can be expensive.[15]

Figure 5.3

Techniques for Allocating Staff Time

Allocation Technique	Advantages	Disadvantages
Interviews with Providers	Inexpensive, easy to administer, quickly available	Relies on staff time estimates, which may not be accurate; staff have incentives to overestimate productive time
Self-administered Questionnaires	Inexpensive, easy to administer, data quickly available	Relies on staff time estimates, which may not be accurate; staff have incentives to over-estimate productive time
Self-administered Time Records	Inexpensive, easy for staff to understand	May interfere with routine clinic operations, staff may have incentives to under-report "downtime"
Patient Flow Analysis	Objectively records duration of client contract, does not rely on staff recollection or estimation	Costlier than previous approaches, requires some training of staff, does not provide information on how providers use non-contact time, may disrupt clinic operations
Time Motion Studies	Provides objective information on actual time inputs needed to carry out activities as well as time not spent providing services	Most costly alternative because it requires trained observers, can disrupt normal clinic operations

Once the visit duration data have been collected, you can use the information to divide up the joint costs incurred in each cost center. Before the joint costs (personnel, equipment and furniture, and infrastructure) can be allocated to visits, they must be added up and assigned to the cost centers that have already been defined.

Following is an example of the visit duration approach to cost allocation. The example assumes that you used a technique similar to PFA to record the duration of client contact with various clinic cost centers.

Background: An integrated MCH-FP clinic decided to estimate the costs of its services (the same list of services as in Figure 5.2). As a first step, the analyst identified three primary cost centers in the clinic: Reception/Waiting room, Examination room, and Education room. The total monthly joint costs of $4,165 were divided up among these costs centers using the following criteria:

Personnel	Percent of time worked in each center
Equipment	Physical location of item
Infrastructure	Area of cost center as percentage of clinic area
Miscellaneous	Not assigned to cost centers, but divided equally among visits

Applying these criteria resulted in the estimates of monthly joint cost by cost center as shown in Figure 5.4.

Figure 5.4

Allocating Joint Costs Using Information on Duration

Cost center	Personnel	Equipment	Infraestructure	Misc.	Total
Reception/Waiting	$404	$31	$160	--	$595
Examination	2,505	39	80	--	2,624
Education	646	22	80	--	748
Miscellaneous	--	33	40	125	198
Total	**$3,555**	**$125**	**$360**	**$125**	**$4,165**

The analyst then carried out a study of visit duration during a one-week period. Data were collected on forms that were hand-carried by clients during their visits. In this clinic, staff were assigned to specific cost centers (for example, the clinician was assigned to the examining room), and did not generally leave these areas during their work hours. If staff move from one cost center to another, you will need to estimate the percentage of time spent in each center. Another assumption made was that the duration of contact with clinic staff was equal to the duration of time spent in a cost center,

In each cost center, clinic staff wrote down the time the client arrived in the center and the time the client left. An example of the form used is shown in Figure 5.5. The results of the visit duration study are presented in Figure 5.6.

The next step was to multiply the values in Figure 5.6 by the number of monthly visits (Figure 5.2) to produce a table of "visit-minutes" for the month, by type of visit, A visit-minute is defined as one client occupying a cost center for one minute. We assume that visit-minutes represent the burden placed upon clinic resources by clients. If 10 clients occupy a cost center for one minute each or if one client occupies a cost center for 10 minutes, the outcome, in terms of visit-minutes, is the same.

Figure 5.5

Study of the Duration of Client Visits

Client Number 001
Method of Family Planning IUD
Type of Visit Insertion
Client Arrival Time at Clinic 08:24

Contact Number	Staff Type	Begin Time	End Time
1	Receptionist	08:24	08:27
2	Educator	08:45	08:54
3	Clinician	09:43	09:56
4	Cashier	09:57	09:58

Figure 5.6

Average Time of Client Contact

Visit Type	Time (in minutes)			Duration (in minutes)
	Education Room	Examination Room	Waiting Room	
IUD insertion	15	18	40	73
IUD follow-up	--	7	78	85
IUD removal	5	12	44	61
Gynecology exam	--	8	57	65
Prenatal exam	--	7	55	62

Therefore, to calculate the number of visit-minutes for IUD clients in the education cost center, the analyst multiplied the number of visits for the month (90) by the average number of minutes spent by educators for that visit type (15 minutes), to get a total of 1,350 minutes. This is the first entry under "Visit-minutes Spent: Education Room" in Figure 5.7.

Figure 5.7

Visit-minutes Spent in Various Cost Centers

Visit Type	Visit-minutes by Cost Center		
	Education Room	Examination Room	Waiting Room
IUD insertion	1,350	1,620	3,600
IUD follow-up	_	1,190	13,260
IUD removal	225	540	1,980
Gynecology exam	_	1,000	7,125
Prenatal exam	--	665	5,280
Total	**1,575**	**5,015**	**31,245**

It should be pointed out that the visit-minute calculation uses the average number of visits per month (from Figure 5.2) rather than the actual number of visits recorded during the visit duration study. We recommend this approach because the pattern of visits observed during the visit duration study may not be representative of a typical visit pattern for the clinic. For example, if there were fewer visits than usual during the visit duration study, total costs would be spread over a smaller number of visits, which would cause the average cost of all visits to increase. By using clinic output data averaged over several months, short-term fluctuations in client volume can be eliminated.

Next, the analyst used the visit-minutes in Figure 5.7 to calculate percentage distributions for each cost center as shown in Figure 5.8. The entries in this figure are the percentage of time spent in each cost center by clients of the various services. For example, 3,600 visit minutes were spent in the waiting room by clients accepting IUDs, which represents 11.5 percent of the total visit-minutes spent in the waiting room.

Figure 5.8

Percent Distribution of Visit-minutes by Type of Visit

Visit Type	Education Room	Examination Room	Waiting Room
IUD insertion	85.7%	32.3%	11.5%
IUD follow-up	—	23.7%	42.5%
IUD removal	14.3%	10.8%	6.3%
Gynecology exam	—	19.9%	22.8%
Prenatal exam	—	13.3%	16.9%
Total	**100%**	**100%**	**100%**

Next, the analyst multiplied each percentage distribution by the monthly joint costs incurred in the corresponding cost center (from Figure 5.4). Figure 5.9 presents the results of this operation, which allocates these joint costs to specific visits. For example, the category of IUD insertion visits receives 32.3 percent of the joint costs of the examination room because IUD insertions accounted for 32.3 percent of the visit-minutes in that cost center. As shown in Figure 5.9, 32.3 percent translates into $847.63 of the total of $2,624 incurred in joint costs in that center.

Figure 5.9

Allocation of Total Joint Costs

Visit Type	Education Room	Examination Room	Waiting Room
Total Joint Cost	$748.00	$2,624.00	$595.00
IUD insertion	641.04	847.63	68.68
IUD follow-up	--	622.64	252.96
IUD removal	106.96	282.54	37.77
Gynecology exam	--	523.23	135.92
Prenatal exam	--	347.95	99.68

Finally, to obtain the joint cost per visit in each cost center, the allocated joint costs in Figure 5.9 were divided by the number of monthly visits of each type (Figure 5.2). Total joint costs for each type of visit were calculated by summing the rows, thereby adding up costs incurred in each cost center. These results are presented in Figure 5.10.

The only joint cost left to be allocated was the "miscellaneous" category, which was divided equally among all visits since there was no obvious reason to assign more or less of this cost to any given type of visit. The calculation is simple:

$$\frac{\$198 \text{ total misc costs}}{525 \text{ visits}} = \$0.38 \text{ per visit}$$

This amount is added to the total joint costs per type of visit presented in Figure 5.10 to obtain total joint costs.

Figure 5.10

Joint Costs per Visit, by Cost Center

Visit Type	Education Room	Examination Room	Waiting Room	Total for Visit Type
IUD insertion	$7.12	$9.42	$0.76	$17.30
IUD follow-up	0.00	3.66	1.49	S.15
IUD removal	2.38	6.28	0.84	9.50
Gynecology exam	0.00	4.19	1.09	5.28
Prenatal exam	0.00	3.66	1.06	4.72

Impact of allocation assumption: What difference does the choice of allocation technique make on the estimates of joint costs per visit? Figure 5.11 summarizes the results obtained from these two allocation approaches. The IUD insertion and removal visits increase in cost under the "duration of client contact" assumption, while the other three visits decrease in cost. The two factors responsible for the direction and magnitude of the change are the total length of the visit and the amount of time spent in cost centers with high joint costs. The IUD insertion and removal visits are the most costly, mainly because much more time is spent in direct contact with the more expensive cost centers.

In summary, the allocation method you choose should depend on the program you are costing. If all visits last about the same length of time, and if cost centers are reasonably similar in the use of joint resources, then the equal joint cost method should suffice. But in most cases, the analyst will probably need to use the duration of client contact approach, because joint costs are likely to be different across cost centers and the duration of client contact with each center will vary by the type of visit.

Figure 5.11

Comparing Allocation Methods

Visit Type	Equal Joint Costs	Service Center Duration
IUD insersion	$7.93	$17.30
IUD follow-up	7.93	5.15
IUD removal	7.93	9.50
Gynecology exam	7.93	5.28
Prenatal exam	7.93	4.72

The Issue of Non-Contact Time

In many clinics, service providers spend less than 100 percent of their work time with clients. The allocation methodology presented in the previous section assumes that the cost of the time when providers are not with clients ("non-contact time") should be allocated to visits in the same proportion as contact time. For example, if a patient flow analysis shows that a physician is busy with clients 70 percent of the time, this means that his non-contact time is 30 percent. Therefore, if IUD revisits account for half of his 70 percent of contact time (or 35 percent), then IUD revisits are assigned half of non-contact time (or 15 percent).

This assumption may not be valid in all situations. It may take the same amount of time to clean up and prepare for an IUD acceptor as for an IUD follow-up visit, even though an insertion visit may require more than twice as much of a physician's time as a follow-up visit. In this case, precision of the cost estimates could be improved by allocating contact time to visits according to the relative duration of visits, while dividing non-contact time equally among visits. Usually, though, such fine adjustments will not make much difference.

One issue related to non-contact time that cannot be ignored is the amount of non-contact time that is not used productively, or "slack time." The term "slack time" does not necessarily imply that staff are wasting time or neglecting their duties; in many clinics, providers spend significant amounts of time simply waiting for clients. Large amounts of slack time can reflect low demand for services, or may indicate client preference for visiting clinics at a certain time of day.

Some uses of cost data will require you to estimate how much non-contact time is used productively. Two examples follow:

Forecasting family planning costs: Suppose that you were carrying out a study to forecast costs of providing family planning in several clinics. Assume that you had information on the average costs of providing different methods and had made a forecast of the number of clients that were expected to attend those clinics. You then calculated the total costs of providing contraception by multiplying the projected number of clients by the average cost per client.

This approach could greatly overestimate the costs of providing family planning services, because average costs may include large amounts of slack time. If slack time does indeed exist in the system, additional clients could be served at lower than average cost simply by using existing staff resources more efficiently.

A study carried out in Morocco demonstrates this point. The results showed that clinic personnel were spending significant amounts of time waiting for clients. Increasing the number of clients at the clinic would increase staff productivity. As a result, an increase in clinic output could be achieved without adding additional staff. In economic terminology, the marginal cost of each additional unit of output would be lower than average cost (up to a certain point). If average costs had been used to make cost projections, the total costs of expanding output would have been overestimated. [4]

Introducing a new contraceptive method: Suppose that a new method is introduced into a family planning program. If the new method can be delivered without having to purchase additional space and equipment, the only relevant costs will be the costs of contraceptives, supplies and labor. If staff are less than fully occupied, then even the labor costs may be zero. This is because the time used to serve acceptors of the new method would not otherwise have been used productively.

Example of the impact of unallocated time

The only way to distinguish between productive and unproductive use of non-contact time is through time-motion or observational studies. Observers can be assigned to specific providers and record how they allocate their time among different activities. If the clinic is not very busy, it may be most efficient for observers to move around the clinic and observe providers at different times. The following example illustrates the sensitivity of cost estimates to the amount of slack time in a service delivery system.

Assume that an observational study has been carried out in a single-physician clinic where the only services offered were IUD insertions. The results show that in a five-hour shift (300 minutes) the physician spent 180 minutes in direct contact with patients, during which time she inserted 12 IUDs (an average of 15 minutes per insertion). The remaining 120 minutes of her shift were divided equally between other visit-related activities (five minutes of preparation and clean-up per patient) and time spent waiting for additional patients. Therefore, of the 300 minutes of available time, 240 minutes were used productively

Furthermore, assume that an analysis of the clinic's costs showed that the physician receives a salary of 300 pesos per day and clinic capital and infrastructure costs were estimated at 120 pesos per day. An IUD costs 10 pesos, and the materials and supplies used in an IUD insertion cost 5 pesos. The average cost per IUD insertion can then be calculated as follows:

Salary of physician (300 pesos/l2 insertions)	25 pesos
Cost of IUD	10
Cost of materials and supplies	5
Daily cost of capital (120 pesos/12 insertions)	10
Average cost per insertion	50 pesos

If the 60 minutes that the physician spent waiting for patients had been used productively, she could have inserted three more IUDs at an additional (or marginal) cost of only 15 pesos per insertion (the cost of the IUD plus materials and supplies). The average cost per insertion in this case would be calculated as follows:

Salary of physician (300 pesos/15 insertions)	20 pesos
cost of IUD	10
Cost of materials and supplies	5
Daily cost of capital (120 pesos/15 insertions)	8
Average cost per insertion	43pesos

This example shows that when clinic staff are not fully utilized, additional services can be provided at a cost (15 pesos per insertion), which is considerably lower than the average cost of the previous units produced (50 pesos per insertion). Moreover, the average cost of an insertion at the higher output level of 15 insertions is only 43 pesos, compared to 50 pesos at the lower output level of 12 insertions.

Chapter 6

Costing Non-Clinic Based Services

In many countries, non-clinic based distribution programs or pharmacies are the primary source of resupply methods, such as OCs, condoms and vaginal tablets. The term "non-clinic based distribution" covers a broad range of program structures, including posts located in health centers or in small shops, distributors working out of their own homes, or outreach workers visiting the homes of women in the community. These programs can be associated with integrated MCH/FP programs, or they may be solely dedicated to providing family planning methods.

Community-based distribution: Community-based distribution (CBD) is a term that describes many of these non-clinical approaches. CBD programs are an important source of family planning methods and information for women who lack easy access to clinics. These programs were originally devised to respond to a lack of trained medical personnel in many developing countries. Community-based distributors in Latin America and Asia generally provide OCs, condoms and vaginal methods to new acceptors and continuing users, whereas in Africa, they sometimes serve as only a source of resupply.

Community-based distributors provide services to clients in the clients' homes or at posts, which may be located in the home of the distributor, at her place of business or at a health facility In addition to selling or giving away contraceptives, distributors may also sell or give away health products. Distributors may be salaried or may receive a sales commission for each unit of contraceptive sold. Some are unpaid volunteers.

The next level of CBD staff is the field supervisor (often referred to as "promoters"). Supervisors visit distributors in order to check sales and inventory records, to replenish stocks of commodities and to collect revenues. Supervisors also help to train distributors and give informal presentations about family planning to women in the community.

Characteristics of CBD programs vary greatly. In Honduras, as in much of Latin America, the CBD program affiliated with the International Planned Parenthood Federation (IPPF) provides only family planning services. In Bangladesh, the CBD program is housed within the Ministry of Health and Family Welfare, and distributors provide some health services in addition to family planning services. Other differences are that distributors travel to women's homes and receive a salary in Bangladesh, whereas they work out of posts and earn sales commissions in Honduras.

Contraceptive social marketing: Efforts to increase private sector involvement in family planning led to the development of contraceptive social marketing (CSM) programs in the early 1960s. These programs supply contraceptives to pharmacies and other outlets that sell health products. Initially, many CSM programs used their own personnel to distribute contraceptives to retail outlets. In recent years, though, many programs have used commercial networks to distribute products to sales outlets.

CSM products generally are priced lower than commercial brands. This is because CSM programs receive donated commodities or purchase them through special arrangements with commercial suppliers that are willing to offset a lower per-unit profit margin with higher sales volume. CSM programs often begin by introducing condoms and spermicides and then add OCs later on. In some countries, the program may be the country's sole supplier of a contraceptive method (e.g., condoms in Ghana).

Although CBD and CSM programs are similar in many respects, there is one major difference between them that can have important costing implications. CBD programs generally retain control of the contraceptive commodities up to the point of sale or distribution to the user while CSM programs usually sell contraceptives to wholesale distributors, who then bear the cost of distributing and selling them to the user. Since our focus in this manual is on economic costs incurred by programs, costs borne by distributors who are not paid by programs are excluded.

Approaches to Costing CBD Programs

Two basic cost-output ratios can be calculated for CBD programs. The first option is a "cost per unit of output" approach, which ignores visits and instead produces an estimate of the costs to the program of distributing one unit of a contraceptive method. To use this approach, you first allocate costs to methods, and then divide by the number of units distributed of each method.

A second (and sometimes more time-consuming approach) is the "cost per visit" approach, which considers either a visit by a client to a post or a visit by a distributor to a client's home. The cost of these visits can be determined in much the same way as visits to a clinic. Labor, capital and materials can be allocated to visits by direct observation or by some other allocation technique.

Which approach should be used? If distributors are paid a sales commission, then use the simpler unit cost approach. However, this approach does have one disadvantage. Since costs are averaged across all types of users, it is not possible to distinguish between the cost of providing services to new clients as compared with continuing users. Programs in which continuation rates are low or programs that concentrate on recruiting new users may have higher per-unit costs than programs mainly serving continuing users. Consequently, you should not use this approach if you think it is important to distinguish between acceptor and continuing user costs.

If distributors are paid a salary, you should allocate their time across visits. However, if visits are assumed to be of equal length (i.e., provision of different contraceptive methods and health services take about the same length of time) and if the program is not

concerned about slack time, then the application of the visit approach will be similar to that of the unit cost approach. While the visit approach is more time-consuming, it does yield information important for resource allocation, particularly in situations where staff members are not working for all the hours for which they are paid.

Program expansion can raise some particularly difficult costing issues. If a program contemplates expanding its services using additional volunteers, then the cost of using such labor is zero. However, the program likely will need to hire staff to supervise these volunteers, and the costs of additional supervisory staff should be included. In some cases, though, program expansion will require hiring workers to fill positions currently held by volunteers, or paying sales commissions to new workers. In such instances, the costs of these inputs should be included.

Allocating Staff Costs

The visit approach: In order to use the visit approach, you need to determine how distributors allocate their time among clients who receive different services. The objective is to estimate how much time the distributor spends in different activities, so that the distributor's cost of time can be allocated appropriately.

Several techniques exist for measuring the time the distributors spend on various tasks. Patient Flow Analysis (PFA) can be used to determine the duration of visits of different types to a fixed CBD post. However, PFA would not be a useful tool in outreach programs. Direct observation may prove too intrusive and expensive in outreach programs. In these programs, the analyst may have to rely on interviews with the distributors or on timesheets.

If the analyst is concerned about the reliability of time allocation data collected via interviews or timesheets, she may have to develop more complex and more costly methodologies to allocate time. These could include interviews with clients to verify the accuracy of reports provided by distributors.

The unit cost approach: In this approach, you do not need to obtain information on how distributors allocate their time. The sales commissions are the cost of promoting and distributing different methods. For example, if 95 percent of CBD sales commissions are from OCs, then these commissions are considered to be the cost of employing the distributors to promote and distribute OCs. The remaining 5 percent of commissions would be divided among other products distributed, such as condoms and spermicides.

Other Direct Costs for CBO Programs

Commodity costs: Most CBD programs distribute OCs, condoms, and perhaps a spermicide. As discussed in the section on clinic costs, commodity costs should include the purchase price, plus any shipping costs, customs charges and any other costs incurred to get the product into the program warehouse. Information on unit commodity costs should be available from the program administrator, or in the case of donated commodities, from the donor.

Personnel costs: The costs of salaried program personnel include their base pay plus all benefits. Data on staff salaries usually can be obtained from the program administrator, or from the personnel office. (Review Chapter 3 for a discussion of how to collect the costs of salaried personnel.)

All other costs: Other costs to be collected include travel and per diem, office supplies, equipment and vehicle maintenance, building maintenance, building infrastructure costs and capital costs. (Refer to Chapter 3 for information on collecting these data.)

Allocating Other Direct Costs

The basic allocation problem in CBD programs is to determine how much of each direct input is used up in activities related to specific contraceptive methods. Sometimes you can identify blocks of resources that can be aggregated and allocated to methods all at the same time. For example, if you found out that all supervisors in a CBD program carried out the same functions, then you could aggregate their salaries and benefits, travel and per diem costs, and the costs of their office space. The resulting total cost could then be allocated to methods using an appropriate allocation variable. (Choosing allocation variables is discussed in the next section.)

However, in some programs personnel with similar job titles may carry out different job functions. Therefore, you should always try to collect costs of individual inputs and then aggregate them later on, if appropriate.

In certain instances you may need to do a double allocation of resources shared with other programs. For example, in Honduras the CBD program occupies office space in the headquarters of a multi-service family planning organization. The costs of this space first must be separated from the costs of space used for overall program administration or to support other service delivery programs. (Review the allocation methods presented in Chapter 4.) Only then can the costs of the CBD office space be allocated to contraceptive methods.

Allocation variables: Our approach is to identify a key program input that determines how intensively other inputs are used. Then, the distribution of costs estimated for that input can be used to allocate the costs of related inputs.

The key input in many CBD programs is the supervisor who works directly with distributors. If you are able to find out how these supervisors divide their time among different activities, then you can assume that all inputs directly related to their efforts — for example, travel and per diem, educational materials, etc. — can be allocated using the same percentage breakdown.

Estimating how salaried staff use their time: Estimating a percentage distribution of effort is not easy. In many CBD programs, salaried staff spend much of their time carrying out general activities such as supervision, training and information dissemination; it is difficult to relate their work directly to particular contraceptive methods. Following are some ways to estimate how salaried staff spend their time in relation to specific methods.

Records

The first step is to review any records kept by supervisors related to the tasks staff complete in a given period of time. For example, some supervisors are required to keep track of the number of times in a month that they motivate, communicate, supervise, orient, or otherwise interact with distributors or clients. These categories are not particularly useful in deciding how to distribute the cost of supervisors' time to contraceptive methods. However, this information can be used to structure interviews with supervisors, which can help them to think about how their time is allocated among methods.

Interviews

You can ask supervisors directly about how much of their time is spent supporting specific methods. Be careful, however, to get useful information since supervisors (or other salaried CBD staff, for that matter) are not accustomed to relating their efforts directly to methods or to quantifying their work day. You may need to ask them about activities on a typical day or perhaps even accompany them on a visit to distributors.

Activity logs

In most instances you will want supervisors to fill out daily activity logs for a couple of weeks. The daily log should be designed to collect data on the number of hours per day spent working to support the distribution of specific contraceptive methods, other health products, or general health and family planning themes.

As already discussed, the validity of the data obtained from self-administered logs or from interviews depends on the willingness of the respondent to be truthful. If you question the validity of some of your data, then you may need to make adjustments in the analysis. For example, supervisors may overstate the number of hours that they work but provide accurate reports of how their time is distributed. Therefore, while their time may be accurately allocated, you will not know whether all of the time reported as worked was in fact used productively.

EXAMPLE: Unit Cost Approach for CBD Program

The following example demonstrates how to calculate costs in a CBD program where distributors receive sales commissions. This example has been adapted from an FHI-supported study of the costs of a CBD program in the Dominican Republic.[16]

Identify commodity costs: This program distributes two commodities: Lo-femenal, an oral contraceptive manufactured by Syntex, and Sultan, a latex condom produced by Ansell. The U.S. Agency for International Development (USAID) purchases these commodities and donates them to the program. For the purposes of this example, we assume that USAID is the lowest cost source of commodities available to the program. The respective unit costs of the commodities delivered to the program's warehouse are as follows:

Commodity	Cost to Donor (dollars)	Shipping (dollars)	Total cost (dollars)
Lo-Femenal (one cycle)	$0.14	$0.01	$0.15
Sultan (one condom)	$0.045	$<0.001	$0.045

These data were obtained directly from the program. If the program administrator does not know the unit cost of donated commodities, you should be able to obtain this information from the commodities support division of the relevant donor.

Figure 6.1

Annual CBD Costs
(Sample Program in the Dominican Republic)

Method-specific Costs	Annual Cost
Contraceptives	$59,414
Sales Commissions	40,745
Bonuses	5.757
Sub-total	$105,916
Joint Recurrent Costs	
Salaried Personnel	$66,620
Transport and Per-diem	11,245
Training of Staff	11,330
Office Costs	30,485
Joint Capital Costs	
Equipment and Furniture	$3,475
Transport and Per-diem	5,450
Sub-total (joint costs)	$128,605
Total	$234,521

Collect annualized program costs: Figure 6.1 shows the annual costs of various types of program resources. Sales commissions are tabulated by brand, but in this program there is one brand for each method. Thus, costing out brands is the same as costing out methods. If visits were the unit of output, the only difference would be that "wages and salaries" would replace sales commissions. These cost categories are rather broad ("salaried personnel" rather than salaries of individual job titles). In this instance, we knew from interviews with program staff that the supervisors and regional directors all performed similar functions related to general program promotion and supervision. Therefore, we decided to put all of their costs into one category. Some of the costs listed will not be immediately available in annualized terms. For example, the capital cost item was calculated by taking an inventory of all equipment, furniture and vehicles used by the CBD program (the same method used to calculate capital costs presented in Chapter 3). Likewise, costs of training will probably need to be calculated separately, because some of the costs are paid out of the central administration budget. The remainder of the costs were taken directly from CBD annual expenditure records.

Annualized costs in per-unit terms: The next step is to set up separate columns for each contraceptive product or brand, and then to divide up the costs according to the allocation criteria you have identified (see Figure 6.2). Costs that are in the "method-specific" column are already explicitly identified with a method. In this example, the program provided information on commodity costs and payouts of commissions and bonuses by method.

Figure 6.2

CBD Joint Costs Allocated to Methods Using Percentage Distribution of Sales Transactions

Method-specific Costs	Oral Contraceptives	Condoms	Total
Contraceptives	$51,252	$8,161	$59,413
Sales Commissions	38,306	2,440	40,746
Bonuses	5,207	550	5,757
Sub-total	$94,765	$11,151	$105,916
Sales Transactions (Percentage)	**85%**	**15%**	**100%**
Joint Costs (Allocated Using Percentage of Transactions)	**$109,314**	**$19,291**	**$128,605**
Total Brand-Specific and Non-Joint Costs	204,079	30,442	
Units Sold	341,688	181,360	
Total Direct Cost per Unit	$0.60	$0.17	

Costs that are in the "joint cost" category must be allocated using the most appropriate variable available. Assume that you had no information on how joint costs should be allocated. One choice is to allocate joint costs in proportion to sales transactions registered by distributors. If users of OCs generally purchase one cycle at a time, and condom users buy three condoms per visit, it could be argued that the ratio of supervisor effort should equalize three condoms to one pill cycle. This approach assumes a total of 402,141 sales transactions, of which 85 percent are pill transactions and 15 percent are condom transactions. Clearly, the OCs receive a much higher percentage of joint costs.

Other allocation alternatives could be chosen. The approach that has been used by the FUTURES Group, which provides technical assistance in social marketing through its SOMARC project, is to allocate direct costs using the relative number of CYPs produced by each method or brand. This approach would allocate a higher percentage of joint costs to Lo-Femenal than would the transaction approach described above.

A third approach would be to allocate joint costs equally across methods. The justification for this allocation is that CBD directors and support staff (who are responsible for overall program management) divide their time equally in supervision, management and promotion of the two CBD methods. This approach would allocate a smaller percentage of joint costs to OCs than would the transaction approach. Since the final estimate of cost per unit is sensitive to the allocation of joint costs, it is important to give careful consideration to selection criteria for allocating joint costs,

The problem of allocating joint costs would also occur if the cost per visit approach were followed. The analyst would need to develop criteria to allocate the time of supervisors and other costs to visits.

Costing Social Marketing Programs

The process of collecting and allocating social marketing costs is very similar to that described in the previous example on CBD programs. The major difference is that a higher percentage of social marketing costs tend to be brand-specific. Because expenditures made for advertising and promotion often relate directly to a specific brand of contraceptive, these costs can all be put in that brands column. Likewise, repackaging costs often can be identified explicitly with the products sold.

Finally, since social marketing programs often concentrate heavily on promoting specific brands, it is easier to allocate staff time to methods. CSM managers may be able to tell you with some precision how much time they spend working on behalf of different methods, or even that they divide their time equally among all program brands.

EXAMPLE: Costing a CSM Program

As in the CBD costing example, the first two steps for calculating cost per unit of output in a contraceptive social marketing program are to collect information on per-unit costs of commodities and to collect annualized program costs. Figure 6.3 shows these data for a social marketing program that distributes two brands of OCs and one condom brand. The line items and costs are loosely based on a study of the costs of the social marketing division of ASHONPLAFA, the IPPF affiliate in Honduras.

Figure 6.3

Unit Commodity Costs and Total Annual Program Costs for a Social Marketing Program

Brand-specific Costs	Total	OC1	OC2	Condom
Unit commodity costs		$0.15	$0.27	$0.05
Publicity/Promotion		$18,300	$19,800	$35,500
Repackaging Materials		11,000	23,575	34,600
Joint Recurrent Costs				
Salaries/Benefits	$24,000			
Travel/Per diem	1,840			
Vehicle Maintenance	1,960			
Utilities	690			
Office Supplies	120			
Customs Costs	1,500			
Joint Capital Costs				
Fquipment/Furniture	$1,890			
Building	4,200			

If we compare the structure of costs in Figure 6.3 with the structure of costs in the CBD example (Figure 6.1), it is clear that a larger proportion of costs can be directly identified with brands in the social marketing program. This lowers the likelihood of distortion caused by allocation errors, because a much smaller proportion of costs is subject to arbitrary allocation criteria.

Figure 6.4

Calculation of Total Program Costs per Unit Sold

Method-specific Costs	Total	OC1	OC2	Condom
Publicity/Promotion		$18,300	$19,800	$35,500
Repackaging Materials		11,000	19,800	34,600
Joint Recurrent Costs				
Salaries/Benefits	$24,000	$8,000	$8,000	$8,000
Travel/Per diem	1,842	614	614	614
VehicIe Maintenance	1,968	656	656	656
Utilities	690	230	230	230
office Supplies	120	40	40	40
customs Costs	1,500	500	500	500
Joint Capital Costa				
Equipment/Furniture	$1,890	$630	$630	$630
Building	4,200	1,400	1,400	1,400
Total Non-commodity Costs		$41,370	$55,445	$82,170
Units Sold		131,500	84,700	600,000
Non-commodity Cost per Unit		$0.32	$0.66	$0.14
unit commodity costs		$0.15	$0.27	$0.05
Total Cost per Unit		$0.47	$0.93	$0.19

Figure 6.4 shows how we calculated the total unit costs by brand. Based on interviews with the project manager, we decided to allocate equal portions of all joint costs to brands. This decision stemmed from two factors: First, the program manager stated that he and his staff spent approximately equal amounts of time on activities related to each method; and second, all other joint resources were used to support the activities of program staff, and so were allocated in the same way. Once joint costs were allocated to brands, we simply added up the costs in each brand's column, and then divided by the number of units sold to get the non-commodity cost per unit. Finally, we added the per-unit contraceptive commodity cost to arrive at the total unit cost.

Chapter 7 Converting Cost per Visit into Cost per CYP

So far, this manual has presented various ways to relate the costs of a family planning program to the outputs produced by that program. Specifically, we have shown how to calculate cost per visit in clinics and CBD programs, and cost per unit of contraceptive distributed in non-clinical programs. Although these cost-output ratios are useful for examining trends in the costs of outputs over time (e.g., how much does an IUD insertion cost this year as compared to last year?), they cannot be used to compare the costs of different methods and delivery systems. It is meaningless to compare the cost of a female sterilization to the cost of a cycle of OCs distributed through a CBD program. In order to make such comparisons, we need a standard measure that will allow us to compare the costs of different methods or delivery systems. Couples use family planning in order to avoid pregnancy; therefore, methods should be compared on the **cost of providing protection** from unwanted conception.

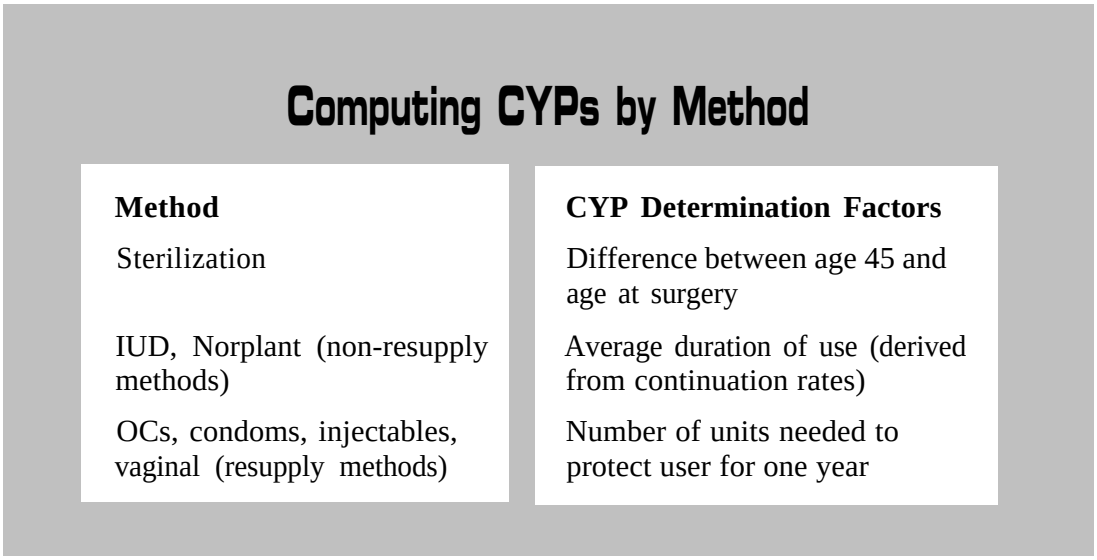
The "couple-year of protection" (CYP) is a standard indicator of contraceptive protection that has been widely used in the family planning literature. Using CYPs, we can aggregate costs of providing protection over the time period during which a method is used. Then, instead of talking about costs of visits made for specific purposes (acceptance, revisit, discontinuation) we can talk about costs during the time period of contraceptive protection. In the following sections, we first show how to use CYPs, and present some ways to improve the measurement of CYPs. Then, we show how to match up costs with contraceptive protection, which produces the indicator that we are interested in, namely, cost per CYP.

Calculating Couple-years of Protection

The idea behind the CYP is that for each contraceptive method there is a level of use that equates to one year of protection from pregnancy Thus, 13 cycles of OCs or 100 condoms (assuming 100 acts of intercourse annually) or one-fifth of a Norplant set (assuming the Norplant is used for five years) will equal one CYP? Another way to use the CYP concept is to compare contraceptive methods according to the years of protection provided by one unit of the method. For example, one cycle of pills is worth 1/13 of a CYP, while one condom is worth 1/100 of a CYP? Similarly, if the average woman uses Norplant for five years, then the implant provides five CYPs.

The number of CYPs provided by a method (or the number of units of a method needed to provide one CYP) is calculated in different ways, depending on the contraceptive method (see Figure 7.1). In the case of sterilization, the age of the client at the time of the operation is subtracted from the age at which most women are no longer fecund. If we assume that women are no longer fecund after age 45, then a 33 year-old sterilization acceptor would receive 12 CYPs.

Figure 7.1



For IUDs and Norplant, CYPs are based on continuation rates. Continuation rates measure the percentage of clients who are still using the method at the end of a specified time interval. For example, a one-year continuation rate of 82 for IUD users tells you that 82 percent of IUD acceptors had retained their IUDs for one year. If one assumes that this continuation rate applies to subsequent years of use as well, then the average IUD user retains the device for approximately 3.5 years.

For re-supply methods (pills, condoms, vaginal methods, injectables), CYPs are calculated by dividing the quantities distributed by some factor that represents the number of units required for one CYP. For example, if a CBD program sells 7,500 cycles of OCs per month, it provides 577 CYPs (7,500 x l/13).

CYP Conversion Factors

In this section, we discuss some of the ways of making the CYP a better measure of fertility outcome. Specifically, we deal with adjustments to CYP that reflect method-specific differences in use-failure rates, wastage, differences in fecundity associated with the age of the user, and differences in the timing of protection.

Use-failure rates: The major weakness of CYP is that the CYP does not take into account the use-failure rates or use-effectiveness of different methods.[17] Actual failure in the use of contraceptives (especially for re-supply methods) is unappreciated by many professionals working in family planning. One reason for the low effectiveness rates of condoms and OCs is user errors or omissions in use of these methods.

Wastage: Conventional CYP for re-supply methods does not generally take into account wastage. Wastage may occur prior to service delivery, but is mainly a concern with use after the client receives the product.

Differences in fecundity by age: Women who select sterilization may be older than women who select re-supply methods. Since fecundity declines with age, the higher is the age of the woman, the fewer pregnancies are prevented.

Lack of a discount for time: Because most program managers prefer to see results sooner rather than later, a year of protection now is not equivalent to a year of protection or a birth averted 10 years from now.

Some other problems with CYPs include substitution (which method clients would have used in the absence of the program, the result is that some programs may get "credit" for too many CYPs); ability to reach high priority clients (no extra weight given to serving poor or rural clients, for example); failure to account for secondary effects, either positive or negative (i.e., protection from STDs resulting from use of condoms); consistency of use; and proportion of users who are married, since marital status influences coital frequency.

An Interagency Task Force on Performance Indicators (with representatives from the United Nations Population Fund, the U.S. Agency for International Development (USAID), and the U.S. Centers for Disease Control and Prevention, has recommended a group of "standard" CYP factors that can be modified if country-specific or delivery system-specific data are available.[18] The standard factors proposed by the task force take into consideration the four problems noted previously-use-failure rates, wastage, fecundity by age and discount for time. Following are the factors themselves, along with the rationale for selecting a particular factor.

Female sterilization: Assuming that on average, sterilizations occur at age 32.5, a client would have 12.5 years of protection before reaching 45. However, since many of these years of protection occur when her natural fecundity is declining, the task force recommended that CYPs be reduced from 12.5 to 10.

IUDs: Data from recent clinical trials suggest that continuation rates have increased, thereby raising the average number of CYPs provided by an IUD. The task force has recommended that each IUD user be credited with 3.5 CYPs since it was estimated that half of acceptors would have stopped using the IUD at this time.

Condoms: The task force recommended that the number of condoms per CYP be increased from 100 to 150 condoms to account for failure in use, wastage of product and erratic use.

Foaming tablets: The same factors as condoms (150 per CYP) are used.

Oral contraceptives (OCs): The task force recommended that the number of cycles of OCs per CYP be increased from 13 to 15 to account for incorrect use and wastage.

Injectables: lnjectables are effective for different time periods. Some are given monthly, while others provide two or three months of protection. For example, for the two-month variety, six injections are required for one CYP; for the three-month version, four injections equal one CYP?

Norplant. The task force recommends 3.5 CYPs per acceptor, based on continuation rates obtained from clinical trials. The recommendations of the task force are estimates, based on data collected in many developing countries.

These recommendations can be used in analyses in countries that lack good information on method continuation, commodity wastage and use-effectiveness. However, if data on these variables exist that are specific to the country or program that you are costing, these can be used to calculate CYPs. The USAID-supported EVALUATION Project is developing empirically defensible conversion factors for CYPs. [19]

Data on method continuation may be available from surveys of acceptors of various methods. In some cases, national fertility and contraceptive use surveys, including multi-country programs like the Demographic and Health Surveys (DHS), may include a use-effectiveness module. Analysis of these data will provide information on continuation rates. Average age at acceptance of sterilization is also available from some surveys; if such data are not available, you could review information from clinics. Estimates of wastage are particularly difficult to make. You would probably need to have data on method use (from surveys) and distribution (from service statistics) and compilation of such data may be well beyond the needs of the program.[20]

None of these adjustments takes into consideration the issue of method and source switching. Usually the marginal addition to CYPs of introducing a new method or delivery system is smaller than the number of CYPs produced. This is because some users of the new method or delivery system switched from some other method or source, and therefore do not add to prevalence on the margin. In this case, CYPs could be adjusted by subtracting the number of CYPs "borrowed" from other delivery systems. Finally, programs may pursue other broad objectives, such as achieving a reduction in the number of high-risk pregnancies. The CYP measure can be adjusted to reflect protection provided to women in selected age-parity groups, thereby converting it into a measure of outcome.

In some circumstances, CYP may not be a suitable measure of impact. For example, if program managers desire to lower the incidence of sexually transmitted diseases (STDs), then the relevant output may be number of condoms distributed, and the number of condoms must be translated into STD protection to determine outcome.

Relating Costs to CYPs

Now that we have discussed the denominator of the cost per CYP measure, the following section discusses methods for calculating the numerator. For methods resupplied through non-clinic based distribution systems, the numerator will simply be the unit cost of the method times the number of units needed for one CYP. For example, if the unit cost of a cycle of OCs provided in a social marketing program is 45 cents, then the cost per CYP ratio would be $0.45 times 15 cycles (the quantity of OCs needed to provide one year of protection, allowing for commodity wastage) or $6.75 per CYP.

One exception would be if any local or source-specific data were available on commodity wastage and/or misuse, which would justify making modifications to the standard factors for each method. For example, if you knew that 40 percent of OC users did not know how to take the pill properly, you would need to increase the estimate of pill cycles per CYP. In addition, standard factors for condoms and barrier methods could be adjusted using information on average coital frequency, or source-specific wastage.

In the case of multi-year methods (which we discuss in the remainder of this chapter), we must ensure that the costs we include in the numerator cover the time period during which the CYPs in the denominator are provided. For example, an IUD user accepts the method in year one, returns to the clinic periodically for check-ups, and has the IUD removed midway through the fourth year of use. The costs of all visits made during this period (the insertion visit, follow-up visits and the removal visit) must be included in the numerator.

More specifically, assume that you had the following information on costs:

IUD insertion $10.00

Follow-up visit $3.00

Removal $5.00

In addition, assume that all IUD users are told to return to the clinic for check-ups three times in the first year and twice in each of years two and three, and that compliance with this follow-up schedule is 100 percent. Finally, assume that all users have the device removed halfway through year four. Cost per CYP would then be calculated using the following formula:

$$\frac{C(ins) + nC(fu) + C(rem)}{AMC}$$

where C(ins) equals the cost of insertion, C(fu) equals the cost of a follow-up visit, C(rem) equals the cost of a removal visit, n equals the number of follow-up visits made between insertion and removal, and AMC equals average method continuation in years.

Substituting the values for costs and visit frequency (seven follow-up visits include three in first year and twice each year during the second and third years), cost per CYP would be calculated as follows:

$$\frac{\$10.00 + 7(\$3.00) + \$5.00}{3.5} = \$10.29$$

Obviously, in many programs the average duration of use is much lower than 3.5 years. Changes in duration of use can have a large impact on cost per CYP. For example, if users retain their IUDs for only one year rather than the 3.5 years in the previous example, cost per CYP increases to $21.00 [$10 + 2($3) + $5].

If you think that compliance with the follow-up schedule may be less than 100 percent, how many follow-up visits should you assume the client actually makes during 3.5 years of use? Below we have listed a few of the possible approaches that can be used for getting this information.

Ask service providers directly: The problem is these subjective estimates may not be accurate. Providers may not remember or they may tend to overestimate the number of check-up visits made by clients.

Sample clinic records: This is fairly simple (if clinic records are available), does not cost very much, and is very accurate. It does require some care in selecting an appropriate sample. (An example of how clinic records could be sampled to estimate visit patterns follows.)

EXAMPLE: Average Number of Follow-up Visits Per Client

This example shows how to determine the average number of visits made by clients who use IUDs or Norplant over an average three-year period. A form should be developed and used to record data on visits. The following information will be needed:

Method used

Date of method acceptance

Dates of follow-up visits

Reason for each follow-up visit

Additional services received at each visit

The first step is to decide how many records to sample. The more records you sample, the more confidence you will have in the accuracy of your estimates. You may also need to consult a statistics book or a sampling specialist to help determine the number of records you will need to select to ensure a given level of precision in your estimate. You can use standard statistical techniques for sample size determination, in which you choose a sample large enough to ensure that the true mean number of visits falls within a predeter-

mined confidence interval. You determine the sampling interval by dividing the total number of IUD or Norplant clinic records by the sample size. For example, if there are 1,000 IUD records and you need a sample of 100 records, then the sampling interval would be 10.

From a random start between the first record and record 10 (if 10 is the sampling interval), you choose every 10th record and write down the data on the form you have developed. If the record chosen is not eligible for some reason, you proceed to the next record in sequence until you find an eligible record, and then continue sampling from that record.

In order to be eligible for the sample, the client must have been using the method for at least one year. Data should be recorded using the following criteria:

- If the client accepted more than 12 months ago but less than 24 months ago, record data on visits only for the first 12 months of use.
- If the client accepted more than 24 months ago but less than 36 months ago, record data on visits only for the first 24 months of use.
- If the client accepted more than 36 months ago, record data on visits during the first 36 months.

This information then is used to calculate the average number of follow-up visits made in each year of use.

Assume that you had sampled the clinic records as described and that you had found the actual number of follow-up visits to be lower than the recommended regimen of three visits in year one and two visits annually in years two and three. Figure 7.2 presents the results of the clinic record study. The average number of visits varies from 2.36 visits in year one to 0.86 visits in year three; the average number of visits over the full three years is 4.28.

Figure 7.2

Average Number of IUD Follow-up Visits by Year of Use

	Year 1	Year2	Year 3
Number of visits	236	102	57
Number of women making visits	100	96	66
Avg. visits per woman	2.36	1.06	0.86

If we recalculate the cost per CYP using these data on follow-up, we obtain the following result:

$$\frac{\$10.00 + 4.28\ (\$3.00) + \$5.00}{3.5} = \$7.95$$

Adjustments to Costs and CYPs

The example just presented improves on our original calculation of cost per CYP by incorporating information on the number of follow-up visits that users actually make. However, further refinements to the cost per CYP ratio can also be made. In the following sections, we discuss two of these: discounting costs and CYPs and adjusting CYPs for natural decreases in fecundity that women experience as they age.

Discounting Costs and CYPs

The benefit of using a contraceptive is the **protection** that the method provides. Costs are incurred in order to keep the protection intact. However, the timing of these costs differs significantly depending on which contraceptive method is used. For example, female sterilization acceptors incur nearly all of the costs of protection up front, while OC users must continue to incur costs each time they obtain more cycles in order to maintain protection. We should correct for these differences in timing of costs and protection if we are to make valid comparisons of the cost per CYP ratios of various methods.

We can adjust for these differences by **discounting** future costs and protection. Discounting is a technique that allows future costs and outputs to be expressed in current dollars or outputs. A dollar promised at some point in the future is worth less than a dollar received today because current dollars can be invested to yield more future dollars. Similarly, births averted now are worth more than births averted in the future because of time preference.

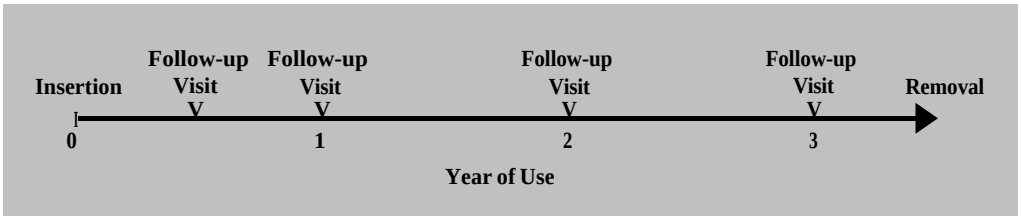
Discounting Costs: As an example of how to discount the costs and protection of one IUD user, we use the same costs of IUD-related visits as in the previous example:

IUD acceptance visit $10.00

IUD follow-up visit $3.00

IUD removal visit $5.00

For ease of computation, we assume that the average IUD client returns for follow-up visits twice in the first year, once in the second year, once in the third year, and has the IUD removed in the middle of the fourth year. This follow-up schedule is different from the one presented earlier; the cost per CYP associated with this follow-up schedule would be $7.71 (computation not shown). We assume that follow-up visits occur at mid-year in the first year, and on the last day of each year thereafter. The timing of IUD costs would look like this:



All costs incurred after the date of insertion should be converted to present value terms. For example, the cost of the second follow-up visit should be discounted back to what the visit would have cost at the date of insertion. This is accomplished by dividing the cost of the visit by $(1+r)^n$, where r is the discount rate and n is equal to the number of years since insertion. Therefore, the total discounted cost (or present value) of using the IUD over a 3.5-year period would be given as follows:

$$\text{Total Cost} = \text{Insertion} + \frac{\text{Follow-up Visit}}{(1+r)^{0.5}} + \frac{\text{Follow-up Visit}}{(1+r)} + \frac{\text{Follow-up Visit}}{(1+r)^{2}} + \frac{\text{Follow-up Visit}}{(1+r)^{3}} + \frac{\text{Removal}}{(1+r)^{3.5}}$$

The further into the future that costs are incurred, the more they are discounted because the denominator (1+r) becomes larger. Using the numbers from our example, and assuming a 6 percent discount rate, we would obtain the following result:

$$\$10.00 + \frac{3.00}{(1+0.6)^{0.5}} + \frac{3.00}{(1+0.6)} + \frac{3.00}{(1+0.6)^{2}} + \frac{3.00}{(1+0.6)^{3}} + \frac{5.00}{(1+0.6)^{3.5}} = \$25.01$$

Another way to calculate the terms in the previous equation is to use a present value table like the one that is presented at the end of this chapter. The numbers in the table are the inverses of the values you would obtain by calculating the denominator of each term in the equation above. Thus, when you use a present value table you **multiply** the cost by the values in the table, rather than dividing by $(1+r)^n$ as is done in the equation.

The present value of the costs incurred by one IUD user equals $25.01, which is less than the $27.00 we would have gotten had we simply added up all of the costs. The difference between the nominal value and the present value is relatively small because the discount rate we chose was low. With a higher discount rate, the difference would be greater.

Discounting CYPs: The procedure for discounting CYPs is identical to that described above for costs. We use the same discount rate as we did for costs because an averted birth today translates into resource savings today However, the impact of the adjustment can vary depending on the length of the period of protection associated with various methods. Below, we present a method for discounting CYPs for IUDs and female sterilization (FS), and show how the relative cost of protection provided by the two methods changes when both costs and CYPs are discounted.

Discounting CYPs for IUDs: We assume that protection begins when the IUD is inserted and continues uninterrupted until the IUD is removed. Therefore, the average time period for discounting CYPs is at the midpoint of each year. The equation to determine discounted CYPs would then be given as follows:

$$\text{Discounted CYPs} = \frac{1.00}{1.06^{0.5}} + \frac{1.00}{1.06^{1.5}} + \frac{1.00}{1.06^{2.5}} + \frac{1.00}{1.06^{3.25}} = 3.16$$

Discounting CYPs for Female Sterilization: As with IUDs, we assume that protection is uninterrupted, and is delivered at the mid-point of each year. The major difference is in the length of protection. For this example, we assume that an average acceptor of female sterilization (FS) is 33 years old and, therefore, receives 12 years of protection. The calculation for discounted CYPs for FS includes 12 terms, one for each year of use. (The formula that follows is abbreviated for simplicity.)

$$\text{Discounted CYPs} = \frac{1.00}{1.06^{0.5}} + \frac{1.00}{1.06^{1.5}} + \ldots + \frac{1.00}{1.06^{11.5}} = 8.6 \text{ CYPs}$$

Figure 7.3 summarizes the estimates of nominal and discounted cost per CYP for the two methods. We assume that the cost of a female sterilization is $70. In the first row, the $70 cost of FS is spread over 12 nominal years of protection, which makes FS less costly per CYP than IUDs (see third column of Figure 7.3). In the second row, both costs and CYPs are discounted. This adjustment increases FS costs per CYP relative to IUD costs because the denominator of the FS cost per CYP ratio is reduced from 12 CYPs to 8.6 CYPs. The denominator of the IUD cost per CYP ratio is reduced as well, but so is the numerator. The two adjustments tend to cancel each other out.

Figure 7.3

Impact of Discounting on the Costs per CYP Incurred by IUD and Female Sterilization Users

Type of Cost and CYP	IUDs	Female Sterilization	Ratio of IUD Cost/CYP to FS Cost/CYP
Nominal Cost per CYP	$7.71	$5.83	1.32
Discounted Costs per Discounted CYPs	$7.91	$8.11	0.98

Age-adjusting of CYPs

The relative risk of pregnancy is higher for younger than for older women. Consequently, relatively fewer births are averted by older than by younger contraceptive users. This is important because permanent methods are generally used by older women, while younger women select temporay methods. Therefore, when comparing the cost per CYP of various methods, the protection provided by methods used by less fecund older women should be devalued relative to the protection provided by methods used by younger women.

Standardization techniques have been developed to adjust CYPs for age.[21,22,23] We use the standardization technique proposed by Anson and Chernichovsky, et. al. Data on the relative probability of conception by age in a population not using contraception (from Anson and Chernichovsky) is combined with information on the age distribution of contraceptive users (from DHS) to calculate weighted effectiveness coefficients.

Assume that the data in Figure 7.4 describe the age distribution of contraceptive users in a certain country. Also assume that the values in Figure 7.5 describe the risk of conception relative to the risk of women in the age group most likely to become pregnant (20-24 year olds).

Figure 7.4

Age Distribution by Contraceptive Method

Age Group	OCs	IUDS	FSter
15-19	0.11	0.02	0.00
20-24	0.31	0.17	0.03
25-29	0.33	0.28	0.11
30-34	0.16	0.23	0.20
35-39	0.08	0.16	0.26
40-44	0.01	0.09	0.23
45-49	0.00	0.05	0.17
Total	1.0	1.0	1.0

Note: For each column, the total users of the method sum to 1.0; for example, if there were 100 OC users, 11 of them would be aged 15-19.

Figure 7.5

Risk of Contraception Relative to Age Group

Age	Risk
15-19	0.87
20-24	1.00
25-29	0.95
30-34	0.86
35-39	0.72
40-44	0.41
45-49	0.08

Figure 7.6

Calculation of Weighted Coefficient for Female Sterilization (F5) and IUDs

Age	Risk	Proportion of Total FS Use		Coefficient
15-19	0.87	x 0.00	=	0.000
20-24	1.00	x 0.03	=	0.030
25-29	0.95	x 0.11	=	0.105
30-34	0.86	x 0.20	=	0.172
35-39	0.72	x 0.26	=	0.187
40-44	0.41	x 0.23	=	0.094
45-49	0.08	x 0.17	=	0.014
Total				**0.602**

Age	Risk	Proportion of Total IUD Use		Coefficient
15-19	0.87	x 0.02		0.017
20-24	1.00	x 0.17	=	0.170
25-29	0.95	x 0.28	=	0.266
30-34	0.86	x 0.23	=	0.198
35-39	0.72	x 0.16	=	0.115
40-44	0.41	x 0.09	=	0.037
45-49	0.08	x 0.05	=	0.004
Total				**0.807**

To age-adjust the standard CYP factor for IUDs, we multiply the relative risks of conception by the age distribution of IUD users and add the values obtained for each age group. As shown in Figure 7.6, the weighted effectiveness coefficient is .807 for IUDs and .602 for sterilization. The difference reflects the fact that sterilization users are typically older than IUD users.

The final step in the adjustment process is to multiply each method's weighted coefficient by the number of CYPs provided by that method. For example, assume as we did earlier that the average sterilization provides 12 years of protection. The age-adjusted CYPs for sterilization would be 12 years times .602 or 7.2 years, while the adjustment for IUDs would be 3.5 CYPs times .807 or 2.8 CYPs. The cumulative effect of age adjusting **and** discounting would be calculated by multiplying the discounted CYPs for a method by its age adjustment coefficient. For example, in the case of sterilization we would multiply discounted CYPs (8.63) by the coefficient for FS (.602) to obtain 5.2 discounted **and** age-adjusted CYPs.

Figure 7.7 extends the example presented in Figure 7.3 by including a final row that shows the impact of discounting and adjusting for the age of the acceptor. IUD costs per CYP are now considerably lower relative to FS costs, reflecting the fact that FS is used during years of lower fecundity than is the IUD.

Figure 7.7

Impact of Discounting and Age-adjusting on the Costs per CYP Incurred by IUD and Female Sterilization Users

Type of Cost	IUDS	Female Sterlization	Ratio of IUD Cost/CYP to FS Cost/CYP
Nominal Cost per CYP	$7.71	$5.83	1.32
Discounted Cost per Discounted CYP	7.91	8.11	0.98
Discounted Cost per Discounted and Age-Adjusted CYP	9.81	13.47	0.73

When to Adjust CYPs: Some research questions will require you to adjust CYPs for age and discount both costs and CYPs. In other cases, such adjustments will not be needed. Adjusting and discounting are most appropriate when you are comparing the costs of alternative methods that a client might choose. Depending on age and the length of method use, the costs of method choices could change dramatically when discounting and age-adjusting are employed. The following examples illustrate situations in which the analyst would need to decide whether discounting and age-adjusting were warranted.

> **Example:** Two clinics are providing IUDs. You want to determine whether there are differences in costs of providing these methods, and the reasons for any differences that are found. Possible reasons for differences may include the following: level of demand, excess fixed capacity in clinics, salaries and credentials of staff who perform various jobs, variations in tasks performed, time spent in providing services, duration of IUD use, and frequency of follow-up visits.

To answer these research questions, you would not adjust either CYPs or costs, because the adjustments could obscure the clinic-related reasons for the variations. In fact, in seeking to understand why there are differences, you will want to examine the costs of individual visits and not just the aggregate costs for all visits.

> **Example:** A clinic that provides several different contraceptive methods is considering sponsoring a promotional campaign for sterilization. In the country where the clinic is located, the average age of sterilization acceptors is 38 years. Clinic managers do not expect that the campaign will reduce that average age. They also believe that most sterilization acceptors would have chosen the IUD in the absence of sterilization. Would you recommend that the clinic sponsor the campaign? Would your answer be different if the woman were 28 years old?

In order for clinic managers to make a decision, they need to know the cost of providing both sterilization and IUDs, including the costs of acceptor visits and other visits. These costs, as well as the CYPs from the methods received, will need to be adjusted if a truly fair comparison of the methods is to be made.

Sterilization provides more CYPs if a woman is 28 compared to 38, and the age-adjusted difference in CYPs is greater than 10 years because fecundity is higher for younger women. However, the 28 year old may also need more IUDs (five, assuming she uses each one for 3.5 years) to protect her until she is 45 years old.

Clearly, there are no easy answers to this question. In this specific situation and also more generally, the research question will suggest which standardization procedures should be selected. An important point is that adjustments to costs and CYPs must be documented and recommendations must be based on the study results.

Chapter 8 Costing Applications

The purpose of this final chapter is to demonstrate how some of the theory and examples we have discussed can be applied to real problems that family planning program managers face. These applications of cost analysis are illustrative of issues that are commonly encountered in the developing world. They also reinforce the point that the definition of the research problem will dictate to a large extent the methodological approach that should be followed.

The chapter is organized so that the examples presented correspond to the three major uses of cost analysis as discussed in Chapter 1. These uses are the following:

- **Comparing costs of service delivery units**
- **Changing program structure or services offered**
- **Sustainability and financing of services**

The corresponding examples we have selected are:

Example: What is the impact in Kenya on costs of providing IUD insertion immediately postpartum rather than later in a woman's hospital stay or six weeks or more after delivery?

Example: What is the impact on contraceptive prevalence and on service delivery costs of adding Norplant to the National Family Planning Program (NFPP) of Thailand?

Example: How do the costs of service delivery compare with the fees charged to clients of an IPPF affiliate in the Dominican Republic?

Kenya Example : Cost Comparisons of Programs to Provide IUDs

The Provincial General Hospital in Nyeri, Kenya has recently begun to provide IUDs to women who are hospitalized following childbirth.[24] IUDs are generally inserted no sooner than six weeks after delivery However, making IUDs available during hospitalization for delivery may encourage some women who rarely visit health facilities to use contraception and to select the IUD. Providing IUDs immediately following childbirth may also be less costly than at other times because the amount of time required for insertion and follow-up care may be lower.

Question: What does it cost to provide one year of contraceptive protection, using IUDs, for insertions performed at the following three post-delivery intervals?

- insertion immediately following delivery of the placenta (also called "immediate post-placental insertion" or "IPPI")
- insertion at some later time during hospitalization for delivery (also called "insertion before hospital discharge" or "IBHD")
- insertion at least six weeks following delivery (also called "interval insertion")

This example uses a technique called cost-effectiveness analysis. (For extended discussions of cost-effectiveness analysis, see references 1 and 3.)

Methodology: The cost of one year of contraceptive protection was calculated for each of the three insertion groups. We assumed that all women in each of the three groups would use the IUD for at least one year. Only the costs to programs providing services were included. Also, we measured only costs of labor, materials and contraceptives, because we assumed that adding IUDs to the method mix would not require additional space and equipment.

The formula used to determine incremental or marginal costs is as follows:

Total Marginal Costs = (1 + pExp) CIV + n(CRV) where

pExp = the probability of expulsion in the first 12 months of use

CIV = the marginal cost of an insertion visit

n = the average number of revisits in the first year

CRV = the marginal cost of a revisit

Estimates for each component of the formula were determined as follows:

pExp. Previous research results were used.

CIV. Observation studies of patient-provider contacts were used to determine labor and supply inputs. Information on the cost of labor was obtained from the hospital's administrative office. Cost of the IUD and related supplies were obtained from donors and from commercial suppliers.

n. The records of previous acceptors of IUDs were sampled. Separate estimates were made for women with interval insertions and for women who received their IUD during hospitalization for delivery (including both IPPI and IBHD).

CRV. A similar procedure to that described for CIV was used

Expulsion rates as determined by previous studies (pExp) are as follows:

IPPI = 16 per 100 woman-years

IBHD = 23 per 100 woman-years

Interval = 4 per 100 woman-years

CIV/CRV results are presented in Figure 8.1.

Figure 8.1

Costs of IUD Insertion, and Follow-up Visits (in U.S.Dollars)

Cost of Insertion Visit	**Timing of Insertion**		
Inputs	**Interval**	**IPPI**	**IBHD**
Labor	$1.59	$0.75	$1.10
Materials*	1.56	1.56	1.56
Total	$3.15	$2.31	$2.66
No. of Insertions	21	20	20

Cost of Follow-up Visit	**Type of Follow-up Visit**		
		Maternity Ward**	
Inputs	**MCH Clinic**	**PP/IPPI**	**IUD only**
Labor	$0.95	$0.18	$0.72
Materials	0.31	0.00	0.31
Total	$1.26	$0.18	$1.03
No. of Revisits	20	6	17

* Includes TCu380A, iodine solution, cotton, latex gloves

** Revisits to the maternity her combine post-partum and IUD check-ups (PP/IPPI) or are made solely to check the IUD (IUD only). In the case of PP/IPPI visits, the labor cost corresponds only to the part of the the visit in which the clinician checks the IUD.

The results of the record search to determine the average number of revisits follows:

postpartum insertions = 1.50 revisits in first year

interval insertions = 1.17 revisits in first year

Then total marginal costs in the first year for each of the insertion groups:

IPPI = $3.37

lBHD = $3.97

Interval insertion = $4.75

Conclusion: The relative cost difference between the three alternatives indicates that substantial savings could be made if more IUDs were inserted immediately postpartum. More than 140 IPPI clients could receive services for the same cost that would provide services to 100 interval clients.

Thailand Example: Expanding the Availability of Norplant

Thailand has one of the highest rates of contraceptive use in the developing world. The 1987 Demographic and Health Survey (DHS) found that 68 percent of married women aged 15-44 were using a method of contraception. Thailand's National Family Planning Program (NFPP) wants to increase contraceptive use further and also wants to encourage clients to use long-acting and permanent methods.

In 1990, the NFPP decided to expand the availability of Norplant, a relatively new contraceptive method that provides protection for five years." However, Norplant is costly relative to other equally effective methods. Given the limited resources available for family planning services, programs like the NFPP need to weigh the high cost of Norplant against its potential to increase contraceptive use.

Question: Was the NFPP's decision to provide Norplant a good use of scarce resources, and should the NFPP continue to offer Norplant?

Methodology: The study was designed to answer two questions:

- Did the NFPP's decision to provide Norplant result in the program attracting users who otherwise would not have used another modern method of contraception?
- What did it cost the NFPP to provide Norplant as compared with the costs of IUDs and injectables (two other modern methods provided by the program)?

To answer the first question, we interviewed the first 50 Norplant acceptors at each of the 11 hospitals included in the study. Women were asked about their previous contraceptive use, what method they would have used in the absence of Norplant and where they would have obtained the alternative method.

To answer the second question, we calculated costs per couple-year of protection (CYP) for Norplant, IUDs and injectables. The cost per CYP measure incorporates information on the costs of family planning services, the frequency of client visits to receive services, and the average length of time that a method is used.

The cost of a family planning service depends on which method is used and which type of visit is made. We identified three specific visit types: acceptance, follow-up and discontinuation. Norplant and IUD users make all three types of visits, but users of injectables can discontinue use simply by not receiving the next injection. We calculated costs for eight different combinations of method and visit type (all possible method-visit combinations except injectables discontinuation).

Since the purpose of the study was to evaluate the NFPP's decision to provide Norplant, we included only the costs to the NFPP. Costs to the client (including travel and the opportunity cost of time) were not estimated. Also, only the additional or marginal costs of services are relevant to this situation, because the expanded Norplant program was implemented within the existing hospital structure. Consequently, we obtained information on variable costs only, including the costs of contraceptives and any related supplies and the value of the labor time used to provide services.

We calculated labor costs using a modified patient flow analysis, in which we recorded the number of minutes that a sample of women making each type of visit spent with service providers. In addition, service providers added information on the time spent in preparation and clean-up. Salary and benefits data were provided by each of the hospitals in the study and were used to calculate a cost per minute for each service provider Labor costs for each type of visit were determined by multiplying the cost per minute of service provider time by the number of minutes of contact between provider and client.

The costs of follow-up care for IUDs and Norplant equal the cost per follow-up visit times the number of follow-up visits made over the duration of method use. To determine the average number of follow-up visits made by IUD users, we only sampled the hospital records of women who had accepted the IUD at least one year previously. The average number of follow-up visits in the first year was calculated, as was the proportion making a visit at the end of the year. We assumed that the clients who made a visit at the end of the first year would make a visit at the end of the second year and so on.

Hospital records for Norplant users were limited, because the NFPP had only recently expanded the availability of the method. Therefore, we assumed that the follow-up visit patterns of IUD acceptors could be used to approximate the patterns of Norplant acceptors, given that the two methods are similar in that they require only insertion and removal visits.

Results: Figure 8.2 shows clients' reported contraceptive use prior to receiving Norplant and Figures 8.3 and 8.4 show the method that clients said they would have selected in the absence of Norplant. Clearly, Norplant added little or nothing to contraceptive use. Figure 8.5 presents information on the costs of specific visits for each of the three methods, The high cost of an acceptor visit for Norplant reflects the high cost of the implants themselves.

Figure 8.2

Previous Contraceptive Use Among Norplant Recipients

	Percent
Used Last Month	71%
Previously Used	17
Never Used	11
unknown	1
Total	100% (n=550)

Figure 8.3

Likely Method if Norplant Not Available: Woman Who Had Never Used Contraception

Method	Percent
Injectable	56%
Pill	19
IUD	16
Condom	5
Other	2
None	2
Total	100% (n=57)

Figure 8.4

Likely Method if Norplant Not Available: Woman Who Had Used Contraception Before

Method	Percent
Injectable	47%
Pill	33
IUD	12
Condom	3
Sterilization	2
Other	1
None	2
Total	100% (n=493)

Our review of the hospital records of IUD users showed that acceptors made an average of one follow-up visit in the first 11 months after acceptance. In addition, about 10 percent made a visit at the end of the first year.

Thailand levies an import tax on both Norplant and IUDs, which increases their cost. Injectables are manufactured domestically, and therefore are not subject to import taxes. Including import taxes in the cost of the contraceptives to the NFPP reduces the cost of injectables relative to IUDs and Norplant. However, because the import taxes are a transfer of resources from one government ministry to another, they are not a real cost to the government as a whole in determining alternative uses of resources.

Figure 8.6 presents a table showing the cost per CYP for the three methods. For both IUDs and Norplant, the cost per CYP decreases with length of use. The cost of revisits is lower than the cost of an acceptor visit and the number of revisits is low. For injectables, however, the cost of a revisit is only slightly less than that of an acceptance visit because the commodity

must be provided at each visit. Consequently, the cost per CYP declines only slightly with duration of use. The cost per CYP of Norplant is higher than that of IUDs and injectables for all durations of use. IUDs are consistently the lowest-cost method.

Figure 8.5

Marginal Costs of Visits by Method (in U.S. Dollars)

Norplant Visits (excluding import taxes)

Type of Visit	Supplies	Labor	Commodity	Total	No. of Cases
New Acceptor	$1.44	$1.03	$23.00	$25.47	100
Follow-up	0.00	0.24		0.24	104
Discontinuation of Method	1.55	0.91		2.46	19

IUD Visits (excluding import taxes)

Type of Visit	Supplies	Labor	Commodity	Total	No. of Cases
New Acceptor	$0.91	$0.61	$1.12	$2.64	93
Follow-up	0.30	0.30		0.60	88
Discontinuation of Method	0.47	0.34		0.81	63

Injectable Visits

Type of Visit	Supplies	Labor	Commodity	Total	No. of Cases
New Acceptor	$0.32	$0.42	$0.71	$1.45	100
Follow-up	0.32	0.21	$0.71	1.24	110

Conclusion: The decision to expand the availability of Norplant did not result in higher levels of contraceptive use. Moreover, regardless of the duration of contraceptive use, protection could be provided at lower cost by IUDs or by injectables. Also, many women said that they would use injectables if Norplant were not available (Figures 8.3 and 8.4). Therefore, the demand for contraception could have been satisfied by emphasizing injectables and IUDs instead of Norplant. This application of costing methodology shows program managers that they could save money by avoiding costly methods that do not add to contraceptive prevalence. However, other considerations (i.e., expanding the method mix) could convince program managers to introduce Norplant in spite of its high costs.

Figure 8.6

Cost per CYP by Duration of Use

	Norplant	IUDs	Injectables
One Year	$28.18	$4.07	$5.17
Two Years	14.10	2.06	5.07
Three Years	9.41	1.39	5.03
Three Years, Six Months	8.07	1.20	5.02
Four Years	7.06	1.06	5.01
Five Years	5.65	0.86	5.00

Note: Assumes 1.04 follow-ups visits in first year of use and 0.091 follow-up visits in subsequent years of use for Norplant and IUD acceptors. Also includes discontinuation visits for Norplant and IUD acceptors. (Import taxes excluded.)

Figure 8.7

Costs of Training Nurses to Insert Norplant

Travel Costs	
Eleven trainees*	$2,030
Bangkok instructors*	980
Subtotal	3,010
Opportunity Costs/Honoraria	
Trainees	$901
Local instructors	540
Bangkok instructors	727
Subtotal	$2,168
Materials	$827
Facility Rental	$200
Incidentals	$105
Grand Total	$6,310

* Information on salaries of participants and time away from work was to determine the opportunity costs of time. Both trainees and trainers took time away from their regular jobs to attend the training course.

Figure 8.8

Training Cost per Norplant Inserted (in U.S. Dollars)

Total Training Cost	$6,310
Total Change in Number of Insertions*	+ 9,504 insertions
Total Training Cost/Insertions	$0.66
Total Training Cost/CYP**	$0.19

* Total increment in number of insertions = 36 insertions/month x 11 trainees x 24 months. Assumptions made were the following that nurses provided services for two years and that all training costs were allocated to insertions. Also the increment in insertions in the six month period following training over the same six month period in the previous year would be a good measure of average monthly change over a two-year period.

** Total number of CYPs = total number of insertions x 3.5 years.

Another decision that program managers need to make is how to decide on the size of the training budget and how to allocate it. As part of the project described above, a study of the costs of training nurses to provide Norplant was carried out.[25] The results of the study are shown in Figures 8.7 and 8.8.

These tables show that the training cost per CYP for Norplant is $0.19. One might assume incorrectly that the training in Norplant provision in Thailand was a good investment. Although the number of procedures performed by the nurses increased dramatically, recall that most of this increase was achieved at the expense of providing other methods. While the training did increase the number of Norplants inserted, the impact on contraceptive use was almost zero. Therefore, the cost of achieving an impact on the margin (i.e., increasing contraceptive use) was high.

Dominican Republic Example: Cost Data to Evaluate Cost Recovery

A recent emphasis of the U.S. Agency for International Development and other donors has been to encourage family planning programs to recover a portion of their costs through user fees. However, some programs are concerned that charging fees may prevent poor clients from using family planning services.

PROFAMILIA (the IPPF affiliate in the Dominican Republic) charges fees that range from less than U.S. $1 for a standard medical visit to more than U.S. $20 for a Norplant insertion. In 1990, FHI provided technical assistance to PROFAMILIA to carry out a study to estimate the costs of various family planning services. One objective of the study was to evaluate PROFAMILIA's cost recovery efforts.[16]

Questions:

- How much of the cost of a clinic service is covered by the fee charged to the client?
- How do methods compare in terms of the cost (and the price to clients) of the protection they provide?

Methodology: Costs were estimated for each method and each delivery system. PROFAMILIA operates two clinics that provide IUDs, Norplant, oral contraceptives, condoms and assorted other barrier methods, Minilaparotomy, a female sterilization procedure, is available at the larger clinic.

We measured the cost per client-visit, defined as the cost to PROFAMILIA, supporting donor agencies and PROFAMILIA clients of all resources expended in the course of individual visits to the clinic. Costs were estimated for each type of client-visit, (e.g., acceptance, follow-up, discontinuation), by method. Visit costs were calculated by adding up the costs incurred in each clinic cost center, and then allocating these costs to visits based on duration of client contact with the cost centers.

Data on fees charged to clients were collected from PROFAMILIA pricing schedules.

The cost of contraceptive protection is distinct from the cost of contraceptive services. For female sterilization, Norplant and IUDs, the cost of protection is calculated by multiplying the cost of a service by the number of times a client uses that service. For example, if an IUD acceptor returns to the clinic four times for follow-up care during the period of time that she uses the device, then the cost of protection would be equal to the cost of the insertion visit plus the cost of four follow-up visits and a removal visit. We obtained information from clinic records on the average number of follow-up visits made by IUD and Norplant users. The total cost of protection was then divided by estimates of the average duration of method use (obtained from the literature) to yield an estimate of the cost per year of protection, or CYP.

Results: Figure 8.9 presents information on total visit costs, fees charged for visits and the percentage of the costs covered by the fees. In absolute terms, the most expensive visit is the surgery visit, followed by the Norplant insertion visit and the IUD insertion visit. PROFAMILIA collects the most revenue from Norplant insertions, followed by sterilizations and IUD insertions. In percentage terms, cost recovery is highest for IUD insertions, and lowest for sterilization.

Figure 8.9

Percentage of Costs Recovered by Method and Visit Type (in U.S. Dollars)

Method and Visit Type	Cost per Visit	Fee for Service	Percentage of Costs Recovered
IUD			
Insertion visit	$10.54	$4.93	46.7%
Follow-up visit	4.67	0.72	15.4
Removal visit	4.79	0.72	15.0
Norplant			
lnsertion visit	$48.03	$20.36	42.4%
Follow-up visit	4.71	0.72	15.3
Removal visit	11.09	3.14	28.3
Female Sterilization			
Evaluation visit	$8.99	$1.97	21.9%
Surgery visit	97.08	11.21	11.5
Follow-up visit	7.02	0.72	10.3

Figure 8.10 presents information on cost per CYP and price per CYP by method. The "costs per CYP" column reflects full economic costs of providing a year of contraceptive protection using each method. From this perspective, Norplant costs roughly twice as much per CYP as the other two methods. From the client's point of view (the second column), Norplant is expensive relative to IUDs, while female sterilization provides the lowest-priced protection.

Figure 8. 10

Cost Recovery per CYP by Method (in U.S. Dollars)

Method	Total Cost per CYP	Price per CYP	Clinic's Net Cost per CYP
IUD	$13.05	$3.14	$9.91
Norplant	27.22	9.09	18.13
Female Sterilization	14.45	1.78	12.67

Conclusions: Contraceptive protection provided by IUDs and female sterilization costs approximately half as much as protection provided by Norplant. Even though PROFAMILIA charges higher fees to Norplant users, the costs absorbed by PROFAMILIA and its donors (see third column) are highest for Norplant. Donors are currently willing to provide the Norplant sets free of charge, but there is no guarantee that this will continue indefinitely. Therefore, PROFAMILIA should consider increasing the price of Norplant to encourage clients to accept IUDs and female sterilization, which have lower costs.

References

1. Phillips, Margaret, Donald Shepard, Stephen Lerman and Richard Cash. "Estimating Costs for Cost-Effectiveness Analysis." Geneva: WHO Program for Control of Diarrhoeal Diseases, 1988.

2. Creese, A. and D. Parker, eds. "Cost Analysis in Primary Health Care." Geneva: World Health Organization, 1992.

3. Reynolds, J. and K. Celeste Gaspari. "Cost-Effectiveness Analysis." Chevy Chase: Primary Health Care Operations Research Project (PRICOR), May 1985.

4. Knowles, J.C. and A. Wagman. "The Relationship Between Family Planning Costs and Contraceptive Prevalence: Will FP Costs per User Decline over Time?" unpublished paper. Washington: The Futures Group, 1991.

5. Janowitz, Barbara and John Bratt. "Costs of Family Planning Services: A Critique of the Literature." *International Family Planning Perspectives* December 1992; 18(4): *137-44.*

6. Nicholson, Walter. *Intermediate Microeconomics and ifs Application.* 4th ed. Chicago: The Dreyden Press, 1987.

7. Reynolds, Jack. "User's Guide, PHC Management Advancement Programme, Module 1: Conceptual Framework." Chevy Chase: University Research Corporation, 1991.

8. J. Bongaarts. "Contraceptive Use and Annual Acceptors Required for Fertility Transition: Results of a Projection Model" *Studies in Family Planning 1986;* 17:209.

9. Bratt, John and Barbara Janowitz. "Cost of Family Planning Services Delivered Through ASHONPLAFA Programs." unpublished paper. Research Triangle Park: Family Health International, 1990.

10. Stover, John, James Knowles, Anne Wagman, Dorothy Nortman. "TARGET-COST: A Model for Projecting the Family Planning Service Requirements and Costs to Achieve Demographic Goals." Washington: The Futures Group, 1991.

11. Bitran, Ricardo. "Short Guidelines for Costing Selected Primary Health Care Projects in Developing Countries." Washington: Resources for Child Health Project (REACH), undated.

12. Brenzel, Logan. “ANE Bureau Guidance for Costing of Health Service Delivery Projects.” Washington: Resources for Child Health Project (REACH), 1988.

13. Forsythe, Steven and Enrique Schwartz. “AIDSTECH Costing Guidelines, draft 5.” Research Triangle Park: Family Health International, 1991.

14. Castro, V.,R and Giron, T., N. “Surgical Cost Study” unpublished paper. Bogota: PROFAMILIA, 1985.

15. Knowles, J.C., and L. Emrich. “The Estimation of Family Planning and Primary Health Service Costs in Morocco.” draft paper. Chapel Hill: The Futures Group, 1990.

16. Bratt, John and Barbara Janowitz. “Costs of Family Planning Services Delivered Through PROFAMILIA Programs.” Research Triangle Park: Family Health International, 1992.

17. Shelton, James. “What’s Wrong with CYP?” *Studies in Family Planning.* Sept/Oct 1991; 22(5): 332-35.

18. Johnson, J.T. “Proposed New ‘Standard' CYP Factors.” memorandum. 27 March 1990.

19. Bertrand, Jane, Robert Magnan and James Knowles, “Handbook of Indicators for Family Planning Program Evaluation.” unpublished paper. Chapel Hill: The EVALUATION Project, Carolina Population Center, 1993.

20. Bertrand, J., J. Stover and M. Edwards. “Deriving Empirically-Based Conversion Factors for CYP.” 120th annual meeting of American Public Health Association, Washington, 8-12 Nov 1992.

21. Chernichovsky, D., J. Anson. “Cost Recovery and True Cost-Effectiveness Ratios of Contraceptive Provision.” Washington: World Bank, 1989.

22. Gorosh, M. and D. Wolfers. “Standard Couple-Years of Protection: A Methodology for Program Assessment, Manual No. 10.” New York: Center for Population and Family Health, Columbia University, 1977.

23. Wishik, SM. and K.H. Chen. “Couple-Year of Protection: A Measure of Family Planning Program Output, Manual No. 7.” New York: Institute for the Study of Human Reproduction, Columbia University, 1973.

24. Hubacher, D., B. Janowitz, E.M. Mate and C. Waszak. “Comparing the Costs of Two IUD Programs in a Kenyan Hospital.” 120th annual meeting of the American Public Health Association, Washington, 8-12 Nov 1992.

25. Janowitz, B., N. Dighe, K. Kanchanasinith, K. Soonthornadhada, N. Auamkul and P. Amornwichet. “The Impact of Introducing Norplant on Contraceptive Use and Costs: An Example from Thailand.” Research Triangle Park: Family Health International, 1992.

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