# Cost and Efficiency of Reproductive Health Service Provision at the Facility Level in Paraguay

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MEASURE *Evaluation*

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## I. Introduction

The cost and efficiency at which maternal, child, and reproductive health care services are provided in developing countries have become increasingly pressing issues over the last decade. A number of factors are driving the concern over cost and efficiency. These include the staggering estimated total cost of providing these services,[1] the scarcity of funds to meet policy objectives, and the resultant pressure from donor countries and agencies for programs to be more accountable for results and cost effectiveness, and for programs to demonstrate the potential for long run sustainability. Furthermore, the analysis of many policy issues of current interest can be informed by detailed information on cost of service. It has long been hypothesized that organizational structure of the health care service provision system may have a substantial impact on the cost of service provision. Analysis of issues such as the effect of decentralizing the health care system or converting from vertical to integrated systems requires large cross sectional data bases of cost information. Existing data obtained at the facility level such as the DHS Service Availability Module and Situation Analysis, while providing much information about the facility's operation, provide essentially none of the information required to make estimates of service provision costs. Any examination of cost and efficiency of the provision of health care services is complicated significantly by the fact that reproductive health involves a large number of different services each with different cost implications.

In this paper we develop a methodology for estimating facility level service provision cost disaggregated to the service level that makes use of survey data collected from 52 public health facilities in Paraguay. In addition, a method is developed to calculate facility level measures of staff use utilization rates to provide information on the efficiency of input use in the Paraguayan health care system. The current paper is part of a larger study of health care decentralization in Paraguay.[2] The broader study was designed to measure changes in cost, efficiency, and other attributes of the public heath care system that might be attributed to the change from a centralized system to one where the responsibility for managing basic health care services provided through public facilities is devolved to the municipal governments. The sample was selected to include a census of public health facilities from 20 municipalities in Paraguay, 11 of which were to be subject to decentralization and 9 were to remain under centralized control. The current paper reports the baseline cost and efficiency results.

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[1] The United Nations Fund for Population Activities (UNFPA) has estimated that worldwide spending on family planning (FP) and reproductive health (RH) will reach 17 billion dollars annually by the year 2000 (UNFPA, 1996).

[2] See Angeles, et al., 1999.

## II. Methods

This section will first provide an overview of the basic approach that is used to calculate the total cost of service provision at the facility level, the total cost of the specific services of concern, and the average or unit cost of these services. Next the data collection methods to obtain the required information to do the cost calculation will be described and some discussion of the issues addressed in the actual calculation of the cost data will be presented. Finally, the data are used to construct medical staff utilization rates and the overall efficiency of the medical service delivery system is discussed.

### Overview of Cost Calculation Method

This study estimates the direct recurrent cost of service delivery at the facility level. This was accomplished by using a variety of data collection strategies to identify and quantify the quantities and cost of the various resources used to produce health care services as observed at each facility. The general approach was to measure the amounts of the various resources that are being used at each facility and "cost" these resources at prices that reflect the amount of funds that are being expended in support of service provision.[3]

Health care by its nature is a very complicated activity using large number of different resources in the production of large numbers of very different outputs. **Table 1** describes the specific health services that were considered in this research. The health care activities that are of primary interest here are those that provide health care services for women and children. For each of these specific services output measures were gathered.[4]

A number of decisions that relate to the basic conceptual issues describe above were made as the cost estimation strategy was designed. These decisions primarily relate to choices about which outputs and cost to consider.

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[3] The issue of who is making these expenditures is an important one. The approach we will employ is based on the total expenditures regardless of who is making them. Thus donated commodities and supplies are costed based on the donors expenditures, staff costs are based on wages and salaries paid to staff regardless of who actually makes the payment. Under a pure "economic" concept of cost, resources would be valued at their opportunity costs; our approach is to value resources at their financial cost.

[4] As noted in the table, more disaggregated output data was obtained for some of the services.

**Table 1**
List of Basic Health Services Used in Cost Analysis

| Service | Notes |
|---|---|
| 1) Growth Monitoring | |
| 2) Prenatal Care | |
| 3) Postnatal Care | |
| 4) Treatment of childhood diarrheal disease | |
| 5) Treatment of childhood respiratory infections | |
| 6) Childhood immunizations | Separate data is collected by type of immunization including Polio, DPT, Sarampion, BCG, and Tetanus |
| 7) Deliveries | Separate data is collected for normal deliveries and Caesarian deliveries |
| 8) PAP tests | |
| 9) Family Planning | Separate data is collect by method |
| 10) Other services | All other service provided by the staff responsible for basic health care. A more complete discussion of the treatment of other services follow. |

The level of disaggreation was dictated by both the availability of output data and by the requirements of the overall study. The focus of the overall study is on the basic health services provided by the public health care system that relate most directly to maternal and child health. These are the first nine services listed in **Table 1** and are referred to as the "specific" services. An "other" service category includes all other services that were provided at the facility using resources that also were used to provide the specific services. The choice to limit the types of services considered helps define the inputs to cost. The specific services listed above are almost always provided by a subset of medical staff types. While some facilities may have surgeons, dentists, anesthesiologist, and other medical staff, these are rarely if ever involved in providing the specific services. Various information was used to identify the staff types that provided the specific services.[5] These included several categories of doctors (general clinical, pediatricians, obstetricians and gynecologists) licensed nurses (including nurse obstetricians) and auxiliary nurses. These staff were put into three groups (doctors, nurses, auxiliary nurses) based on similarity of salaries and

[5] Two sources of information were used to determine which staff performed the specific services. The service statistics collected by the Ministry of health are broken down by who provided the services. Thus it is possible to identify the staff types that provide family planning, prenatal care and so forth from these records. Second, the staff logs (discussed below) also provide information on what types of cases staff members are seeing.

will be referred to as the basic medical staff. Medical staff not typically involved in the provision of the specific services will be referred to as other medical staff and non-medical personnel will be referred to as other staff. One additional point needs to be made on the types of outputs considered. While most, if not all, of the specific services were performed by the basic medical staff, these staff members also treated many other different kinds of cases not included in our list of specific services. These are the patient visits in the "other services" category in **Table 1** above. Because "other services" covered a very wide range of treatment that differed significantly in the time required to provide the service, weights, based on the time requirements for the various other services, were used to construct a visit index for the other services. This was done to alleviate problems in making comparisons across facilities where the complexity of the other cases treated varied substantially. A list of the other services and the weights that were used in the construction of the "other services" output measure is presented in the appendix.

The cost estimates that follow are made for basic health care services, including other services performed by the basic medical staff. Because the composition of services provided is an important dimension of the performance of the health care system, total cost of basic health care service provision is disaggregated by type of service.

The timing of service provision introduces another complication into the process of allocating costs by services. Many of the facilities have staff available 24 hours a day to provide services. This staff provides emergency care after normal operating hours. The primary health service provided by this "on-call" staff is delivery, but other services may be provided as well. The facilities offering services around the clock have, in addition to regular staff, a "guardia" or "on-call" team that remains in the facility. The makeup of this team varies by the type of facility. Because the flow of patients during normal operating hours and off-hours is likely to be very different, the availability of on-call services will likely have a substantial impact on the average cost of service provision because the number of patients served per hour of on-call staff time will likely be much lower than the number of patients seen per hour of staff time during normal operating hours. Unfortunately, the service statistics do not allow us to determine which cases were seen during normal hours of operation and which cases were treated after hours. Two analytic approaches were used to handle this problem. On the one hand, the provision of on-call services can be viewed as a part of the general overhead expense of the facility, and as such, should be included in the cost of providing the individual services as described in **Table 1**. The other approach would be to treat on-call service

provision as a separate service and calculate the cost of the resources devoted to it.[6] Throughout this section, we will note the effect that different treatment of on-call service provision has on cost and efficiency results.

The second issue addressed was determining the costs of the resources that were used in the estimates. The production of the basic health care service requires five categories of resources whose consumption in the facility can be observed. These resource categories include (1) staff time; (2) supplies, medicines, and other consumables; (3) facility level administration and overhead expenses (including such items as utilities and routine maintenance); (4) equipment; and (5) physical space.[7] The results of the use of these resources are the observable production of health care services at the facility level (e.g., number of patients served) and unobservable (at the facility level) health outcomes.

For the first three categories of resources – staff time, supplies and medicines, and administration and overhead – the costs are incurred contemporaneously with the use of the resources and the provision of the services. In other words, there is a relatively direct relationship between the flow of payments for the resources and the flow of services that these resources provide. We will refer to these costs as recurrent costs.

For the last two categories – equipment and physical space – there is a much more indirect relationship between expenditure on these resources and the flow of services they produce. While a building is generally paid for when it is built, it provides a flow of resources over a prolonged period of time. The same is true for medical equipment. For the purposes of this study, we use only the elements of recurrent costs for basic health service.[8]

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[6] It should be noted that both of these approaches have some shortcomings. Treating "on-call" service provision as a part of overhead would be correct if we could allocate it to individual services based on the proportion of those services that were provided on an on-call basis. The absence of service statistics disaggregated between on-call and normal hours of operation cases makes this impossible. The only choices are to allocate the cost of "on-call" service in proportion to the direct cost on the individual services or allocate all of the "on-call" cost to specific services such as delivery. Treating "on-call" costs as a separate service results in including one service with no measured output. In fact, cases were handled during on-call hours, but this output will be assigned to one of the other services categories.

[7] An additional category would include resources that are used to support services at the facility, but whose consumption cannot be observed at the facility level. This category includes all resources used to provide administrative support, supervision, logistic support, training, and so forth that are provided by levels of the health care system above the facility level.

[8] Including an estimate of the capital cost of building and equipment would introduce a number of complexities and require a number of somewhat arbitrary assumptions. The estimation of capital cost requires that a value be placed on the facility's capital stock. That is, a monetary value would have to be placed on the facility's building and stock of equipment. It would then be necessary to assume a useful service life for each element of the capital stock and assume an interest rate in order to construct a period cost of capital (the cost of using the capital stock for a month). Though very basic information of the facility's building and an inventory of the facilities medical equipment were collected in the facility survey, capital cost estimates were not constructed. In previous cost studies for Cote d'Ivoire and Philippines, where equipment and building cost were estimated, they were found to be a small percentage of total cost. See Stewart, J.F., D. K. Guilkey, A. N. Herrin, and R. H. Racelis (1997) and Stewart and Koffi (1997). Because the focus of the overall study in Paraguay is changes due to

Data Collection

The sample for this study consists of all public health facilities located in 20 municipalities selected from three Departments in Paraguay. The facilities are of three types: 1. district hospitals (3), 2. health centers (18), and 3. health posts (31). All facilities are relatively small. All of the hospitals and health centers provided inpatient care with hospitals averaging 20 beds per facility and health centers averaging 5.7 beds per facility. About one-third of the health posts provided inpatient care and averaged 2 beds per facility.

Data collection to support the estimation of service provision cost proceeded on four levels. These include 1) collection of data in the basic facility survey questionnaire, 2) collection of data from staff activity logs, 3) detailed "case studies" of a limited number of the sample facilities, and 4) data collection at administrative levels above the facilities. We will address each of these in turn.

1. Data collection using a facility survey questionnaire: The facility survey included a number of questions that relate to the resources available for service provision at the facility level. These include

- A detailed inventory of the staff was conducted. The number of each type, and the numbers of hours per month that each paid for were obtained.
- An inventory of the facility's stock of family planning commodities and medicines.
- An inventory of equipment at the facility was also compiled.

The facility survey provides the information to measure the quantities of staff time and of various medicines used at each facility and to inventory the equipment stock at each facility.

2. Staff activity logs: At each facility, a number of each type of staff (doctors, nurses, and auxiliary nurses) were asked to keep a log of their patient contacts over a period of five to six days. The number of staff members who kept logs at each facility varied between one and nine (average of 2.6 staff members per facility) depending on the number of staff members at the facility. A total of 1875 patient contacts were logged. For each patient contact, the starting and ending time of the contact were recorded. The nature of the contact, whether it was one of the list of specific services, or an "other" patient contact was also recorded. As described more fully below, these patient contact logs were used to provide the needed information to allocate staff time cost to the various activities for which specific cost estimates were made.

3. Detailed facility "case" studies: The provision of health care services involves a very large number of inputs. With the exception of staff time, specific medicines, equipment, and building space, most of these other

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decentralization and the physical facilities are not expected to change, capital cost were not estimated in this study.

inputs individually represent a very small proportion of total cost. The problems and cost that would have been involved in a complete data collection effort in every facility out weighed the benefits of doing so. To get information on the many minor expense categories, a few facilities were selected for detailed study. The facilities that were subject to this intensive cost analysis were selected so as to be representative of the remaining facilities in the sample. The sample of facilities was divided into four groups based on the characteristics of the facility.[9] A representative facility from each group was chosen and an intensive analysis of the cost of minor medical and other supplies, miscellaneous operating expenses, and facility administration expense was conducted at each of these facilities. These costs were then used as the basis for imputing these costs to the other facilities in the sample.

4. Data collection at other levels of the health system: This effort involved two parts. First the prices paid for many of the resources used in the facility level are not known by the facility itself. Medical supplies for example, may not be purchased by the facility itself, but rather provided by some upper level. To cost these components, the purchasing level was contacted and prices of the various inputs provided to the facilities from that level were obtained. Second, some expenses of the health system such as general administration, logistics, training, etc. are made for resources that support the provision of services at the facility level, but these resources are not actually observed at the facility level. There was no reasonable way to allocate these cost to individual facilities so these costs are not included in the cost estimates.

## Cost Calculations

### Total Cost Calculations

For each public facility in the sample the total recurrent costs of basic medical services at the facility were calculated by cumulating the resources costs in four general categories, 1) basic medical staff cost, 2) administrative expense, 3) specific medical supplies, and 4) other supplies and facility overhead costs.

#### Basic Medical Staff Cost

Total medical staff cost was calculated by accumulating the total number of staff hours for each type of staff that performed the basic health care services at the facility using the staff time data from the facility survey and the

[9] A complete description of the method used to define the groups can be found in Angeles, et al., 1999.

salary data from central records. The total hours for each staff type involved in providing the basic medical services was multiplied by the wage rate[10] for that category of staff and these were totaled for all staff types.

$$TSC_n = \sum_{j=1}^{J} W_{n,j} Hours_{n,j} \quad (1)$$

*Where* $TSC_n$ *is the total basic medical staff cost at facility n*
$W_{n,j}$ *is the wage rate of staff type j (doctors, nurses and auxiliary nurses) at facility n*
$Hours_{n,j}$ *is the number of monthly staff hours of staff type j at facility n*

Administrative staff cost

Administrative cost is clearly an important issue because it is one of the potential areas of cost that may be affected by decentralization. The calculation of administrative staff cost presents two problems. First, in the smaller facilities, there may be no administrative staff[11] and the functions of patient registration and other administrative duties are performed by the medical staff, usually auxiliary nurses. Where there is no administrative personnel, estimating a cost of administration requires that the cost associated with personnel who perform both administrative and medical duties be allocated between the two activities. Second, in the larger facilities services other than the basic medical care of interest here are also performed.[12] Here it is necessary to allocate the cost of administrative personnel between basic medical care and the other activities of the facility. Two approaches were taken. In the first, the detailed cost studies undertook to identify administrative expense at the four typical facilities. Administrative expense was calculated as a percentage of basic care medical staff expense. This percentage was then applied to the other facilities in the same group to produce an estimate of administrative personnel expense. The second approach was to take the reported number of hours for administrative personnel, allocate these hours between basic medical care and other medical care and use the wage rate of administrative personnel to calculate the total administrative expense associated with administration of basic health care services. For facilities that had no

[10] There were two data sources for the wage rate. During the facility survey, facility managers were asked the typical wage rate for each category of staff. Additionally central records were used to get actual salaries of staff at the clinic and these were cumulated by staff type and divided by the number of hours the staff worked at the facility. The second approach was deemed more reliable and is used for the cost estimates reported below.

[11] Only 7 of the 26 health posts with complete data reported having administrative personnel. All health centers and hospital had administrative personnel.

[12] All three of the hospital and 17 of the 18 health centers, and 7 of the 26 health posts had medical staff performing duties not included in the basic package of services considered here.

administrative personnel, the time of auxiliary nurses was allocated between medical time and administrative time to generate estimates of administration cost. The procedures used are described in detail in the appendix. Because there was substantial variation in the uses of administrative personnel within group, the actual hours of administrative personnel were used to generate the results reported below.

Cost of Specific Medicines and Supplies

Specific medical supplies are supplies that would only be used for one of the specific services. Medicine and supply costs were estimated for family planning commodities, vaccines used in immunizations, and deliveries. The price of each specific family planning commodity and each vaccine were obtained from the sources of these supplies and supply cost for each visit was constructed for each type of visit based on the amount used per visit. For immunization this was one dose, for family planning commodities it was based on the amount (number of cycles of pills, number of condoms) distributed per visit. For deliveries a list of supplies that would typically be used was compiled and the total cost of the list calculated. Separate lists were constructed for normal and Caesarian deliveries. Total specific medical supply cost was calculated by multiplying the price of each commodity by the amount used per visit and then summing the result across all services for which specific medical supply costs were calculated.

Other supplies and facility overhead costs

Estimates of the cost for general supplies and miscellaneous expenses were constructed from the detailed case studies. This category included the cost of various other supplies and recurrent operating expenses including maintenance, utilities and so forth. The estimates of these costs were made on the basis of the four detailed facilities cost studies. An estimate of 5% of basic medical staff expense was used for all facilities.

The total recurrent cost of basic health care services for each facility was estimated by summing the component cost as shown in **Equation 2**.

$$TotCost_{Basic,n} = TSC_n + Admin_{Basic,n} + \sum_{i=1}^{I} Med_i + OtherCost_{Basic}$$

*where* $TotCost_{Basic,n}$ *is the total recurrent cost of basic health care services at facility n*
$TSC_n$ *is total basic medical staff cost at facility n*
$Admin_{Basic,n}$ *is adimistration cost allocated to basic medical care at facility n*
$Med_i$ *is the total cost of medicines and supplies specifically used in service i*
$OtherCost_{Basic} = \alpha_{other} TSC_n$ *is the estimate of other overhead expenses* **(2)**

Cost Calculations for specific services

The cost of specific services were estimated by allocating components of cost to each specific activity. The cost components were divided into two categories. The first category was for costs of resources that were used exclusively for a single service, for example all of the cost of family planning commodities was allocated to family planning service provision. The second category was for costs of resources that were used to provide multiple services, the key resource here being staff time. Staff time allocation was used as the key element for allocating cost to various services for two reasons. First, staff time presents the largest component of cost (62% if total recurrent cost). Second, for most of the other components of cost, (e.g., general supplies, overhead items such as utilities and the like) there is likely a direct and proportional association between the amount of labor time consumed and the amount of other resources consumed.

Allocation of basic medical staff cost:

As described above in the data collection section, staff logs were used to record the amount of patient contact time a sample of the staff at each facility spent on the various categories of service in the list of specific services.[13] Thus for each type of staff j, one can calculate the proportion of total patient contact time that type of staff spent on each specific health service. The calculation is shown in **Equation 3** .

[13] Because of the way the staff logs were collected, not all procedures were necessarily observed at all facilities. For example a facility may provide deliveries but one was not observed at a particular facility during the period when staff logs were being kept. Where there was missing data for a particular procedure at a facility, the average time requirements for the procedure from facilities of the same group was used to fill in missing values. See the appendix for a description of how the facilities were placed into homogenous groupings.

$$\alpha_{i,j,n} = \frac{t_{i,j,n} Q_{i,j,n}}{\sum_{i=1}^{I} t_{i,j,n} Q_{i,j,n}} \quad \textbf{(3)}$$

*where* $\alpha_{i,j,n}$ *is the proportion of total patient- contact time staff type j spent on service i at facility n*
$t_{i,j,n}$ *is the time required to see one patient of service i by staff type j at facility n*
$Q_{i,j,n}$ *is the number of patients for service i seen by staff type j at facility n*

Using the proportion calculated in **Equation 3**, the total basic medical staff time for the i'th service is calculated in **Equation 4**.

$$TSC_{i,n} = \sum_{j=1}^{J} \alpha_{i,j,n} TSC_{j,n} \quad \textbf{(4)}$$

*where* $TSC_{i,n}$ *is the total basic medical staff cost for service i at facility n*
$TSC_{j,n}$ *is the total medical staff cost for for staff type j at facility n*
$\alpha_{i,j,n}$ *is as defined above*

The total recurrent cost for each service was estimated by adding the basic medical staff time allocated to the service, the administrative staff time allocated to the service,[14] and specific medicine or supply cost for that service, and amount of total overhead allocated on the percent of basic medical staff time used by that service, as stated in Equation 5.

$$TC_{i,n} = TSC_{i,n} + Admin_{basic,i,n} + Med_i + \beta_{i,n} OtherCost_{Basic} \quad \textbf{(5)}$$

*Where* $TC_{i,n}$ *is the total recurrent cost of service i at facility n*
$TSC_{i,n}$ *is basic medical staff cost allocated to service i at facility n*
$Admin_{basic,i,n}$ *is administrative expense at facility n allocated to service i*
$Med_i$ *is total cost of medicines and supplies used specifically by service i*
$\beta_{i,n}$ *is the percent of total staff expense devoted to service i* $= \frac{TSC_{n,i}}{TSC_n}$
$OtherCost_{Basic}$ *is the total amount of other overhead expenses*

[14] The procedures for allocating administrative cost to specific services are described in the appendix.

One additional issue relating to labor cost requires some discussion. This is the issue of "down time." Obviously, not all staff time is spent in direct contact with patients. Though a staff member may be being paid for eight hours per day at a facility, every minute of those eight hours is not spent seeing patients. Non-patient-contact time may be spent performing administrative duties such as record keeping. It may be spent performing tasks such as instrument sterilization, straightening up the examination room and so forth. It is also likely the case that, because patients are unlikely to appear in a constant continuous stream, some time may be spent just waiting for patients. And finally there may be some "wasted" time when staff engages in personal business or activities rather than the business of the facility. As will be discussed in greater detail in the next section, these issues are most important to the issue of efficiency, however the issue of efficiency appears noticeable in the analysis of cost, particularly unit cost. Estimates of the percent of "down time" were made for each facility based on the staff patient contact logs.[15] "Down time" was distributed to the various services on a proportional basis based on patient contacts. Thus if 75% percent of patient contact time was for prenatal visits, 75% of the down time was allocated to prenatal services. The total cost calculation for the facility and for individual services at the facility include the cost of "down time" calculated as described. This "down time" is highly relevant to our measures of efficiency and is discussed in greater detail in the section on efficiency measures.

**III. Cost Results**

All 52 public facilities in the primary study group were surveyed using the detailed facility survey form. Of these, responses from 47 of the facilities were sufficiently complete to construct the cost measures described above. **Table 2** shows the distribution of the responding facilities by department and facility type. Because of the small number of hospitals, all hospitals were put into a single hospital category.

[15] The time-allocation logs cover a given number of hours based on the start time of the first patient contact and ending with the end time of the last recorded patient contact. By dividing the total number of patient contact hours by the total number of hours the log was kept, an estimate of the percentage of that staff member's time that involved no contact with patients was obtained. It should be noted that the cause of the "down time" is not known.

**Table 2** Number of Facilities Subject to Full Cost Survey

(number of facilities with incomplete data shown in parentheses)

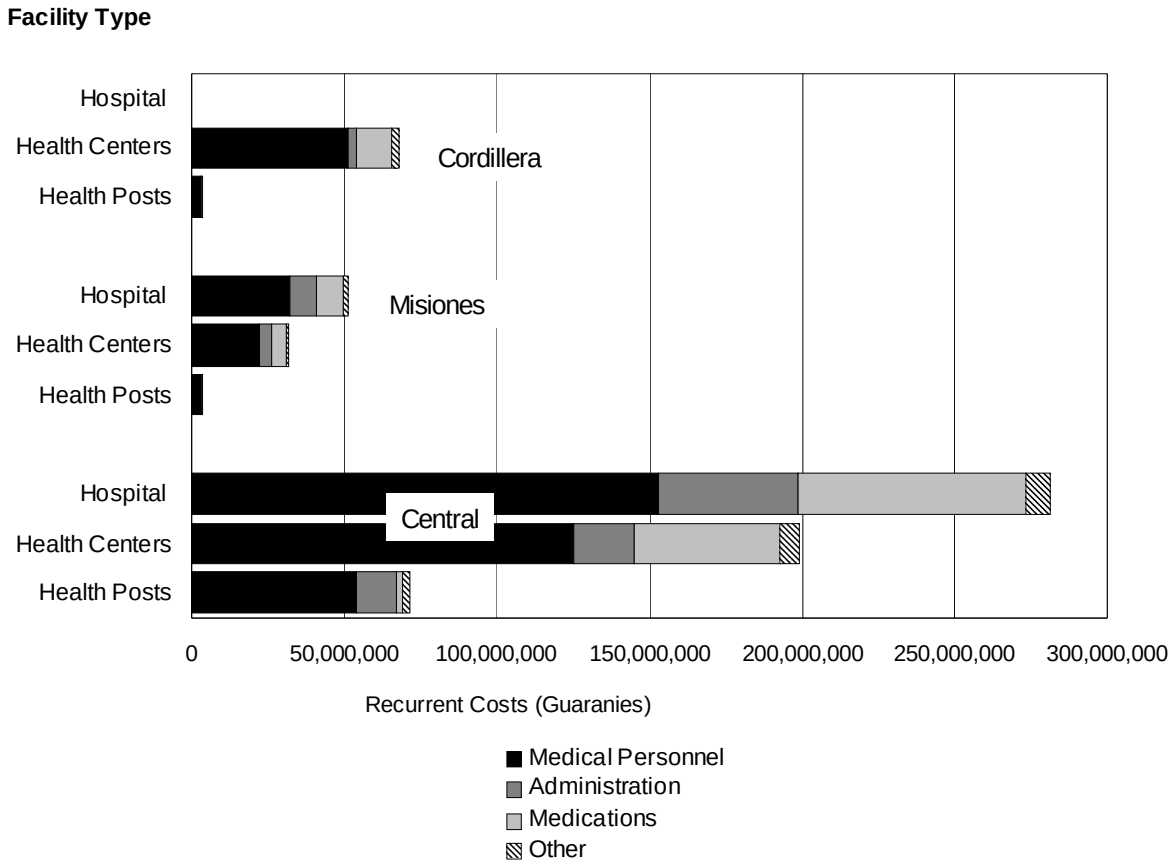
| | Department | | | |
|---|---|---|---|---|
| Facility Type | Cordillera | Missiones | Central | Total |
| Hospitals | 0 | 1 | 2 | 3 |
| Health Centers | 6 | 3 | 9 | 18 |
| Health Posts | 4 | 7 (2) | 20 (3) | 31 (5) |
| Total | 10 | 11 | 31 | 52 (5) |

The total recurrent cost per month was calculated for the 47 facilities with complete data. The 47 facilities had an average total recurrent cost for basic health services of 709.6 million Guaranies (US$252,091) per month. **Figure 1** shows the total recurrent cost per month broken down by department and facility type. It should be noted that these figures do not cover the entire department. Our survey includes 10 of 19 municipalities in Central covering 50% of the total department population, 6 of 20 municipalities in Cordillera covering 35% of the total department population and 4 of 10 municipalities in Misiones covering 39% of the total department population.

Central, which is the most populous department, accounted for 78% of the total recurrent cost per month, and Cordillera and Misiones accounted for 10% and 12%, respectively. Central's proportion of total recurrent cost is not surprising given that more than half of the facilities sampled are in this department. Central accounts for 78% of the basic health care costs, but it accounts for 84% of the population in sampled municipalities. Even though Misiones and Cordillera have roughly the same total cost, the sampled municipalities in Cordillera contain roughly twice the population of the sampled municipalities in Misiones, the least populated of the three study departments. On a per capita basis the sampled municipalities in Misiones have the highest spending, averaging 2,281.27 Guaranies (US$0.81) per person per month. Per capita spending in the sampled municipalities of Central and Cordillera is virtually identical at 946.13 Guaranies (US$0.34) and 921.20 Guaranies (US$0.33) per person per month, respectively. (The appendix presents additional tables and figures on the estimated costs.)

**Figure 1**

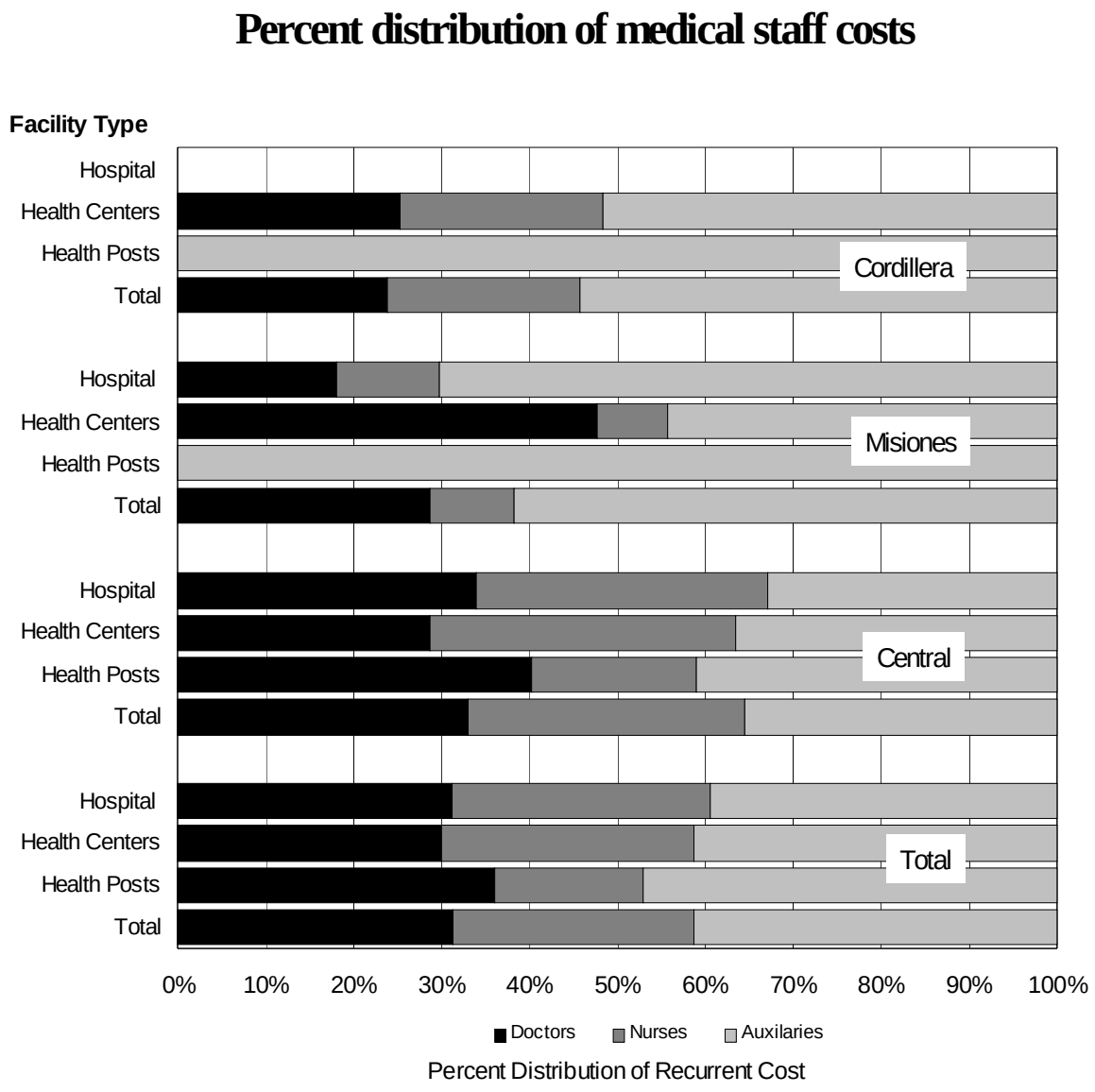
## Distribution of total recurrent cost, by department and facility type




Medical staff costs constitute 63% of total recurrent costs. Thirteen percent is administrative staff cost; 21% is the cost of specific medicines and supplies; and 3% is for other recurrent overhead expenses. As shown in **Figure 2**, there is some variation in the composition of staff costs by department and facility type. Overall, 31% of medical staff costs are for physicians, 27% for nurses, and 41% for auxiliaries. There is a slight variation in the distribution of medical staff costs by facility type and substantially more variation by department. By facility type for all departments, physicians accounted for 31% of medical staff expenses in hospitals compared to 30% in health centers and 36% in health posts. Nurses represented 39% of medical staff expenses in hospitals and health centers, and 17% in health posts, while auxiliaries accounted for 39% of staff expenses in hospitals, 41% in health centers, and roughly 47% in health posts. The distribution of total recurrent staff costs is largely influenced by the distribution pattern of Central.

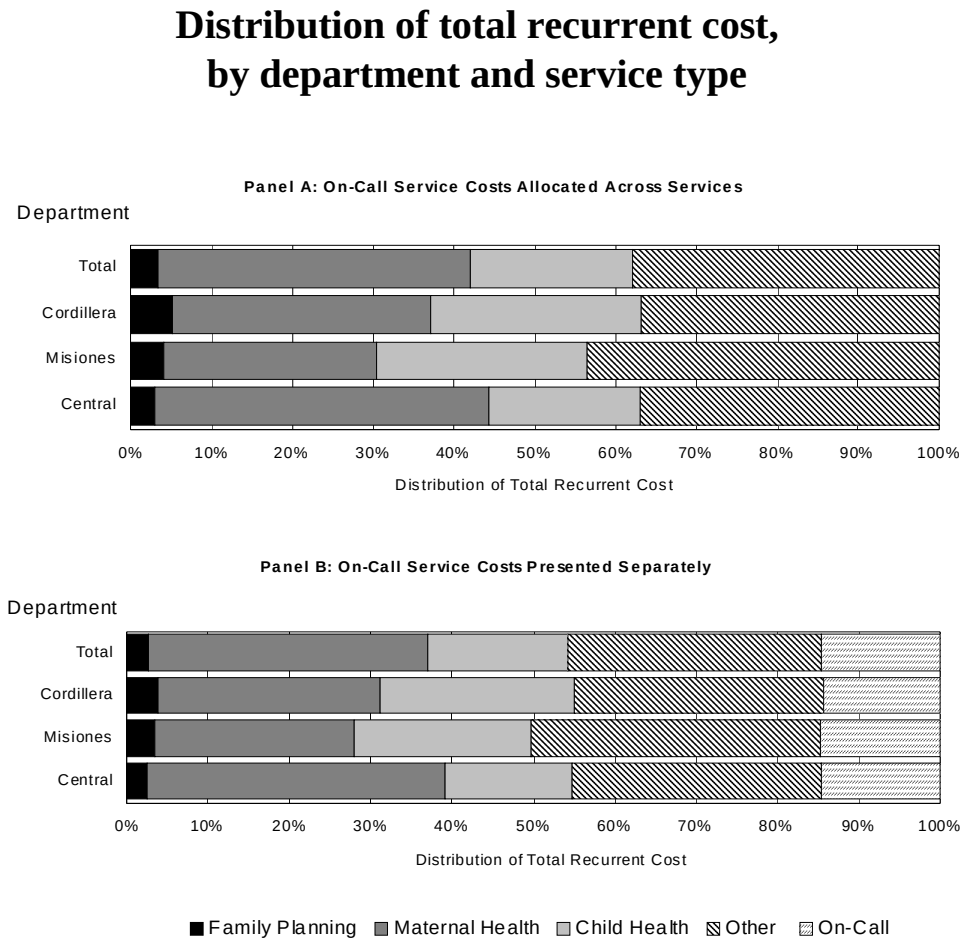
Costs of individual services were calculated for each of the specific services presented in **Table 1**. Not all facilities offered all services, so the number of observations used in the calculation of the service specific costs will vary. By costing the individual services, it is possible to see how the total resource cost is distributed across different activities. **Figure 3** shows the distribution of total recurrent cost across the major health service categories - family planning, maternal health, child health, and other services. These data are presented in two ways. In Panel A of the figure, the cost of "on-call" service provision is allocated across all services. In Panel B, the resources devoted to "on-call" service provision are separated out. The cost of on-call service provision accounts for roughly 14.6% of

**Figure 2**



total costs. Overall, if one allocates the on-call costs proportionately across all services, maternal health services account for the highest proportion of total recurrent costs at 39%, followed closely by other services at 38%, 20% for child health services, and 3% for family planning services (see Panel A). Were one to allocate all on-call costs to deliveries, maternal health would account for 49% of total recurrent costs (see Panel B). There are some variations by department in the service-specific distribution of total recurrent costs. Compared to the other two departments, Central spent a larger percentage of its resources on maternal health and lower percentages on child health and family planning. **Figure A.1** In the appendix presents the same information presented in **Figure 3**, though disaggregated to the level of specific basic health service, department and type of facility. The figure includes the cost of "on-call" services as a separate cost category. The largest single use of resources is for the bundled "other services" accounting for 31% of total recurrent costs. Deliveries account for the next largest expenditure of resources. Combined, the cost of normal and complicated deliveries account for 27% of total recurrent costs. If one were to allocate the entire cost of on-call services to deliveries, its share would increase to 42% of total recurrent cost. With the exception of immunizations, which account for slightly less than 11% of recurrent costs, all other services are each less than 5% of the total with the smallest percentage of resources going to treat diarrhea and to provide post-natal care. An examination by department shows a similar pattern, though there is considerable variation in the pattern of resource distribution across departments. In general, the distribution of resources across facility types generally conforms to expectations. More sophisticated facilities (hospitals and health centers) tend to devote larger proportions of their resources to more complicated medical procedures such as deliveries. The one interesting result here is for health posts in Central where only about 35% of the facility resources go to maternal and child health activities.

**Figure 3**




The average cost per unit (or visit) for each specific service was calculated by dividing the total monthly cost allocated to the service by the total number of visits for that service during a one-month period. These results are presented in **Figures 4** and **5**. These figures show the average cost of the services without including the cost of staff time used in the provision of on-call services. Had the cost of on-call services been proportionally allocated across all services, average costs of each would have been roughly 15% higher than reported in the figures. The average unit cost of deliveries was several orders of magnitude larger than the unit cost of the other services examined. Immunizations represented the smallest cost on a per unit basis. As a general observation, unit costs for most

services appear to be higher when delivered in a hospital or health post setting, though health posts appear to provide family planning, immunizations and growth monitoring at the lowest cost.

**Figure 4**

## Average cost of specific health services, by facility type (weighted by service quantities)

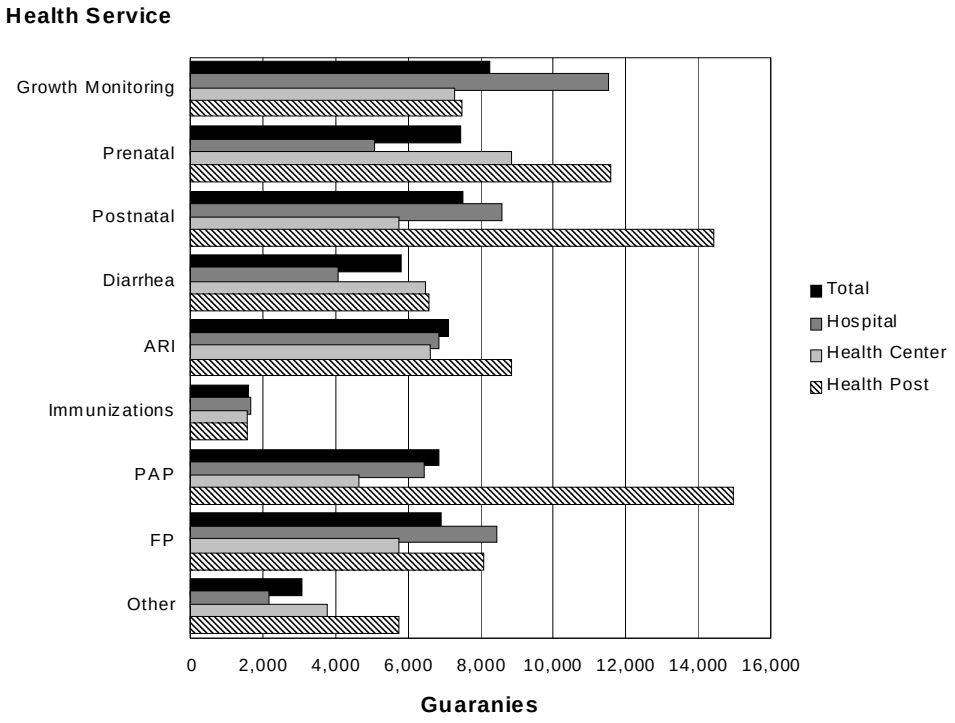
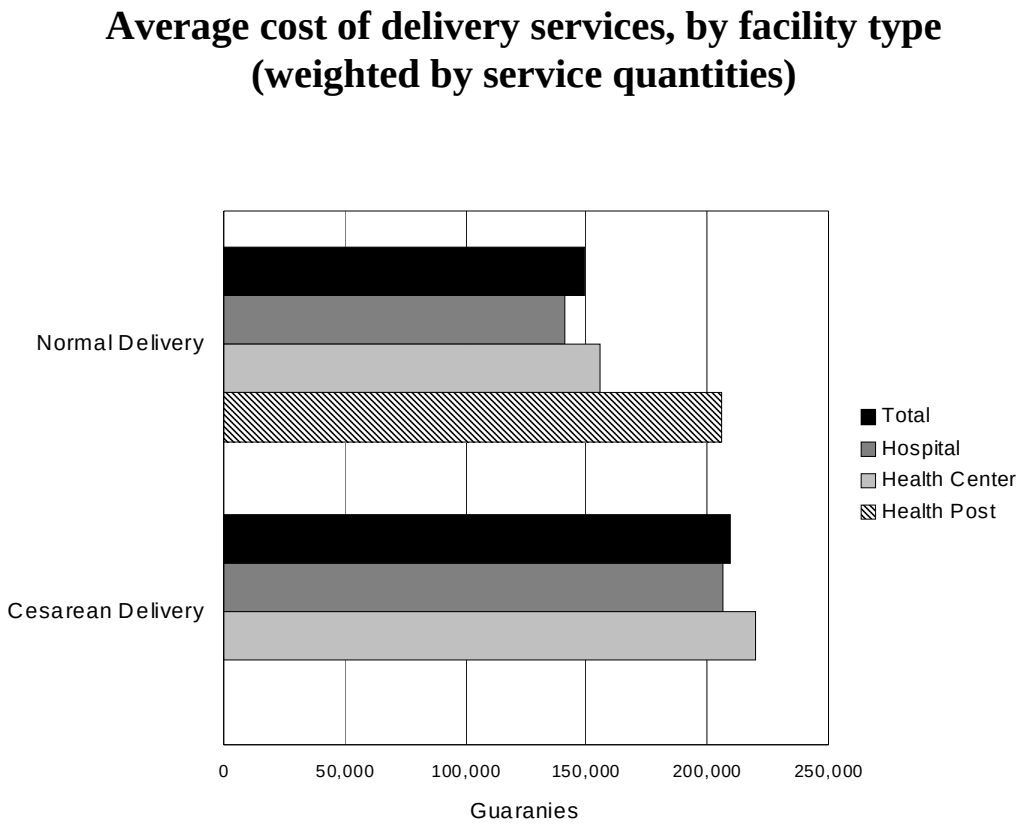


**Figure 5**




As shown in **Figure 5**, the average cost for a normal delivery is similar in hospitals and health centers, and more expensive in health posts. There is also a small difference in the unit cost of a Cesarean section procedure, which is not performed in health posts. It is also interesting to note the effect of allocating on-call service provision to the cost of deliveries. One principal reason for making staff available 24 hours a day is so that delivery services can be offered. If all of the cost of providing this on-call staff is allocated to deliveries, the average cost per delivery increases by 54% across the entire sample. It increases the most in health post (81%) and the least in health centers (46%). These cost estimates provide a part of the picture of health care service provision. They provide a measure of the total amount of resources currently in use by the public sector to provide health care services. In addition they show how those resources are currently distributed across departments, facility types, and types of care provided.

Another striking feature of the average cost estimates is the high degree of cross facility variability. **Table 3** reports the means, standard deviations, and minimum and maximum values for each service.

**Table 3** Average Cost per Visit for Different Services (Guaranies per Visit)

(Not all facilities offer all services)

| Service | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Growth Monitoring | 28 | 10879.8 | 9894.682 | 1386.525 | 32266.77 |
| Prenatal | 45 | 12332.81 | 22505.36 | 1091.579 | 144427.3 |
| Postnatal | 30 | 6488.488 | 5246.934 | 1128.013 | 20950.9 |
| Diarrhea | 37 | 8061.611 | 9151.339 | 597.0662 | 39437.88 |
| Respiratory | 46 | 7948.816 | 8619.256 | 1152.069 | 47893.58 |
| Immunizations | 24 | 1927.741 | 1479.874 | 258.5388 | 7439.236 |
| Normal Delivery | 25 | 157282.9 | 32233.32 | 110913.1 | 220754.3 |
| Caesarian Delivery | 6 | 217796.7 | 12555.02 | 202750 | 236064.5 |
| Family Planning | 45 | 7689.775 | 6521.11 | 2139.615 | 37499.68 |
| Other Service | 47 | 4821.774 | 3661.843 | 406.4552 | 17923.36 |

## IV. Efficiency

Concepts

The economic concept of efficiency describes the issue of how well resources are being used in the production of a good or service. The theoretical concept of efficiency involves two parts. The first requires that given a particular bundle of resources (described by the quantity of each type of input) that the maximum quantity of output that is technically possible to produce is, in fact, produced. The second requires that, given the price of each type of resource, the bundle of resources that is used is the bundle that would require the minimum total expenditure on resources. These two together constitute technical efficiency in production. Together they are equivalent to cost-minimizing behavior by the facility.[16]

As a practical matter, true economic efficiency in production is an unachievable goal. For the purpose of this study, what is important is relative efficiency. Are some types of facilities more efficient in the production of services than others, or does the efficiency of production improve after decentralization relative to what it was before decentralization?

This study will concentrate on one dimension of production efficiency – the efficiency of staff-time utilization. Efficiency of staff utilization is of critical importance for a number of reasons. First, staff costs represent a major proportion of total service provision cost. As was seen in the findings of the section on cost, 63% of the recurrent cost of basic medical care are medical staff costs. Second, previous research has shown that a major source

[16] Again, it is important to stress that this concept is based on quality of the output being a constant.

of variation in relative efficiency across facilities is the result of differences in staff utilization.[17] Finally, staff utilization is the easiest of the efficiency concepts to observe, quantify and analyze.

Variation in staff-utilization efficiency and staff costs can result from a number of factors, including

- Overstaffing facilities relative to the demand for services
- excessive demand placed on staff time for administration and other activities unrelated to the production of health services
- differences in staff effort
- unevenness in the time pattern of demand for services, e.g., too many patients at certain times of day or on certain days of the week, too few patients at other times
- inappropriate use of various staff categories, e.g., providing services with higher paid doctors that could be performed by lower paid nurses

Though each of these factors represents different underlying causes of these variations, it is important to recognize that each can be affected by administrative and organizational choices. How staff time is allocated to facilities and activities is a choice the health system can make and those choices can lead to either higher or lower efficiency. The same is true with respect to such organizational decisions as staff supervision, facility location and operating schedules, and types of services provided at various types of facilities.

Staff utilization rates:

Staff utilization rates measure the degree to which staff time is used in the production of services relative to staff "down time." For each of the basic health services, including other services, the average time per patient contact was constructed using data obtained from the time-allocation logs. Staff utilization rates were constructed for each type of staff.

An average time requirement ($\gamma$) was estimated for each type of service (i), for each type of staff (j), in each facility (n) as shown in **Equation 6**.

$$\gamma_{i,j,n} = \textit{the average time spent by staff type } j \textit{ on case type } i \textit{ at facility } n \qquad \textbf{(6)}$$

By multiplying $\gamma_{i,j,n}$ by the total quantity of service type i provided by staff type j at the facility over a specified period of time ($Q_{j,n}$), the total amount of staff time devoted to that activity is obtained.

[17] See Stewart, J.F., D. K. Guilkey, A. N. Herrin, and R. H. Racelis (1997) and Stewart and Koffi (1997).

$$\tau_{i,j,n} = \gamma_{i,j,n} Q_{i,n}$$

*Where* $\tau_{i,j,n}$ *is the total amount of time spent providing service i by staff type j at facility n*
$\gamma_{i,j,n}$ *is the average time spent providing service i by staff type j at facility n*
$Q_{i,n}$ *is the total quantity of service i by staff type j at facility n* **(7)**

The total amount of staff time of type j and facility n required to produce the entire mix of service produced by the facility can be obtained by adding up $\tau_{i,j,n}$ across all the services. Thus $T_{j,n}$, represents the total amount of staff type j that would be required to provide all the services provided by that type of staff at facility n.

$$T_{j,n} = \sum_{i=1}^{I} \tau_{i,j,n} \quad \textbf{(8)}$$

The staff utilization rate (SUR) is simply the total staff time required to provide the package of services at a facility ($T_{j,n}$) divided by the total amount of time of staff type j which is employed by the facility. This relationship is shown in **Equation 9**.

$$SUR_{j,n} = \frac{T_{j,n}}{S_{j,n}}$$

*Where* $SUR_{j,n}$ *is the Staff utilization rate for staff type j at facility n*
$T_{j,n}$ *is the total amount of time of staff type j reguired to provide all services at facility n*
$S_{j,n}$ *is the total amount of staff time for staff type j that is employed by facility n* **(9)**

The staff utilization rate by staff type serves as a good measure of cross-facility and cross-municipality efficiency. A value of 1 for $SUR_{j,n}$ would indicate that at facility *n*, staff type *j* is spending 100% of their time in patient contact. The difference of 1-$SUR_{j,n}$ is an estimate of the proportion of "down time" by staff type *j*. As discussed above, there are a variety of possible reasons for "down time." One would not expect down time to be zero. As was the case with staff productivity measures, the treatment of on-call services matters in the calculation and interpretation of staff utilization rates. The total amount of staff time used in the calculation $S_{j,i}$ could be measured as either the total hours employed at the facility or the total amount employed during normal hours of operation.

Though one could aggregate staff utilization rates across the different types of staff at the same facility to get an overall rate of staff utilization, this would not take into account the discrepancies in cost of different types of staff. A relatively underutilized doctor is more expensive than an underutilized nurse because the doctor's salary is greater. The final efficiency measure we employ – the total staff utilization rate – is the ratio of total labor cost to total incremental labor cost. Incremental labor cost is defined as the direct cost of the patient contact ignoring all "down time." Thus, the total incremental cost (TIC) for all services provided at a facility during a specified time period can be written

$$TIC_n = \sum_{i=1}^{I} \sum_{j=1}^{J} W_{j,n} \gamma_{i,j,n} Q_{i,n}$$

*Where* $TIC_n$ *is the total incremental costs for all services provided at facility* $n$
$W_{j,n}$ *is the wage rate for staff type* $j$ *at facility* $n$
$\gamma_{i,j,n}$ *is the average time spent providing service* $i$ *by staff type* $j$ *at facility* $n$
$Q_{i,n}$ *is the total quantity of service* $i$ *provided by staff type* $j$ *at facility* $n$ **(10)**

The total staff utilization rate (SUR) for each facility therefore is

$$SUR_n = \frac{TIC_n}{TSC_n}$$

*Where* $TSC_n$ *is the total medical staff cost at facility* $n$*, defined as*
$TSC_n = \sum_{j=1}^{J} W_{j,n} Hours_{j,n}$ *(as defined in Equation* 1**)** **(11)**

Efficiency Results

Total and staff-specific utilization rates were calculated by facility and are presented for each type of facility and for each department in **Figure 6**. Panel A shows the results when on-call hours are included in the calculation and Panel B shows the results when the on-call hours are removed. A complete table of the staff utilization rates by department and facility type appears in the appendix (See table A.5).

It is important to keep in mind the interpretation of the staff utilization rates. A useful way of thinking about them is as follows: they are a ratio of the total amount that would have been paid to staff if they had been paid only

for patient contact[18] hours to the total amount the staff was actually paid. The second thing to keep in mind is that while 100% would, in theory, represent perfect efficiency, in the real world the rates will be lower for all of the reasons described above.[19] In fact, the total staff utilization rate of 53% (73% with on-call hours excluded) compares favorably with staff utilization rates of family planning staff in the Philippines and West Africa where similar methods have been employed.

With the exception of Misiones, the utilization rate of doctors' time is relatively high and does not vary tremendously across facility types or departments. Other staff types, though used with roughly equal efficiency in hospitals, show much lower utilization rates in health centers and health posts. The one exception to this generalization is the utilization rate of nurses in Misiones.

## V. Conclusions

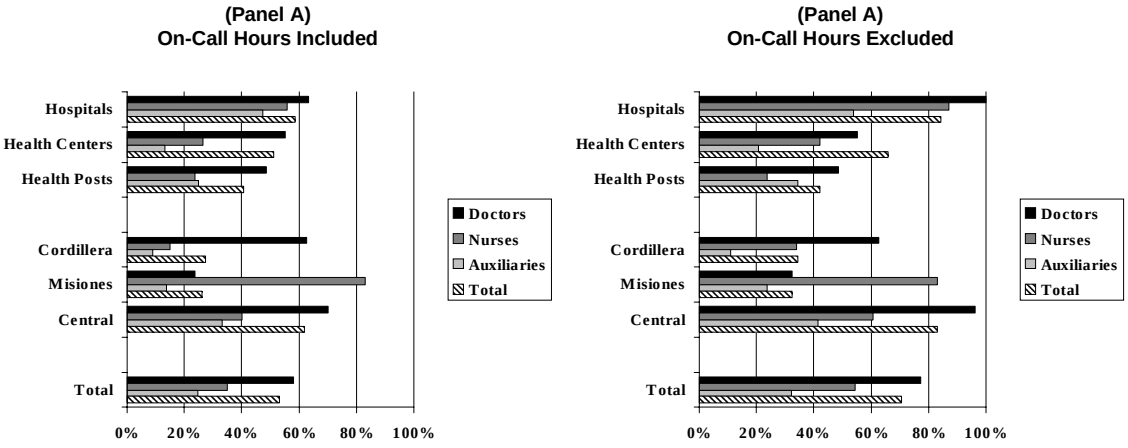
This paper provides a set of facility specific cost and efficiency estimates disaggreated by service for a sample of public health care facilities in Paraguay. To our knowledge this is one of the first studies that presents cost and efficiency estimates for a number of reproductive health services. The estimates show substantial differences in cost that vary with the type of service being provided, and the type of facility providing it. The big unanswered questions are the sources of the large observed variations in cost across facilities. The relationship between cost and the characteristics of the population being served and the structural organization of the health care system will be one direction for our future research.

[18] For auxiliary nurses in facilities where there is no administrative staff to handle patient registration, the patient registration time is added to the patient contact time of the auxiliary nurses.

[19] It should be noted that staff-utilization rates may exceed 100% if the actual time spent with a patient is lower than the "required time" per patient visit. This can occur if the time reported on the log overstates the actual amount of time spent with a patient. The utilization rates calculated with on-call hours excluded can also exceed 100% because some of the patients seen were likely seen outside of regular hours of operation. A combination of these factors likely explains the staff utilization rates for doctors in Central that exceed 100% as shown in Appendix Table A.6.

**Figure 6**

## Medical staff utilization rates, by facility type and department



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## Appendix

This appendix contains a detailed explanation of the technical issues involved in generating the cost and efficiency measures reported in this paper.

**Health Care Output Measures.**

The health statistics information system of the Ministerio de Salud Pública y Bienestar Social (MSPBS) was designed to provide information on health services offered by the public health facilities. Even though it provides information on output levels for specific health services, this information is not sufficiently disaggregated to calculate unit costs for each type of service. The output data used for this study was obtained from the September 1998 Report on Services Provided for the Cordillera, Central, and Misiones health regions. A special worksheet was designed to calculate the output level for each basic health service provided by each facility. For each basic health service, the worksheet recorded output levels by type of staff (physicians, licensed nurses or obstetric nurses, and auxiliary nurses). Output levels for other types of services for each facility were also calculated.

In order to include in the analysis the output of health services that are not considered basic health services we created an "other" service category. To standardize the different outputs we used weights that were based on production time equivalents. This standardization allowed us to convert the outputs of different services to a single unit of measurement, which could then be aggregated. The types of health services that are included in the "other" service category are presented in **Table A.1**.

The service base used for constructing the time equivalents is the "other clinic consultation" category, which requires an average of 10 minutes. The service equivalence factors are calculated according to the time required for each service relative to the time required for the service base. For example, a diabetes consultation requires an average of 20 minutes, which is the equivalent of two "other clinic consultations." Therefore, the equivalence factor for a diabetes consultation is 2. The average time required for each service was obtained by interviewing public facility medical staff experienced in the delivery of these services.

**Table A.2**. presents the calculated service equivalencies for a variety of health services. For purposes of standardizing the measurement unit, we multiplied the equivalence factor for each service by the output level for that

service. The standardized output measures for each service were then added to obtain a single measure, which constitutes the "other" services category.

**Table A.1: List of Other Services**

| | |
|---|---|
| Leprosy consultation | Minor surgery |
| AIDS and TB consultations | Casting |
| Sexually Transmitted Disease consultation | Nebulization |
| Cardiovascular disease management | Dental services |
| Diabetes consultation | Dental health talks |
| Cancer consultation | Sample collection (for facilities without laboratory) |
| Accidents | Home visits |
| Other clinic consultations | Interviews |
| Cures | Clubs |
| Injectables | Talks |

**Table A.2.**
**Equivalence Factors for Other Types of Health Services**

| Health Service | Average time required to provide service (in minutes) | Equivalence factor |
|---|---|---|
| Leprosy consultation | 20 | 2.00 |
| AIDS and TB consultation | 20 | 2.00 |
| STD consultation | 20 | 2.00 |
| Cardiovascular disease | 20 | 2.00 |
| Diabetes consultation | 20 | 2.00 |
| Cancer consultation | 20 | 2.00 |
| Accidents | 20 | 2.00 |
| Other clinic consultation | 10 | 1.00 |
| Cures | 15 | 1.50 |
| Injectables | 5 | 0.50 |
| Minor surgery | 20 | 2.00 |
| Casting | 0 | 0.00 |
| Nebulization | 8 | 0.80 |
| Dentist interventions and emergencies | 20 | 2.00 |
| Dental health talks | 20 | 2.00 |
| Sample collection (for facilities without laboratory) | 15 | 1.50 |
| Home visits | 20 | 2.00 |
| Interviews | 10 | 1.00 |
| Clubs | 30 | 3.00 |
| Talks | 20 | 2.00 |

**Estimating Administrative Cost**

As noted in the text, estimating administrative expense creates two problems. The first of these occurs mainly at small facilities where there is no administrative staff, but rather only medical staff who must perform the necessary administrative duties. This was the case in 19 of the 26 health posts in the sample. The second problem occurs in facilities that have administrative staff and that offer services that were not included in our output measures of basic health care.

Time dedicated to patient registration

A major administrative function is the registering of each patient at the facility. This process occurs for each patient visit. Using data from the staff logs we determined that in facilities with no administrative staff patient registration was done, almost universally, by an auxiliary nurse. The average time spent registering each patient was five minutes. Thus, the total amount of auxiliary nurse time required for patient registration can be estimated as

$$t_{reg} = \frac{5}{60} x\, Q_{total} \quad \text{(A.1)}$$

*Where* $t_{reg}$ *is the number of hours per month required for patient registration*
$Q_{total}$ *is the total number of patients per month*

Total administrative staff costs in facilities without administrative staff

The total time of the staff member will be divided between providing patient care, administrative duties (including patient registration) and some time where none of these tasks are being performed (referred to as down time). As described in the efficiency section of the text, down time was allocated across activities in proportion to the time spent in each activity. For auxiliary nurses who performed administrative duties in the small clinics, patient registration was included as one of the activities and down time was allocated to the administrative staff cost category as described. Thus, for these facilities total administrative staff cost is estimated by

$$Total\ administrative\ staff\ cost = \frac{t_{reg}\, x\, Wage_{aux}}{(1 - proportion\ of\ auxilliary\ nurse\ downtime)} \quad \text{(A.2)}$$

*Where* $Wage_{aux}$ *is the hourly wage rate for auxiliary nurses*

Total administrative staff costs in facilities with administrative staff

For facilities with administrative staff, the total administrative expense was estimated by multiplying the total hours of administrative staff by the wage rate of administrative staff. The problem here is that many of these facilities produced services that were not included in our output measures of basic health care. It was necessary to allocate the cost of administrative staff between the services covered by this study and other services. This was done by examining the relationship between the total number of administrative hours employed at the facility, the number of medical staff hours for staff members who provided the basic health care services and the number of staff hours providing services not covered by this study. The regression results, presented in **Table A.3**, indicate a positive relationship between the number of medical staff hours and the number of administrative staff hours. Increasing the number of staff hours of staff that provide basic medical care, however, has a substantially smaller effect on administrative staff hours than increasing the staff hours of more specialized staff. The coefficients of this regression were used to allocate the staff expense between basic care and other care.

**Table A.3.**
**Results of Regressing Administrative Staff Hours on Basic and Other Medical Staff Hours in Health Facilities with Administrative Staff**

| Variables | Coefficient | Standard Error | *p*-value |
|---|---|---|---|
| Basic Medical Staff Hours | .275 | .062 | .000 |
| Other Medical Staff Hours | .967 | .389 | .020 |

Notes: n=28, Adjusted-$R^2$=.767

Thus administrative staff expense was estimated by

$$Adm_{basic} = Wage_{adm} Hours_{adm} \left[\frac{.28 Hours_{basic}}{.28 Hours_{basic} + .97 Hours_{OMed}}\right] \quad \text{(A.3)}$$

Where $Adm_{basic}$ is the estimated administrative staff cost for basic health care
$Wage_{adm}$ is the hourly wage rate for administrative staff
$Hours_{adm}$ is the total number of administrative staff hours per month
$Hours_{basic}$ is the total number of staff hours per month for medical staff providing basic care
$Hours_{OMed}$ is the total number of staff hours per month for other medical staff

Allocating administration cost to specific services

As noted above, patient registration is the one specific administration function we consider explicitly. For each patient receiving a particular service we estimated a five-minute time requirement for administrative personnel to register the patient. The remaining administrative time was allocated across services in proportion to the total cost of basic medical staff allocated to that service.

$$Admin_{Basic,i} = \left(Wage_{Admin} Q_i \frac{5}{60}\right) + \alpha_i \left(Admin_{Basic} - \sum_{i=1}^{I} Wage_{Admin} Q_i \frac{5}{60}\right) \quad \text{(A.4)}$$

where $Admin_{Basic,i}$ is the estimated administrative staff cost for service $i$
$Admin_{Basic}$ is the total estimated administrative staff cost ( as defined above)
$Wage_{Admin}$ is the hourly wage rate of administrative staff
$Q_i$ is the total number of patients per month forservice $i$
$\alpha_i$ is the proportion of basic medical staff cost allocated to service $i$

# Figure A.1
# Percentage distribution of recurrent costs, by service and facility type

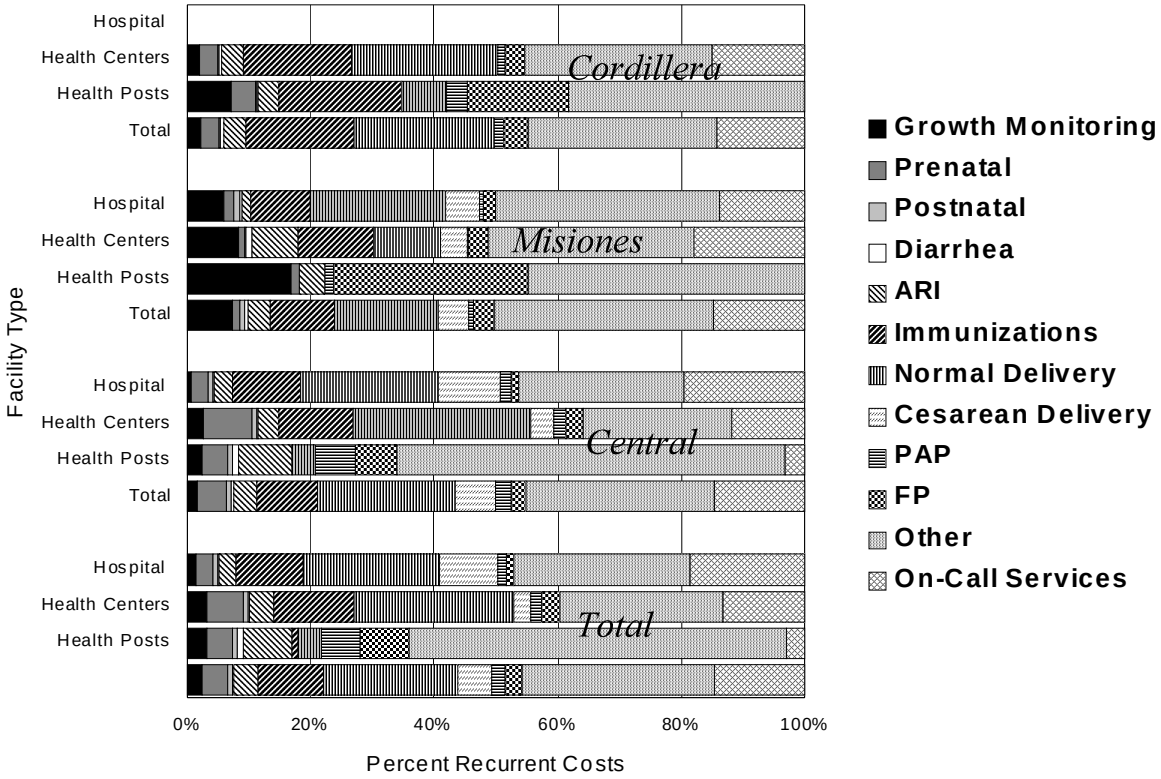

**Table A.4.**
**Total Recurrent Costs by Department and Facility Type (in Guaraníes)**

| Department and Staff Type | Hospital | Health Centers | Health Posts | Total |
|---|---|---|---|---|
| **Cordillera** | | | | |
| Doctors | - | 12,890,604.00 | - | 12,890,604.00 |
| Nurses | - | 11,864,760.00 | - | 11,864,760.00 |
| Auxiliary Nurses | - | 26,369,442.00 | 3,000,211.20 | 29,369,653.20 |
| Medications | - | 2,882,359.80 | - | 2,882,359.80 |
| Administration | - | 11,683,818.00 | 339,702.00 | 12,023,520.00 |
| Other | - | 2,556,240.00 | 95,565.76 | 2,651,805.76 |
| TOTAL | - | 68,247,223.80 | 3,435,478.96 | 71,682,702.76 |
| **Misiones** | | | | |
| Doctors | 5,841,942.00 | 10,711,260.00 | - | 16,553,202.00 |
| Nurses | 3,710,287.00 | 1,799,499.90 | - | 5,509,786.90 |
| Auxiliary Nurses | 22,700,000.00 | 9,929,808.00 | 3,168,223.50 | 35,798,031.50 |
| Medications | 8,300,641.00 | 3,865,113.00 | 178,533.20 | 12,344,287.20 |
| Administration | 8,989,140.00 | 4,360,776.00 | 95,210.00 | 13,445,126.00 |
| Other | 1,610,153.00 | 1,122,028.50 | 121,820.95 | 2,854,002.45 |
| TOTAL | 51,152,163.00 | 31,788,485.40 | 3,563,787.65 | 86,504,436.05 |
| **Central** | | | | |
| Doctors | 51,900,000.00 | 35,850,256.00 | 21,717,466.00 | 109,467,722.00 |
| Nurses | 50,700,000.00 | 43,484,040.00 | 10,210,808.60 | 104,394,848.60 |
| Auxiliary Nurses | 50,400,000.00 | 45,682,328.00 | 22,150,354.00 | 118,232,682.00 |
| Medications | 45,900,000.00 | 20,250,704.00 | 13,140,966.00 | 79,291,670.00 |
| Administration | 74,400,000.00 | 47,421,496.00 | 1,791,104.70 | 123,612,600.70 |
| Other | 7,644,972.00 | 6,250,831.20 | 2,554,428.50 | 16,450,231.70 |
| TOTAL | 280,944,972.00 | 198,939,655.20 | 71,565,127.80 | 551,449,755.00 |

**Table A.5.**
**Staff Utilization Rates (including "on-call" hours)**

| Facility Type | | Cordillera | Misiones | Central | Total |
|---|---|---|---|---|---|
| **Hospitals** | Doctors | - | 0.2206 | 0.8211 | 0.6315 |
| | Nurses | - | 0.8057 | 0.5330 | 0.5566 |
| | Auxiliaries | - | 0.1337 | 0.5710 | 0.4720 |
| | Total | - | 0.2269 | 0.6599 | 0.5846 |
| **Health Centers** | Doctors | 0.6271 | 0.2569 | 0.6555 | 0.5518 |
| | Nurses | 0.1508 | 0.8798 | 0.3282 | 0.2643 |
| | Auxiliaries | 0.0723 | 0.1381 | 0.1718 | 0.1315 |
| | Total | 0.2645 | 0.3153 | 0.6489 | 0.5122 |
| **Health Posts** | Doctors | - | - | 0.4853 | 0.4853 |
| | Nurses | - | - | 0.2380 | 0.2380 |
| | Auxiliaries | 0.3083 | 0.1394 | 0.2659 | 0.2477 |
| | Total | 0.5164 | 0.2117 | 0.4116 | 0.4064 |
| **All Facilities** | Doctors | 0.6271 | 0.2357 | 0.7017 | 0.5798 |
| | Nurses | 0.1508 | 0.8284 | 0.4009 | 0.3502 |
| | Auxiliaries | 0.0899 | 0.1366 | 0.3291 | 0.2459 |
| | Total | 0.2736 | 0.2610 | 0.6171 | 0.5294 |

**Table A.6.**
**Staff Utilization Rates (excluding "on-call" hours)**

| Facility Type | | Cordillera | Misiones | Central | Total |
|---|---|---|---|---|---|
| **Hospitals** | Doctors | | 0.3708 | 1.3725 | 1.0561 |
| | Nurses | | 0.8057 | 0.8737 | 0.8678 |
| | Auxiliaries | | 0.1581 | 0.6502 | 0.5388 |
| | Total | | 0.4089 | 0.9597 | 0.8638 |
| **Health Centers** | Doctors | 0.6271 | 0.2569 | 0.6555 | 0.5518 |
| | Nurses | 0.3396 | 0.8798 | 0.4648 | 0.4202 |
| | Auxiliaries | 0.0947 | 0.3586 | 0.2468 | 0.2042 |
| | Total | 0.4589 | 0.5366 | 0.8154 | 0.6921 |
| **Health Posts** | Doctors | | | 0.4853 | 0.4853 |
| | Nurses | | | 0.2380 | 0.2380 |
| | Auxiliaries | 0.3083 | 0.1394 | 0.3969 | 0.3417 |
| | Total | 0.5164 | 0.2117 | 0.4515 | 0.4432 |
| **All Facilities** | Doctors | 0.6271 | 0.3233 | 0.9621 | 0.7730 |
| | Nurses | 0.3396 | 0.8284 | 0.6058 | 0.5432 |
| | Auxiliaries | 0.1105 | 0.2378 | 0.4158 | 0.3204 |
| | Total | 0.4609 | 0.4507 | 0.8259 | 0.7331 |