

Cost Study for the Mother-Baby Package

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Preface

The effort to find new and more efficient ways to provide resources for health creates the need to study the distribution and use of economic resources coming from various sources.

This document, prepared by MotherCare Bolivia, studies the routes followed by the resources for health, the obstacles keeping such resources from attaining maximum efficiency, and the interventions in maternal-child health that require the highest level of cost and care.

The purpose of this document is to detect the principal obstacles encountered in allocating resources for the health sector so that they can be eliminated and so that the health services can succeed in covering increasingly larger numbers of patients more efficiently, reducing maternal and infant mortality and improving our country's standard of living. The study presents data from some of the country's health districts in order to determine which of them have the greatest deficiencies and which receive the greatest amount of funds relative to their needs. The report then presents the cost results obtained from the mother-Baby package¹ in the districts and compares them with the assessment carried out by the National Maternity and Childhood Insurance Program.

In addition, the study provides information on the cost of services by type of facility and intervention and is thus a useful and easily managed tool.

Guillermo Seoane
Director, MotherCare Bolivia

¹*The Mother-Baby Package developed by the World Health Organization and validated by MotherCare in this study was used to define a package of essential interventions for mothers and newborns, which can be applied in countries with characteristics similar to those of Bolivia.*

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Acronyms

AOP	Annual Operating Plan
CEASS	Health Provisions and Supply Office (<i>Central de Abastecimientos y Suministros en Salud</i>)
IEC	Information, Education and Communication
MCB	MotherCare Bolivia
MBP	Mother-Baby Package
MBPCS	Mother-Baby Package Costing Spreadsheet
PHR	Partnerships for Health Reform
PROISS	Comprehensive Health Services Project (<i>Proyecto Integrado de Servicios de Salud</i>)
SNMN	National Maternity and Childhood Insurance (<i>Seguro Nacional de Maternidad y Niñez</i>)
SNS	National Health Secretariat (<i>Secretaría Nacional de Salud</i>)
WHO	World Health Organization

I. Introduction

The health sector must now confront problems such as increased costs and the lack of optimal allocation of resources. Accordingly, new ways must be found to achieve greater economic efficiency in the provision of health services, particularly in developing countries that are currently implementing reforms in the sector.

Recognizing this problem and that bringing providers and users closer together could generate greater efficiency and quality within the system, the Bolivian health sector has introduced decentralized delivery of services.

Once health services delivery is decentralized, the central government transfers to local governments the shared resources that allow them to maintain, repair or renew the social infrastructure. Given that decentralization is very recent and because there are no data on the health sector in general and on costs in particular, it is very important to analyze resource allocation within the sector. Bolivia has few cost studies in the area of health, and because economic logic has been used in recent years to achieve optimal levels of quality and greater efficiency in allocating resources, new models to measure the cost of providing services must be developed.

The Mother-Baby Package

The Mother-Baby Package (MBP)² developed by the World Health Organization (WHO) in 1994 is used to define an area of essential interventions that must be implemented in developing countries in order to reduce maternal and neonatal mortality and morbidity as well as to assist health planners and managers to cost in a simple way ten basic health interventions with standardized treatment and increased coverage.³ The philosophy of the package is that management and service delivery must be integrated within the existing district health systems.⁴

Because of the advantages that the package offers, particularly in a country such as Bolivia, which has the highest maternal mortality rate in South America (390 for every 100,000 live births),⁵ and because of the health sector's limited resources, it was decided that MotherCare/Bolivia (MCB) should, in collaboration

² We can also call it the package of maternal-neonatal interventions.

³ Currently the coverage of maternal and neo-natal care has been increasing due to implementation of the Maternity and Childhood Insurance program.

⁴ Craig Lissner et al. *Costing the Mother-Baby Package: A Case Study in Bolivia*.

⁵ National demography and health survey (ENDSA), 1994. The World Health Organization did mathematical estimates for 1996 and found a maternal mortality rate for Bolivia of 650 for every 100,000 live births.

with the WHO and the Partnerships for Health Reform (PHR), study the feasibility of the package in the five districts where MC/B operates (Tables 1 and 2). This was done by analyzing and interpreting the Mother-Baby Package Costing Spreadsheet (MBPCS), the cost sheet for the maternal-neonatal package.

This study seeks to improve the use of new instruments that help health planners and local authorities, to both increase coverage and, estimate the level of spending on the ten basic health interventions through standardization of these interventions, in order to reduce maternal and neonatal morbidity and mortality in the medium and long term. The study also seeks to help technical-administrative staff to simply and rapidly obtain the costs of the maternal-neonatal package by district, municipality, department and other territorial divisions, assuming that they have immediate access to demographic and health care indicators.

Having pointed out the data limitations and the recent nature of decentralization, the study evaluates whether the introduction of the MBPCS by municipal governments will help provide policy-makers with general knowledge of the funds needed by the health services to handle these ten interventions, as well as help them standardize how the interventions are handled. A preliminary step in doing this is to learn how the MBPCS works, paying particular attention to its advantages and limitations.

To interpret the MBPCS, MC/B conducted two studies per district (El Alto, Santiago de Machaca, Valle Bajo, Sur Oeste and Valle Puna), for a total of ten studies, with half of the studies representing the health services' current situation and the other half, an ideal situation.

The **current situation** is defined as what was happening within the health facilities at the time the study was conducted in terms of wages and salaries, infrastructure, emergency transportation, costs of medications, inputs and supplies. The **ideal situation** is defined as what the MBP would become with the standard treatment line for the different illnesses covered by the package, according to the population in each district and assuming optimum infrastructure, transport, technical staff and staff training to enable them to resolve obstetrical and neonatal complications. The difference in costs between the ideal situation and the current situation represents the **additional costs**.

Table 1
Principal Characteristics of the Five
MotherCare/Bolivia Districts

Districts	Population	No. of Municipalities per district	No. of communities per district	Health Post	Health Center	Hospital
El Alto	150,000	1	1	2**	7	1
Santiago de Machaca	90,882	4	259	20	8	1
Valle Bajo (Quillacollo)	270,118	8	583	13	17	5
Sur Oeste (Capinota)	44,041	3	50*	6	5	1
Valle Puna (Sacaba)	106,700	2	302	4	5	2
Total	661,741	18	1,195	45	42	10

Source: 1997 cost survey and health facilities base line - MC/B, March 1997.

* Estimated data according to 1992 National Population and Housing Census.

** The two health posts indicated are now health centers. However, they were considered as health posts in light of their equipment and infrastructure.

Table 2**Demographic Indicators of the
MotherCare/Bolivia Districts**

District	Population	Women of child- bearing age	Pregnancies	Births	Children five years old
El Alto	150,000	36,381	4,138	3,793	21,564
Santiago de Machaca	90,882	22,993	3,127	2,866	11,107
Valle Bajo (Quillacollo)	270,118	65,639	1,995	10,997	43,341
Sur Oeste (Capinota)	44,041	10,702	1,916	1,756	6,968
Valle Puna (Sacaba)	106,700	25,928	5,317	4,874	18,299
Total	661,741	161,643	26,493	24,286	101,279

Source: Health facilities base line - MC/B, March 1997.

For the **current package**, a survey was designed to be administered in the five districts where MC/B operates. Work was also done with data from the Ministry of Health and Social Welfare (formerly the National Health Secretariat or SNS), the Comprehensive Health Services Project (PROISS), and the Annual Operating Plans of the municipalities.

The **ideal package** was compared with the data obtained from the national health care standard for women and newborns,⁶ as well as data from the WHO and the former National Health Secretariat.

The report is structured as follows:

Chapter one...the introduction

Chapter two...the methodological procedures carried out to develop the report

Chapter three...the analysis and interpretation of the results obtained

Chapter four...a comparison between the costs of the current package in district II of El Alto and the assessment made by the SNMN

Chapter five... the conclusion

⁶ The standards were developed by the Ministry of Human Development, the National Health Secretariat and MotherCare/Bolivia.

II. Methodology

Field work for this study on costing the Mother-Baby package was carried out in April and May of 1997. The interventions covered by this package are:

Maternity, including basic prenatal care treatment, normal delivery and postpartum during which the postpartum check-up is carried out

Diagnosis and treatment of severe anemia and sexually transmitted diseases such as syphilis and gonorrhea

Essential obstetrical care which covers the management of eclampsia, sepsis, hemorrhage, cesarean section (dystocia) and complications from abortion

Neonatal care, which covers infections, pneumonia and asphyxia in newborns

The MBP is presented on a calculation sheet (Excel),⁷ in which the estimated costs for providing ten Mother-Baby interventions are calculated. This work consists of eight sheets:

1. Demographics
2. Reference
3. Fixed costs
4. Variable costs
5. Health post
6. Health center
7. District hospital
8. Summary

The **demographics** sheet includes information on the population, epidemiology, and health facilities, their capacity and number.

The **reference sheet** provides information related to visits per patient, the reference standard, and the facilities where women have their first visit.

The **fixed costs** sheet provides information related to the salaries of medical and administrative staff, annual depreciation, infrastructure, maintenance and administrative costs, emergency transportation, IEC (Information, Education and Communication), and marketing.

In contrast, the **variable costs sheet** provides information regarding the treatment line per intervention (according to the level of the facility) and the total cost per intervention. The health post sheet, as well

⁷ Microsoft Corporation, MS Excel, version 5.0. Microsoft Corporation, Redmond, Washington, USA, 1995.

as the center and hospital sheets, provide information on costs per intervention.

The final and most important sheet is the **summary of results**, which links all the other sheets in order to calculate the total cost of the package: the cost per intervention and input, the cost per facility, per patient, and per capita, as well as estimated future costs per birth.

The calculation sheet presents a method for rapid estimating of the total cost of implementing the MBP. However, health planners are usually more interested in the additional cost to strengthen the existing health services in the Mother-Baby area. For this reason, two packages were analyzed (the current and the ideal).

Given the similarities between the MC/B interventions and the Mother-Baby Package, it was decided to apply the calculation sheet in the five MC/B districts to provide greater knowledge of the structure of the SNMN cost assessment. The WHO calculation sheet was reviewed to obtain data on standard costs⁸ (for the ideal package) and data on the current health services situation in Bolivia (for the current package). This package, calculated according to the terms of the ideal package, varies, depending on the government's programmed goals.

In order to make the study even more precise, research was done by district and by facility. The universe included in the sample consisted of the health facilities. The study was conducted with quantitative research procedures using the survey technique, with samples from districts with a population of less than 30. Thus—because it was impossible to measure the error (as this may be greater or smaller)—random sampling could produce results that are unrepresentative in terms of probability. However, the point is for the sample to be as representative of reality as possible. Thus, someone who is familiar with the population can be adequately trained to determine what elements are the most representative of that population. Therefore, situational or intentional components were present.⁹

The following steps were followed in developing the survey:

Design of the sample

Preparation of the questionnaire

Pilot test in a health center belonging to District II of El Alto

⁸ The importance here was the assistance given to us at the start by Gloria Metcalfe and Doctor Stanley Blanco, MotherCare staff, as well as the ongoing help of Dr. José Antonio Seoane, former director of the Hospital del Niño, and Dr. Alberto Suárez, former director of the Hospital de la Mujer, who reviewed the treatment line according to the dosage so as to ensure against the least possible defect in the dosage of medication. Also helpful was the protocol developed by the MotherCare team in collaboration with the former National Health Secretariat, for the treatment line to be followed according to complication.

⁹ See Meyer. *Probabilidad y aplicaciones estadísticas*, pp. 259-260 and W. Stevenson. *Estadística para administración y economía. Conceptos y aplicaciones*. pp. 185-215.

Field work
Data analysis and interpretation.

Selection was not random in the sampling used, but rather intentional and opinion-based, where the sample depends on the intention or opinion of the researcher. Taking these aspects into account, 35 percent of the health facilities were surveyed: 14 health posts, 13 health centers, and 7 district hospitals. The surveys were carried out by district, according to the type of facility, distribution and access. However, the option of doing a census to conduct the survey was discarded due to the benefits of the methodology described above such as rapid collection of information on the population—especially when elements are disperse—which implies a relatively low cost in comparison with a census.

The survey data on pregnant women according to the site of their first visit are:

Table 3
Pregnant Woman According to Site of First Visit

Site	Health Post	Health Station	Hospital
Total percent	15%	35%	50%

Source: MC/B cost survey.

These figures show us at what level pregnant women have their initial visit. One explanation for the

figures is that most of the interventions are obstetrical emergencies which must be handled at the secondary care level at least.

For the cost analysis, MC/B did a comparison between the current MBP and the ideal package (Bolivian) and finally a comparison between the current package of District II of El Alto and the SNMN costs. District II of El Alto was used as a reference because this district is the closest in terms of per capita cost (\$2.76) to the average of the five districts (\$2.84). (Table 5)

Table 4 shows more details on the type of information used for both packages. In addition, Table 4 shows that in order to conduct the study with all the required information, data was needed from various working sources, something that was not easy and took some time.

The assumptions used for the ideal package and the current package were:

1. The ideal package operates with 90 percent coverage; the current package operates with 60 percent coverage.
2. The treatment line according to current practice is compared to the guide developed by the WHO.

Thus, in this report the results of the ideal package are analyzed in comparison with those of the current package, and the results of the current package are compared with those of the SNMN. This produces an overall view of the problems. To interpret the costs, graphs and tables were produced that assist in the comparison of the different packages studied.

Table 4

**General Characteristics of the Information Used in the
Current Package and the Ideal Package**

Information	Current	Ideal
Demographics and epidemiology	National sources such as the ENDSA as well as the MC/B	ENDSA, WHO and MC/B
Coverage	60%	90%
Clinical approach	Based on the MC/B standards and external medical support	Based on MC/B and WHO standards
Reference	Surveys conducted in the health facilities	WHO
Salaries	National payrolls	National payrolls
Prices for medications and inputs	From the SNMN, CEASS and private pharmacies	From the SNMN, CEASS and private pharmacies
Information, Education and Communication	Worked with the idea that all women should receive IEC	Worked with MC/B data on Information, Education and Communication (IEC) as well as training

Source: MotherCare Bolivia, 1997

III. Analysis of the Mother-Baby Package

We will begin with the analysis and interpretation of the current and ideal packages in the five districts where MC/B operates, then review the results obtained from the districts, and finally, briefly compare the current MBP and the SNMN assessment of medications and inputs.

1. The number of visits per patient and the referral rate: In terms of visits, in the five districts the current package represents 56 percent of the ideal. This low percentage of visits is because the ideal package seeks to provide health care to more pregnant women (30 percent increase in coverage), and thus the new standards require a larger number of visits for the different interventions. Another factor is that physicians conduct fewer visits per patient because of lack of knowledge or because when the patients feel an improvement (cases without complications) they don't return for their next visit. In economic terms, this means that there are needs not demanded by the population due to the lack of knowledge regarding the consequences that may result from not treating complications under optimal conditions (See Graph 1).

The difference between the number of visits (contacts) in the current package of interventions and the ideal is small for interventions such as neonatal problems, sepsis, anemia and syphilis.

Graph 1**Total Visits per Patient According to
Treatment in the Five Districts**

[for insertion along bottom of graph]

MATERNITY
ANEMIA
SYPHILIS
GONORRHEA
HEMORRHAGE
ECLAMPSIA
CESAREAN SECTION
SEPSIS
ABORTION
NEONATAL CARE
FAMILY PLANNING

Number of contacts per patient according to current treatment

Number of contacts per patient according to ideal treatment

Source: Cost surveys - MC/B, 1997.

The graph shows heterogeneous levels for the number of maternity and neonatal problem visits. While the difference between the number of visits for neonatal problems in the current package and in the ideal package is slight, the difference for maternity visits is considerable. One reason is that the increase in maternity care is due to the increase in the number of women treated in the facilities and the increase in the number of visits required for these interventions. In the case of neonatal care, the number of visits does not produce a significant increase because the increase in newborns treated is offset by the decline in the number of visits.

The economic analysis that can be derived for neonatal problems is the existence of information deficiencies in health, such as moral risk,¹⁰ resulting from implementation of the SNMN. However, this same logic cannot be applied to maternity, despite the fact that the SNMN covers this intervention at no charge. A tentative analysis of what happens in the case of maternity is that women consider the opportunity cost of not going to the hospital—despite its being free—as of greater benefit than going, calculating the costs of transportation to reach the health facilities, the cost of leaving their homes and families alone, the cost of not working that day, etc.¹¹

Graph 2, which covers the five districts, gives an overall idea of the relationship between the number of patients and the cost of the current package. This graph shows that the hospital has a 52 percent share of total patients and also represents 86 percent of total costs, i.e., the hospital has a cost/patient ratio of approximately 2 to 1. This analysis indicates that hospital costs are high (equipment, personnel, infrastructure, etc.) in comparison with the health posts and centers. In addition, the hospitals treat the more complicated cases that cannot be handled at the primary care level and usually require greater use of medications, staff time and other inputs. The graph also shows that the health post, despite having 13 percent of all patients in the facilities, only represents 4 percent of costs.

¹⁰ Moral risk in health has been discussed as if the population consumed health services at a price of zero or close to zero, consuming more than it would if it had to pay for the actual social cost, which from the perspective of economists, represents a loss of social well-being.

¹¹ MotherCare, *Barreras and viabilizadores de salud*, 1996 contains more information on why women do not go to health facilities.

Graph 2**MotherCare Districts: Patients and Costs
by Type of Facility (as a percentage)**

Patients

Costs

Health post
Health center
Hospital

Source: Cost surveys - MotherCare Bolivia, 1997.

2. Cost of the Package

Total cost for the current package is US\$1,876,831 in the five districts, or US\$2.84 per capita. This is comparable to the figures cited in a 1993 World Bank publication in which the per capita investment of US\$4 was found to be the optimum investment in health in terms of disability-adjusted years of life saved. Another estimate appeared in *Making Motherhood Safe* (Tinker and Koblinsky, 1993),¹² in which the estimated cost to reduce maternal mortality was \$2 in a weak system and \$6 in a more developed system. The results described above lead to the conclusion that the five districts fall within what would be called a weak system which could become a strong system with the addition of a total of \$3.99, for a total of US\$6.83.

However, an additional investment of 2.6 million dollars or US\$3.99 per person must be made to provide the ideal package, as shown in Table 5.

Tables 5 and 6 show that under the current treatment, Capinota which operates with 12 health facilities for a relatively small population, where pregnant women using the health services represent 4.3 percent of the total population, is the district with the highest per capita cost to maintain the package. Sacaba, with 11 health facilities serving a population of about 100,000 inhabitants, 4.8 percent of which are pregnant women, has the lowest per capita cost. One reason is that Sacaba has 2.4 times the population and one facility less than Capinota. Another factor explaining the Capinota numbers is 0.5 percent less demand for health care services on the part of pregnant women as compared to Sacaba. Thus, it can be deduced that Capinota has a problem with a dispersed population and effective demand on health facilities by pregnant women.

What would happen if these districts were willing to provide the ten interventions according to the specifications of the ideal package? In this case, the district with the lowest cost to maintain the package would be El Alto, because it only needs to add \$2.87 per capita. Santiago de Machaca would be the most expensive district with \$4.70 per capita.

El Alto, with 3.4 times the population and two facilities less than Capinota, is in an urban area with more population and greater access to transport and roads. In terms of additional cost, we see that the district that needs to invest the most is Quillacollo and the district that needs to invest the least is Santiago de Machaca, the former because the model calculates a larger number of facilities for a larger population and because its population is three times larger than Machaca and it has six more facilities.

¹² Lissner, Craig et al. *Costing the Mother-Baby Package: A Case Study in Bolivia*.

Table 5

**Summary of Current, Ideal and Additional Costs
for the Mother-Baby Package by District**

District	Current Mother-Baby Package (in dollars)		Ideal Mother-Baby Package (in dollars)		Difference between cost of treatment according to standards in comparison with current cost (in dollars)	
	Total cost of package	Per capita cost	Total cost of package	Per capita cost	Total cost of package	Per capita cost
El Alto	413,914	2.76	830,541	5.54	416,627	2.78
Santiago de Machaca	238,706	2.63	666,194	7.33	427,488	4.70
Valle Bajo (Quillacollo)	827,050	3.06	2,088,408	7.73	1,261,358	4.67
Sur Oeste (Capinota)	150,568	3.42	334,817	7.60	184,249	4.18
Valle Puna (Sacaba)	246,593	2.31	595,123	5.58	348,530	3.27
Total	1,876,831	2.84	4,515,083	6.83	2,638,252	3.99

Source: MC/B cost survey, 1997

Table 6
Cost per Patient in Five Districts
by Facility
(in dollars)

Districts	Health post	Health center	Hospital
El Alto	15.98	10.22	62.64
Santiago de Machaca	4.60	5.20	68.00
Quillacollo	2.31	4.00	18.85
Capinota	8.77	30.38	42.34
Sacaba	6.23	5.59	37.90

Source: Results of Mother-Baby Package, MotherCare/Bolivia, 1997.

Analyzing by level of facility, we see that the district currently investing the least in health facilities is Capinota and the district investing the most is El Alto (Table 7). The difference between the two districts is due to the fact that El Alto has new infrastructure and medical equipment donated by international organizations such as PROISS and PROSALUD, as well as by projects like the Dutch and Italian programs which donate infrastructure and equipment to the health facilities, representing 7.2 percent of total cost.

Thus, by analyzing the model we conclude that El Alto requires less investment, because

The district that maintains the highest standards in terms of equipment and personnel

The district after Socaba in terms of the percentage of pregnant women who seek health care services

The district that offers the greatest variety of medications and supplies

Table 7 shows the differences among districts. In the district of Santiago de Machaca, a health post represents 2 percent of total spending in the district hospital, whereas in El Alto a health post represents 6 percent, i.e., three times more.

Similarly, we can see that for the district of El Alto the cost of maintaining a health post represents 57 percent of the cost to maintain a health center, while the health post in Capinota amounts to only 12 percent of the total cost of a health center.

Another difference is that while the health center in Santiago de Machaca represents 5 percent of the total spending by the hospital for the ten interventions, the health center in Capinota represents 44 percent of total spending by the district hospital.

From the data in Table 7, we reach the conclusion that El Alto is the district that has the least difference in costs between the health post and the hospital and between the health post and the health center. This contrasts with Santiago de Machaca and Capinota. However, in terms of the center-hospital ratio, Capinota maintains a strict cost level, with a notable difference between the health post and the health center.

There may be two reasons for these large differences:

(1) the centers in Capinota operate very well and have good infrastructure and equipment

(2) the hospital is in very poor condition, and also fewer pregnant women go to health facilities due to knowledge of the area. The results of the survey proved that the second argument is valid.

Table 7

**Current Cost of Mother-Baby Package by District
and Health Establishment
(in dollars)**

District	Health Post (HP)	Health Center (HC)	Hospital (HO)	HC x times more expensive than HP	HO x times more expensive than HP	HO x times more expensive than HC	HP as a % of HC	HP as a % of HO	HC as a % of HO
El Alto	13,946	23,585	221,826	1.7	16.4	9.4	57.2	6.1	10.6
Santiago de Machaca	2,347	6,633	138,698	2.9	59.1	20.7	35.1	1.7	4.8
Quillacollo	3,510	14,783	106,021	4.2	30.2	7.2	23.7	3.3	13.9
Capinota	2,331	18,827	42,449	8.1	18.2	2.3	12.4	5.5	44.4
Sacaba	3,742	9,845	91,202	2.6	24.4	9.3	38.0	4.1	10.8

Source: Surveys - MotherCare Bolivia, 1997.

Based on what has been described above, the facilities in the El Alto district are in the best situation. There is speculation that it would be possible to generate the presence of cross-subsidies in the health facilities. This would indicate that the facilities are performing other interventions not mentioned earlier such as sutures, first aid, consultations, and the sale of medications and supplies from which profits are obtained, a benefit that is redistributed for all the interventions throughout the facility.

The analysis is presented below, distinguishing between current costs and ideal costs.

3. Current Costs

In the five districts, the interventions with the greatest demand are maternity, family planning and neonatal problems at all levels of health care. Most of the costs are incurred by maternity (55 percent), neonatal problems (18 percent), and complications from abortion (8 percent). Maternity is not an expensive intervention, but it is one that a large number of women need. However, abortion is an expensive intervention due to the extensive amount of medications and supplies such as blood and sanitary napkins needed. Neonatal problems are also expensive because of the large supply of oxygen used and the need for the use of incubator.

The most costly input items are salaries and training at 48 percent, medications at 13 percent and supplies at 12 percent (Graphs 3 and 4).

2.2 Ideal Costs: The interventions with the most patients in the standard package, as in the current package, are: maternity, family planning and neonatal problems. The most expensive are maternity (52 percent of total cost), neonatal problems (10 percent) and complications from abortion (9 percent). The most expensive input items are salaries and training (46 percent), infrastructure and depreciation (11 percent) and medications (9 percent) (Graphs 3 and 4).

Within the MBP, it has been established that in order to cover these interventions each inhabitant would have to contribute a certain amount. The most expensive interventions are maternity, neonatal problems and hemorrhage with a current per capita (per inhabitant) cost of \$1.56, \$0.51 and \$0.23 respectively. These costs are considered low in comparison with the per capita revenues that the municipalities receive through revenue sharing, which in 1997 amounted to US\$31.27 per person. In addition, the costs of gonorrhoea and eclampsia (\$0.01 and \$0.01 per capita) are extremely low, both due to the low number of cases (e.g., the model worked with an incidence of gonorrhoea of 1 percent and an incidence of eclampsia of 0.5 percent)¹³ and also because treatment for the first involves a very low cost.

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Information obtained from the World Health Organization, 1997.

Graph 3**MotherCare Districts: Current and Incremental Cost
of Mother-Baby Package Interventions
(in dollars per capita)**

[along bottom of graph]

MATERNITY
ANEMIA
SYPHILIS
GONORRHEA
HEMORRHAGE
ECLAMPSIA
CESAREAN SECTION
SEPSIS
ABORTION
NEONATAL CARE
FAMILY PLANNING

Current cost of treatment
Incremental cost of package

Source: Cost surveys - MC/B, 1997.

Graph 4**MotherCare Districts: Current and Incremental Cost by Input
(in dollars per capita)**

[along bottom of graph]

VACCINES
MEDICATIONS
SUPPLIES
BLOOD
LABORATORIES
HOSPITALIZATION
SALARIES
IEC
TRANSPORTATION
ADMINISTRATION
INFRASTRUCTURE

Current cost of treatment Incremental cost of package

Source: Cost surveys - MC/B, 1997.

The costs indicated above are considered low and insufficient to handle the interventions in a better way, the suggestion is an increase in proportion to the model in the different interventions. For example, maternity should be increased \$2.01, complications from abortion \$0.47, and family planning \$0.42, and so on for the remaining interventions.

The information in Graph 3, suggests that, to achieve the ideal level, there needs to be an increase by intervention. This would entail emphasizing that the greatest increase occur in maternity, because maternity encompasses prenatal care, delivery and post-partum care, and it is the intervention with the highest demand, followed by complications from abortion, family planning and hemorrhage. In addition, it has been possible to establish that the additional cost to treat syphilis represents a minimal percentage in comparison with future benefits. For example, the per capita cost of the five districts treating approximately 1,139 case of pregnant women with syphilis¹⁴ is \$0.12 per capita each year.

Graph 4 shows that current costs in salaries, infrastructure and supplies are the most costly items in per capita terms. By type of input, a large portion of the money that the government allocates for the health sector is spent on employing medical and administrative personnel, as well as on buying land and building facilities and not on medications and laboratories. Nonetheless, the ideal package proposes increases of 52 percent in salaries, 11.6 percent in IEC and 9.8 percent in infrastructure and no major increases for medications and supplies (Graph 6).

2.3 Additional Costs: Maternity is the intervention requiring the highest investment in order to achieve the ideal, with this intervention representing 50 percent of total additional costs, due to the increased coverage (60 percent to 90 percent) and better quality care with at least four prenatal visits, delivery attended by medical personnel, and postpartum care. However, it is necessary to emphasize some interventions such as eclampsia and gonorrhea for which little increase is needed because in theory these interventions are being resolved under optimal conditions or would cost more than is necessary. (Graph 5).

Using the description above, we can show that the Ministry of Health currently allocates most of its resources to pay wages and salaries for both medical and administrative personnel. For this reason, both the central government and local governments should join efforts to increase the budget allocated to medications and supplies, thus providing adequate care to mothers and newborns. The interventions that need the highest increases are family planning and syphilis at five times their per capita cost; those that need the least are neonatal conditions, at one times per capita cost, and eclampsia at two times per capita cost (this difference is because the current practice does not use various medications necessary for the treatment of interventions). Maternity is the most expensive intervention because the model assumes that 100 percent of women should receive prenatal, delivery and postpartum care.

¹⁴ MotherCare, CDC, Atlanta, USAID and former SNS, *Estudio de seroprevalencia y factores de riesgo de sífilis materna y congénita en Bolivia*. February 1997.

What happens in this case with inputs? Salaries and training represent 52 percent of total additional costs. This suggests the need to hire a larger number of personnel to serve the respective facilities and to provide more training for medical personnel (See Graph 6). However, the model assumes that the facilities are currently operating at 100 percent capacity and that in order to increase coverage from 60 percent to 90 percent of all pregnant women, it would be necessary to build more facilities and hire more personnel for the ideal package. It is more likely that this assumption is incorrect and that the facilities are currently operating at less than capacity with the possibility of absorbing a larger percentage of patients without having to increase the number of medical-administrative personnel or their infrastructure, despite the increased coverage. This assumption would lead us to think that infrastructure has quite a strong impact on the ideal model. However, the finding that resulted from a sensitivity analysis without taking infrastructure into account caused the per capita cost for District II of El Alto to decrease from US\$5.54 to US\$5.19 per capita in the ideal package.

Graph 5**MotherCare: Additional Cost by Intervention
(as a percentage)**

[clockwise starting at left]

ANEMIA
SYPHILIS
GONORRHEA
HEMORRHAGE
ECLAMPSIA
CESAREAN SECTION
SEPSIS
ABORTION
NEONATAL CARE
FAMILY PLANNING
MATERNITY

Source: Cost surveys - MotherCare Bolivia.

Graph 6**MotherCare: Additional Cost by Input
(as a percentage)**

[clockwise starting at left]

IEC
TRANSPORTATION
ADMINISTRATION
INFRASTRUCTURE
VACCINES
MEDICATIONS
SUPPLIES
BLOOD
LABORATORY
HOSPITALIZATION
SALARIES

Source: Cost surveys - MotherCare Bolivia

For these reasons, the model predicts a long-term increase in personnel and infrastructure. However, the construction of a larger number of health facilities could be unnecessary; therefore the increase that must be made in salaries could reduce the amount of the total cost.

The conclusions that can be reached are as follows:

- a. Maternity (prenatal, normal delivery, postpartum) in the five districts is the most expensive intervention because it represents the largest number of patients and visits.
- b. By input, salaries have the greatest effect on total costs.
- c. There are inexpensive interventions such as syphilis and gonorrhea, due to the low cost of treatment.

Advantages of the Package: Costs reflect the level at which complications were treated, i.e., whether they were handled at the health post, health center or in the hospital. Therefore, this information is one more tool to help health planners and programmers know how to spend more efficiently according to facility level, and so that they can plan and program Mother-Baby health packages in the most appropriate way. This tool makes it possible to obtain general information on costs easily and quickly.

Limitations of the Package: One of the difficulties is obtaining information on health indicators, as well as information on the cost of infrastructure, maintenance and staff payroll by municipality. Other limitations include difficulties in measuring the variations in equipment and medication costs occurring over a certain period of time and finally, the need for computer equipment.

3.- Sensitivity Analysis: All the analysis of the ideal practice presented in the preceding section made the assumption that 100 percent of pregnant women receive medical care in maternity. Given that this condition or situation is difficult to achieve, we show below some of the data obtained when the assumption was changed from 100 percent to 80 percent and 60 percent respectively.¹⁵ The effect of this decrease in economic terms can be seen in Tables 8 and 9.

From the tables, we can see that by reducing the percentage of pregnant women who require care in maternity from 100 percent to 80 percent, investment is reduced by a total of US\$483,071, and if there is a more drastic reduction from 100 percent to 60 percent, investment is reduced much more, amounting to US\$1,084,502.

However, this analysis is given in monetary terms, since in political and social terms the "supposed savings

¹⁵ These percentages were selected for sensitivity analysis, according to the criteria of health experts, MotherCare/Bolivia and MotherCare/Washington, considering that percent is an ideal goal, 80 percent a feasible goal and 60 percent a real and achievable goal.

it would generate" would come as the result of reducing coverage and a lower percentage of pregnant women receiving treatment according to standards, to the detriment of the health of those women who do not go to health facilities.

We present below data comparing the current Mother-Baby Package and the value of the medications and inputs packages of the National Maternity and Childhood Insurance program.

Table 8
Per Capita Cost to Cover Maternity Care
by District Based on Three Projected Coverage Percentages
(in dollars)

Districts	Maternity		
	100% (ideal)	80% (feasible)	60% (real)
El Alto	5.54	5.17	3.79
Santiago de Machaca	7.33	6.69	6.17
Quillacollo	7.73	6.69	5.83
Capinota	7.60	6.89	6.02
Sacaba	5.58	5.22	4.17
Total	6.85	6.12	5.20

Source: Cost surveys, MotherCare/Bolivia, 1997.

Table 9

**Difference in Percentage of Pregnant Women
Receiving Medical Care in Maternity
(in dollars per capita)**

Districts	80% - 100%	60% - 100%
El Alto	0.37	1.75
Santiago de Machaca	0.64	1.16
Quillacolla	1.04	1.90
Capinota	0.71	1.58
Sacaba	0.36	1.41
Total	0.73	1.65

Source: Cost surveys, MotherCare/Bolivia, 1977.

IV. The Mother-Baby Package and the National Maternity and Childhood Insurance Program

Decentralization—understood as a process whereby powers are transferred from central levels to local levels—allows for "differentiated care of preferences and needs, leads to greater responsibility by bringing suppliers closer to users, creates greater awareness of fiscal responsibility within communities and introduces higher levels of competence."¹⁶

Decentralizing health services means giving local units of the system great financial and administrative autonomy. Decentralization is appropriate for providing services directly to clients and for instituting prices for medications and preventive care.¹⁷

In the area of health, both public reforms and demands from participants themselves point to gradual decentralization. This means transferring more decision-making power to local authorities (including decisions on resource utilization and allocation) and also giving more managerial autonomy to units directly providing services. Communication between providers and users allows for adjusting services to demand and to the population's needs.¹⁸

In recent years the Latin American and Caribbean countries have recognized that excessive centralization is a fundamental cause of inefficiency in their national health systems. Starting in August 1993, the government of former President Sánchez de Lozada undertook a series of structural reforms with the understanding that stability does not by itself bring growth, nor does growth automatically lead to greater equity.

The health sector has begun organizing a National Health System and basically seeks to be included in the Law on Administrative Decentralization and the Law on Popular Participation, so that in this context it can correct the inadequacy of public resources so as to appropriately satisfy care requirements in the health system and reduce the country's high morbidity and mortality. Implementing these laws gives rise to reform in the health sector in terms of roles, areas of responsibility, territories, management of services and financing sources.

The Law on Popular Participation and the Law on Administrative Decentralization led the health sector to define its policy in Supreme Decree 24269 of 1994 (the Life Plan), later Supreme Decree No. 24303 of May

¹⁶ Larrañaga, O. (1994). in Espinoza, Lourdes. Thesis for Masters Degree in Economics with specialization in Political Science.

¹⁷ World Bank, 1992. *Financial Health Services in Developing Countries. An Agenda for Reform*. A World Bank Policy Study. Washington, D.C., 1992.

¹⁸ Capra, Katherina. *Economía de la salud: Una aplicación para el municipio de Viacha*. Thesis for the Bachelor's degree in Economics.

24, 1996. We refer to National Maternity and Childhood Insurance which, based on decentralization in health, seeks to create greater efficiency in health care services.

National Maternity and Childhood Insurance is a system of protection for women of child-bearing age and children under age 5. It is designed to cover maternity care and potential complications from pregnancy and childbirth, as well as to protect children under age 5 in cases of diarrheal disease and acute respiratory infections, which represent the two major causes of mortality in Bolivia.¹⁹ The financing sources for the insurance come from tax revenue sharing; 3.2 percent of 85 percent represents investment expenses through popular participation, as well as resources from external loans and international cooperation. In the local setting, those responsible for administering the Maternity and Childhood Insurance Program are the local health directors (DILOS).

Before analyzing the comparison between National Maternity and Childhood Insurance and the current MBP, we will consider some aspects that the Maternity and Childhood Insurance package does not include but are included in the MBP (Table 10).

It is impossible to compare the total current package because the SNMN, as already noted, calculates only variable costs and does not include any fixed costs such as infrastructure and salaries. Nor does it consider all the interventions offered by the MBP. Thus, we compare only variable costs for interventions considered by both packages, namely:

- Maternity (prenatal, delivery and normal postpartum)
- Cesarean section (dystocia)
- Eclampsia
- Hemorrhage
- Sepsis
- Neonatal complications
- Syphilis^{20*}
- Gonorrhea*

¹⁹ National Committee for Safe Maternity, Office of the First Lady of the Nation, departmental prefectures and municipal governments. National Maternity and Childhood Insurance, 1996.

²⁰ (*) Neither syphilis or gonorrhea is included in the analysis since the SNMN does not have an assessment of the costs of these interventions. We only have the assessment of examinations like the VDRL and RPR, with values of BS.2 and BS.4 respectively.

Table 10

**Comparison between National Maternity and Childhood Insurance
and the Mother-Baby Package**

National Maternity and Childhood Insurance	Mother-Baby Package (current package)
No differentiation in cost of treatment according to level of facility	Differentiates the level of the facility
Does not include demographic information	Includes demographic and epidemiological information
Care for mothers and children under age 5	Only includes treatment for infants up to the first month of life
Does not include costs for infrastructure, salaries (fixed costs)	Includes infrastructure and salaries
Does not include complications from abortion, severe anemia and family planning	Includes complications from abortion, anemia, family planning and sexually transmitted diseases
Takes other expenses into account ²¹	Does not include acute diarrheal diseases or acute respiratory infections
Includes laboratory cost separately	Does not take other expenses into account. Includes laboratory cost within the cost of the intervention

Source: Former National Health Secretariat, Information Bulletin No. 18, 1997 and MC/B/Bolivia, Cost Study for the Mother-Baby Package.

²¹ These expenses are not specified in the package. However, they can be considered administrative expenses.

MC/B calculated an approximation of what would become a comparison between the cost of the hospital SNMN²² and the cost of the Mother-Baby Package according to the districts where MC/B operates, obtaining the following results:

Graph 7

Difference between the Cost per MBP Intervention in District II of El Alto and the SNMN Reimbursement Rates in Dollars

[along bottom of graph]

Eclampsia
Hemorrhage
Maternity
Neonatal care
Cesarean section
Sepsis

SNMN reimbursement El Alto, average cost per patient

Source: National Health Secretariat, Public Health System Division, Bulletin No. 18. *Salud Informa*.

²² It was assumed that the assessment made by the SNMN of the different interventions was at the hospital level in that several of the interventions described are handled at the secondary and tertiary care level.

Graph 7 shows that most of the highest costs are at the hospital level, the most expensive interventions being sepsis at \$67.3 and cesarean section at \$61.8. This is due to the high cost of antibiotics needed to effect the treatment. However, it is not the unit cost that is expensive but rather the dosage per episode that each patient must take.

We note that it is in the hospital environment that reimbursement would have to be increased most, given the fixed costs of that facility and also considering that 50 percent of interventions are handled at that level. The evidence from this analysis is that the SNMN reimbursement rate does not cover fixed costs, which are much higher in hospitals than at the primary care level.

If a hospital carries out six interventions, it will be reimbursed \$24 minus the variable cost it incurs.

Table 11 shows us that while some of the SNMN reimbursement rates are very close to values of the current variable costs calculated by the model, for several of the interventions the reimbursement rates are not high enough to cover the variable costs. For example, eclampsia has a variable cost of \$31 and a reimbursement of only \$19; a cesarean has a variable cost of \$62 and a reimbursement of \$48. This rate of reimbursement has a direct effect on patients, since the SNMN partially covers the variable cost of the interventions and the other portion of the cost must thus be covered by someone, in this case the patient. Because most hospitals do not have stocks of medications and inputs, the payment that the patient must make for specifically in these items. Empirical evidence also shows that several of the payments that should be made by the SNMN are paid by the patients due to administrative and bureaucratic problems. For example, pharmacies are not open 24 hours a day, so a patient who is prescribed certain medications when the pharmacy is closed must go to a private pharmacy to obtain what was prescribed.

After noting the differences between one package and the other, we will proceed with a short description of a tentative analysis, seeking to apply the model to the municipalities. This attempt considered the municipalities belonging to the district of Santiago de Machaca. A comparison was made for this purpose between the current Mother-Baby package of the municipalities in the district of Santiago de Machaca and the assessment of interventions as determined by the SNMN. (See Graph 8).

Graph 8 shows that the difference between the SNMN and the MBP for the municipalities of Guaquí, Tiahuanacu and Desaguadero is slight because there are only primary care facilities in those municipalities. Thus, for example, while the municipality of Viacha has 16 health posts, five centers and one hospital, the municipality of Desaguadero has only 1 health center. The population can also be taken into account. For example, although Tiahuanacu has more facilities than Desaguadero, the former is much less expensive if the comparison is made in per capita terms, which means that municipality has a larger population.

Moreover, treatment at the primary care level is always lower because it consists only of preparing the patient for referral (in the case of the municipalities of Tiahuanacu, Desaguadero and Guaquí). However, the current treatment cannot be handled at the primary care level but must be performed in a hospital. This applies to those interventions mentioned earlier that are complications from pregnancy (the case in the

municipality of Viacha which has a basic hospital), making the costs of the package more expensive.

Once the advantages of the Mother-Baby Package are analyzed, we are able to state that it shows how Ministry of Health policy-makers can use this model to make an overall estimate of what variable as well as fixed costs would be needed for a specific facility to operate. The Ministry would thus be able to allocate resources more efficiently, particularly to determine certain priorities and at the same time assess the costs of each intervention.

Graph 8**Cost of Current Mother-Baby Package and
Rates of Reimbursement by Municipality
(in dollars per capita)**

Source: Our own graph based on data from National Maternity and Childhood Insurance and MC/B Bolivia surveys.

Conclusions

Once this study was developed, the following conclusions were reached:

The MBP emerges in response to problems in the allocation of resources for the health sector in developing countries such as Bolivia.

The costs of the package reflect the level at which complications have been treated, i.e., whether they were handled in the health post, the health center or a hospital. The study thus becomes another tool enabling planners and programmers of health care policy to know how to spend more efficiently by level of facility, as well as to plan and program packages in Mother-Baby health, and to quickly and easily obtain general information on costs.

Within the MBP, it has been established that treatment for the most costly interventions is: maternity, neonatal problems and hemorrhage.

Similarly we note that a considerable portion of the money that the government allocates to the health sector is used to pay wages and salaries for medical, para-medical and administrative personnel, as well as to purchase land and construct buildings rather than on medications and laboratories. However, with the creation of the National Maternity and Childhood Insurance, new sources of financing are being included to handle these interventions.

The financing sources of the SNMN are resources from tax revenue sharing with 3.2 percent of 85 percent going to investment through popular investment. In 1996, this amount represents a total of approximately US\$0.8 per capita because resources allocated to health are scarce. Therefore, it is important to study new ways to finance health care services to achieve a better overall view of costs.

The concrete application of what is established under the MBP in the five MotherCare districts allows us to conclude that:

- The assistance of international organizations makes the district of El Alto the district with the lowest cost to maintain the MBP, a situation opposite to that of Santiago de Machaca. Based on this analysis, the importance of foreign investment in the health sector is established.
- In several of the interventions assessed by the SNMN, the rates of reimbursement are not high enough to cover the current treatment and these rates do not reflect minimum standards of quality care. Currently the resources allocated by the SNMN to reimburse health facilities, particularly hospitals, are inadequate. They must be increased to achieve the ideal treatment. (We thus assume that the SNMN reimbursement rates for the tertiary care level hospitals are more unlike the actual costs of the basic hospitals which were the subject of this study).

- Another important finding from applying the MBP in Bolivia is that the variable cost of treatment differs significantly among different health care levels. Reimbursements to current facilities for services are the same for health posts, health centers and hospitals.
- The difference between the SNMN and the MBP for the municipalities of Guaqui, Tiahuanacu and Desaguadero is very slight because those municipalities have only primary care facilities.
- The highest cost in maternity occurs in the district of Santiago de Machaca, which represents 64 percent of total additional costs; the highest salary expense occurs in the district of El Alto, representing 59 percent of total additional costs.
- The analysis performed using the current and ideal MBP shows that it is feasible to use the MBP in the five districts because the ideal MBP is only 2.4 times more expensive, which means an annual increase of \$3.99 in per capita terms.
- The Mother-Baby package is a useful tool to be used by the SNMN (probably Basic Municipal Health Insurance) to determine priorities and thus achieve better allocation of resources.
- From the preceding analysis, we conclude that in order to achieve the proposed goals it is necessary to apply the MBP in the central and local governments, the objectives of which aim to help technical/administrative personnel to obtain the costs of the Mother-Baby package by district, municipality, department and other territorial divisions in a simple and quick way. This is with the understanding that there is immediate access to demographic and health care indicators.
- This topic and new ways to measure the costs of health care services may be the subject of a research study in the future.