Global Development Network

Strengthening Institutions to Improve Public Expenditure Accountability

A Cost-Effectiveness Analysis of the Health Sector in Peru

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March, 2013

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This Research Paper has been prepared as part of the research which was conducted under the GDN Global Research Project "Strengthening Institutions to Improve Public Expenditure Accountability", implemented in partnership with Results for Development Institute (R4D), USA with the aim of building and strengthening institutional capacity for public expenditure analysis across developing and transitional countries. The Global Research Project is fully funded by the Department for International Development (DFID), UK. The views expressed in this publication are those of the author(s) alone.

Table of Contents

INTRODUCTION

Improvements in the health conditions of the Peruvian population are evidenced in a better quality of life, in individual welfare, and also in the development of the society. Economic growth in the past decades, according to the Central Reserve Bank of Peru (BCRP) an average of 5 percent in the last 15 years, has resulted in important advances in the health sector. As a consequence, key indicators of the sector's development such as child and maternal mortality and chronic malnutrition, have shown a decreasing trend. Furthermore, there has been progress in access to health services, as well as increasing health insurances rates. These programs are responsible for enhancing the welfare of the population.

In spite of these advances, however, Peru still presents high indicators of health deficiency in comparison to other countries, in part due to the health sector's low budget allocation. Even though the sector's budget has increased in the past years, it is still limited. For the year 2009, the Public Health Budget was PEN 5,735 million, which represents 7.2 percent of the total budget (Integrated System of Financial Management (SIAF), 2009), or around 1.5 percent of the GDP. This not only restricts the necessary advances in effective coverage, it also hinders reducing the gap between rural and urban areas. Clearly, this has contributed to the inefficiencies in the system that doesn't allow for optimized use of resources. The low budget allocation is particularly problematic because the Peruvian government implements a policy of universal insurance. No country has been able to implement a universal insurance policy with a Public Health Budget of less than at least 6 percent of the GDP.

Moreover, even though the policies have, over the years, focused on the poorest, inequality remains a serious problem that the sector must resolve. For example, there have been great advances in institutional deliveries, the services being accessed by 80 percent of pregnant women in 2009. Nevertheless, this is a national average that conceals strong inequalities between rural and urban areas. The Health Demographic Survey (ENDES, 2009) shows that while 93 percent of pregnant women in the urban areas received professional medical attention, only 57 percent had access in rural areas.

Health care requires government intervention in order to guarantee well-being at minimum cost. However, in Peru, household financing is the first source (34.7 percent in 2005, (MINSA/CIES (2008)). The government is the second source of financing of medical expenses (30.7 percent in 2005). Household contributions are mainly through out-of-pocket expenditure in a country where more than one-third of the population is poor. This fact limits access to health services only to those who can afford it, while low income households risk being excluded from access to these services. In developed countries, health financing depends mostly on the public treasury or social security; thus, payment is made before the service is required through insurance mechanisms and the configuration of funds that allow risk-diversification.

This document is concerned with improving government expenditure in the health sector, particularly maternal and neonatal health. The body of this work is a Cost Effectiveness Analysis (CEA) of government expenditure and policies to increase institutional deliveries; i.e. deliveries in health establishments. This analysis is particularly important as the budget

for maternal and neonatal health has entered a reform process in the framework of the Result Based Budget. The reform is intended to change the manner of budget allocation and thus the distribution of money across different health policies. Policy recommendations for this particular subsector are fundamental at the time.

Before coming to the CEA, we first present the Strategic Program of Maternal and Neonatal Health (PSMN) because it is the framework within which policy recommendations will have to be implemented. The second section is a summary of government objectives regarding maternal health and institutional deliveries. The third section describes the current situation of institutional deliveries in Peru, emphasizing the potential differences among marginalized groups. The information in this section will serve as a baseline to evaluate the gap between the current situation and the government's goals, as also help understand the impact evaluation. Sections 3 and 4 are the core of this work as they deal with the impact and cost estimations, respectively. Section 5 contains the cost effectiveness estimations and the policy recommendations. Finally, section 6 concludes this study.

I. INSTITUTIONAL DELIVERIES AND THE STRATEGIC PROGRAM OF MATERNAL AND NEONATAL HEALTH

Although Peru has experienced significant economic growth over the last fifteen years,[1] development indicators, especially those related to poverty and health, have not kept pace. This is particularly true for maternal and child health indicators.

The Maternal Mortality Rate (MMR) and the proportion of professionally attended deliveries are widely accepted indicators of maternal health. The MMR in 2005 was 164 per 100,000 live births, and the proportion of deliveries with assistance from specialized sanitary staff was 72 percent. Both indicators are well above developed countries and even the Latin American and Caribbean averages.

According to United Nations figures, the MMR in developed countries in the year 2006 was around 9 per 100,000 live births and the proportion of deliveries attended by skilled health care personnel was 99 percent. The MMR for Latin America and the Caribbean, on average, is 130 per 100,000 live births, and 86 percent of deliveries are attended by skilled health care personnel (United Nations, 2008).

Moreover, national averages in Latin American countries hide important differences among regions and socioeconomic sectors. One of the most important differences is among rural and urban populations. For instance, while 93 percent of deliveries in urban areas were institutional in 2009, only 57 percent were institutional in rural areas. Women in urban areas also undergo more prenatal checkups, are more likely to receive assistance from health staff during deliveries, and make greater use of birth control methods.

Professional attendance at births is essential in reducing the MMR; proper care during delivery has a relevant impact on overall maternal and infant health. Complications during delivery are an important cause of maternal mortality. In 2003, according to the Ministry of Health (MINSA) reports , hemorrhage was the primary cause of maternal death (43 percent), followed by hypertensive diseases related to pregnancy (14 percent), sepsis (8 percent) and unsafe abortion (8 percent) (MEF, 2010); these causes have not changed in the last decade or so. Such complications can be reduced if deliveries take place in a proper facility with adequate and skilled health staff.

Regarding neonatal and child health, studies in Peru have shown that the principal causes of neonatal deaths are respiratory disorders (60 percent of neonatal deaths in rural areas are attributed to asphyxia), low birth weight, neonatal sepsis and congenital malformations. The respiratory disorders are related to two factors: labor and obstetric complications, and low birth weight and prematurity.

[1] The country's GDP has grown by an average of 4.15 percent in 1990 to 6.2 percent over 2002–2007.

The Strategic Program of Maternal and Neonatal Health (PSMN) was created in 2008 for the purpose of improving government expenditure in combating these problems. It was part of a group of five budgetary programs created in the Performance Based Budget framework which continued through 2009 and 2010. This strategic program received PEN[2] 361,623,892 in 2008, which represents 0.5 percent of the Peruvian Government Budget, and 4 percent of the budget of the Ministry of Health. This budget was distributed between the Ministry of Health (34 percent), Integral Health Insurance (SIS) (23 percent) and the regional authorities (43 percent) to perform specific activities to accomplish the goals outlined below. The program includes increasing institutional deliveries, improvements in hemotherapy, increasing the number of childbearing women affiliated to SIS, and the elaboration of technical guidelines for maternal and neonatal attention.

Formally, PSMN seeks to improve women and child health. The principal interventions focus on three different points in the life cycle:

Before pregnancy: The program aims to educate as many people as possible about sexual and reproductive health, and provide them access to birth control methods through:

- Setting up healthy town councils, communities, schools and families that exemplify sexual and reproductive health.
- Increasing availability of and access to sexual and reproductive health counseling and birth control methods.

During pregnancy and labor: The program seeks to reduce maternal mortality and morbidity through:

- Increasing access to quality prenatal services for pregnant women. These include diagnoses and appropriate treatment for complications during pregnancy such as anemia, sexually transmitted diseases and urinary infection.
- Increasing the proportion of deliveries in qualified health establishments.
- Increasing access to establishments with adequate capacity to deal with basic, essential and intensive obstetric emergencies.
- Increasing access to hemotherapy centers.
- Strengthening the referral system concerned with its organization, operations and financing.

During neonatal period (the first 28 days after birth): The program aims to reduce neonatal mortality and morbidity through:

- Increasing the proportion of deliveries in qualified health establishments.
- Increasing access to establishments with adequate capacity to contain basic, essential and intensive neonatal emergencies.

[2] Peruvian Nuevo Sol

1) GENERAL GOALS

The four principal goals of this program are (see Table 1):

Strategy management

This objective can be considered as the link between the government and society. For this program, the information has been gathered from three different sources: reports of the institutions responsible for the execution of activities and services related to the advances in program implementation, as also problems if any; reports of the Ministry of Economics (MEF) related to budget implementation and the accomplishment of the specific goals of the strategic program; and reports of the effectiveness of the local services in the chosen territories.

Spreading knowledge on sexual and reproductive health to a wider population, as also giving access to birth control methods

The ENDES 2000 report stated that in Peru:

- Almost all women know of or have heard about at least one birth control method, especially injection (96 percent) and the pill (95 percent).
- The lowest percentage of birth control users are in rural areas, in the regions of Huancavelica and Ayacucho where only 50 percent women use a birth control method.
- One of every ten women lacks complete knowledge about birth control methods.

Reduction of maternal mortality and morbidity

The Peruvian government has prioritized institutional births in reducing maternal mortality which is the first National Sanitary Objective in its National Coordinated Health Plan (2007–2020), with the specific goals of reducing teenage pregnancy; complications during pregnancy, delivery and post-delivery; and broadening access to different birth control methods.

Reduction of neonatal mortality and morbidity[3]

According to data from MEF, the neonatal mortality rate (i.e. the first month of a child's life) is 10.6 per 1,000 live births in the urban areas, and 18.7 in the rural areas. Both MEF and MINSA have agreed on a proposed neonatal mortality rate as wel as the expected institutional births coverage for women in rural areas.

However, according to a 2009 evaluation of the progress of the PSMN, there was no budget for the new components of the strategic program: health infrastructure, improvement of resolvent capacity of health facilities and blood banks. It also highlights an unevenly distributed budget in terms of the different regions. Finally, it suggests needed improvements in hemotherapy through investment in "access of pregnant women to safe blood" and "blood banks."

[3] Cooperative Roundtable on the Fight against Poverty ("Mesa de Concentración para la Lucha contra la Pobreza"). Following Monitoring Maternal and Neonatal Health Strategic Program. June Report 2008.

Table 1: Main goals of the Maternal and Neonatal Health Program

Goal	Component Objectives	Inputs	Indicators
Improve women and Children´s Health	Conduction of the management of the strategy	Management of the strategy	Proportion of supervised establishments with maternal and neonatal health services
		Regulation of the provision and funding of maternal and neonatal attention	Number of regulations about maternal and neonatal health
	Population with knowledge on sexual and reproductive health and that have access to birth control methods	Population informed about sexual and reproductive health.	Proportion of women in childbearing age with knowledge of any birth control method
		Access to birth control methods and counsel on sexual and reproductive health	Proportion of women with unsatisfied birth control methods demand
	Reduction of Maternal mortality and morbidity	Pregnant women have access to prenatal attention services of quality and complications are attended according to resolutive capacity	Proportion of pregnant women with 6 prenatal controls
			Proportion of pregnant women with at least one prenatal control in the first trimester
		Pregnant women have access to qualified delivery attention and normal and complicated puerperiums services according to resolutive capacity.	Proportion of attended deliveries in health establishments that fulfill obstetric and neonatal functions
			Proportion of complicated deliveries attended in health establishments that fulfill Obstetric and Neonatal Functions (FON)
		Pregnant women have access to safe blood and components	Number of viable investment profiles
			Proportion of pregnant women with hemorrhage diagnosis is that receives safe blood transfusion
		Pregnant women have access to maternal and	Proportions of pregnant women with referred complications that were

		neonatal reference and counter-reference according to resolutive capacity.	attended in health establishments with basic, essential or intensive obstetric and neonatal functions (FONB, FONE or FONI).
			Proportion of referred complicated neonates that were attended in FONB, FONE or FONI.
	Reduction of neonatal mortality and morbidity	Neonates have access to normal neonatal attention services	Percentage of institutional attention of the newborn
		Neonates have access to services with resolutive capacity to attend neonatal complications	Proportion of complicated neonates attended with FONB, FONE and FONI.
		Neonates have access to intensive care neonatal services	Proportion of complicated neonates attended in ICU.

Source: MEF.

2) QUANTITATIVE GOALS

There are three sources which help us to determine and follow the government's goals regarding institutional deliveries. The main source is the Result Based Budget with objectives up to 2011, and is the more reliable in terms of data gathering. The goals are:[4]

- To reduce MMR from 185 to 120 per 100,000 live births by 2011.
- To reduce MMR to 66 per 100,000 live births by 2020.
- To increase the rate of institutional delivery coverage in rural areas from 42.9 percent to 70 percent by 2011 with quality facilities and within the cultural context of the population.

The information available is presented in Table 2.

Table 2: Advancement in indicators for the maternal and neonatal health program

Goals	Indicators	Estimates		Progress
		2007	2009	
Final Goals				
Improve maternal and neonatal health	Neonatal mortality rate: Number of children who die before one month of birth by thousand live births	15	13	No progress
	Maternal mortality rate: Maternal deaths by 100, 000 live births	Data not available		
Intermediate Goals				
Expand knowledge of sexual and reproductive health and access to methods of family planning	Global fertility rate: average expected births during a woman's reproductive years	2.4	2.6	No progress
	Number of couples protected: Percentage of married women in fertile age using family planning methods	73.1	73.2	No progress
Reduce maternal morbidity and mortality	Coverage of institutional deliveries for women in rural areas	49.4	55	No progress
	Coverage of cesarean section for women in rural areas: Percentage of rural women who gave birth by cesarean section	7	7.5	No progress
Reduce neonatal morbidity and mortality	Proportion of newborns attended in health establishments	76.6	79.8	Progress
	Proportion of live births under 37 weeks of pregnancy	14.7	15.0	No progress

[4] Peruvian Ministry of Health (2007). *National Coordinated Health Plan.* MINSA, Lima. Page 21.

	Proportion of newborns with complications attended at health establishments	Data not available

Government statistics show a decrease in the neonatal mortality rate from 15 to 13 per 1,000 live births. In addition to the final goals, the maternal and neonatal health program includes intermediate and immediate goals. One intermediate goal is reducing maternal morbidity and mortality, and one of the indicators is coverage for institutional deliveries in rural areas.

The government, through Congress, set out to increase the coverage of institutional deliveries in rural areas to 70 percent for the year 2011. In 2007, coverage was 49.4 percent; it rose to 55 percent in the year 2009. There is still a 15 percentage point gap to fill. We use this goal as the basis for our cost estimations. If the proportion of rural deliveries over national deliveries stays at 36 percent, then the increase to 70 percent of rural institutional deliveries would imply a global increase in institutional deliveries to 85 percent.

The other two sources of information on the government's goals for institutional deliveries are:

- The Peruvian government's commitment towards fulfilling the United Nation's Millennium Development Goals by 2015 and monitoring of advances by the Presidency of the Chamber of Ministers (PCM). However, many of the global objectives cannot be quantified for Peru as there is not enough information regarding institutional delivery.[5]
- The National Coordinated Health Plan with goals for 2011 and 2020.[6]

[5] PCM (2009). "Resumen ejecutivo informe del cumplimiento de desarrollo del milenio Perú- 2008." Available at http://www.onu.org.pe/upload/documentos/IODM-Peru2008.pdf

[6] MINSA (2007). "Plan Nacional Concertado de Salud." Available at www.lachealthsys.org

II. SITUATION OF INSTITUTIONAL DELIVERIES

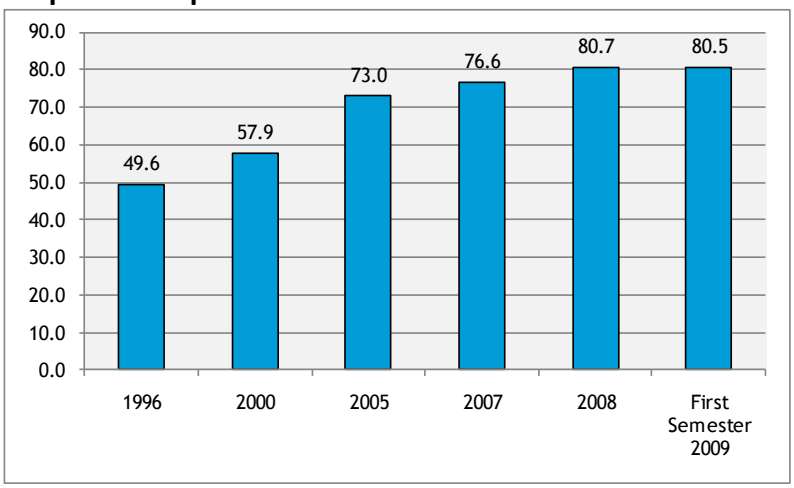
It is important to assess and review the current state of attendance at birth in order to execute interventions directed towards expanding institutional births, specially focusing on the poorest population. The following section presents charts and graphs with descriptive statistics that depict the situation vis-a-vis institutional deliveries and other key variables. The statistics estimated here are primarily based on the ENDES 2009 survey.

The survey takes into account demographic and social characteristics of women in their childbearing age and of children below 5 years of age. It is the most trustworthy data set with more detailed information regarding pregnancy, delivery and post-delivery characteristics, and it is representative at a national, regional, and location (urban/rural) level.

1) INSTITUTIONAL DELIVERIES

The official figures for institutional deliveries from the National Statistics and Information Institute (INEI) show an increasing trend over the years (Graphic 1).

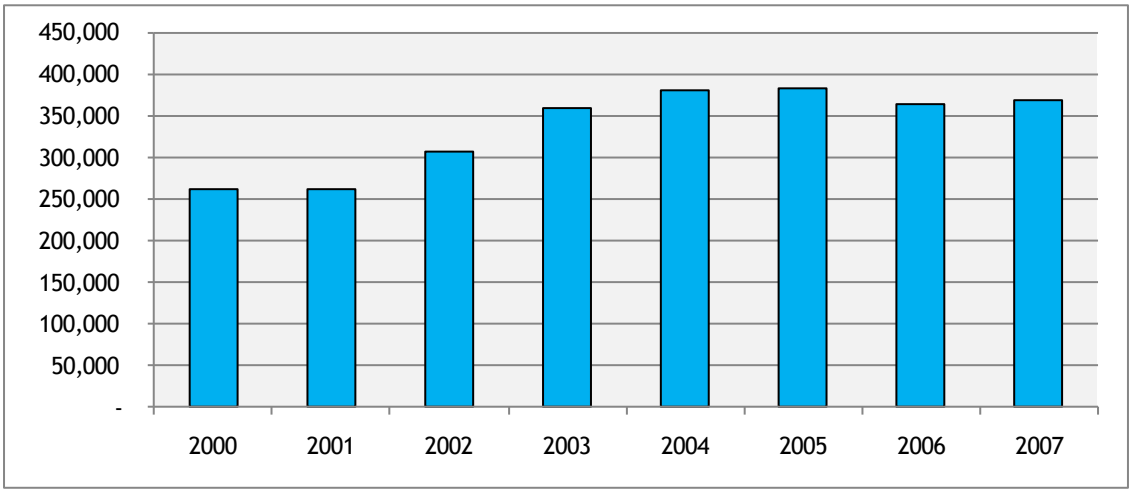
Graphic 1: Proportion of deliveries in health establishments



Source: INEI-ENDES.

Our estimations for the year 2009 show 80 percent coverage of institutional deliveries. Graphic 2 shows the evolution of deliveries performed in MINSA's establishments from 2000 to 2007.

Graphic 2: Institutional deliveries attended in MINSA's establishments (2000–2007)



Source: MINSA

Even though the overall trend is positive, the real increment was in 2004, remained stable in 2005, and dropped in 2006. Some possible explanations for the decrease in the total number of assisted deliveries in MINSA establishments are:

- Health management, along with other public programs, is going through a decentralization process. While MINSA has transferred resources, which implies more autonomy for each region, it is adversely affected by loss of leadership[7]. Different regions have different health priorities, possibly affecting institutional deliveries.
- By September 2005, a regulation for the appointment of MINSA personnel was approved [8]. It stated that, starting in 2006, health professionals such as nurses and obstetricians would be appointed within MINSA. This meant the migration of professionals to principal cities for administrative positions, leaving many establishments, especially in the countryside, without adequate professional staff.
- Increasing the number of obstetricians implied hiring more male obstetricians for the furthest regions. Women did not like being attended by a male doctor for cultural reasons. Moreover, there are wide disparities by location. Table 3 shows the differences between rural and urban households. According to ENDES 2009, while about nine out of every 10 women have an institutionally attended delivery in urban areas, just half the women in rural areas do.
- Although ENDES shows an improvement in rural areas from 2000, when only 24 percent of deliveries were at institutional establishments, even now, four of every 10 women don't have institutional deliveries, and the urban/rural gap is far from being closed.
  Women who had institutional deliveries in urban areas had better access to obstetricians and doctors—the type of personnel MINSA considers capable of a proper delivery—and to health establishments with greater capacity for caregiving.

[7] Information obtained through interviews with MINSA personnel.
[8] Peruvian Health Ministry (MINSA) Press Release, September 2005.
Available at http://www.minsa.gob.pe/ocom/prensa/notadeprensa.asp?np_codigo=2874&mes=9&anio=2005

Table 3: Type of delivery by geographic location

	NID	ID by Doctor or Obstetrician	ID by other Personnel	TOTAL
Urban	7%	92%	1%	100%
Rural	43%	51%	6%	100%
TOTAL	20%	77%	3%	100%

ID= institutional delivery.
NID= non-institutional delivery.
Source: ENDES 2009.

Table 4 shows institutional deliveries by region. In this case as well, there are significant differences between the coast and the rest of the country. While in Lima–Metropolitan area, only 2 percent of deliveries are non-institutional, in the highland and in the jungle, more than 30 percent are non-institutional deliveries. Moreover, there is a significant gap between women in Lima and other coastal regions, and women from the rest of the country in access to doctors and obstetricians.

Table 4: Type of institutional delivery by natural region

	NID	ID by Doctor or Obstetrician	ID by other Personnel	TOTAL
Lima–Metropolitan area	2%	97%	1%	100%
Other coastal areas	8%	91%	1%	100%
Highland (sierra)	32%	63%	5%	100%
Jungle (selva)	36%	60%	4%	100%
TOTAL	20%	77%	3%	100%

Source: ENDES 2009.

According to ENDES 2009, 39 out of every 100 women had an institutional delivery in MINSA hospitals (Table 5). Thus, MINSA's hospitals are the primary place of delivery. However, the homes of the women or midwives come second as a preferred option where 19 out of every 100 women give birth. This implies that women and newborns are at great high risk from complications that require professional staff with adequate equipment.
Note also that eight out of every 100 institutional deliveries are performed in a MINSA health post which has been documented by the Ministry of Health as being incapable of such interventions.[9]

Table 5: Place of delivery by geographic location

	Total	**Urban**	**Rural**
Hospital MINSA	39%	48%	23%
Hospital Essalud[10]	10%	15%	2%
Hospital FFAA/PNP[11]	0%	1%	0%

[9] Health posts shouldn't conduct a delivery unless it is an imminent one. Health centers are capable of attending deliveries with skilled health professionals and proper equipment. The situation is different for health centers and posts from Essalud, because Essalud Health Posts do have at least one obstetrician and the capability to perform deliveries.
[10] Social Security
[11] Armed forces and National Police

Health center MINSA	15%	14%	16%
Health post MINSA	6%	2%	13%
Center/post-Essalud	1%	2%	0%
Private practice	8%	11%	1%
Woman's or midwife's house	19%	6%	42%
Other	1%	1%	2%
TOTAL	**100%**	**100%**	**100%**

Source: ENDES 2009.

Differentiating according to place of delivery by area of residence, Table 5 also shows that nearly half the women living in urban zones give birth in MINSA's hospitals and 6 percent delivered in their own or the midwife's home. The situation is different in rural areas where only 23 percent of all women give birth in MINSA's hospitals and 42 percent of them deliver in their own or the midwife's home. Another relevant difference is attendance in health posts. Even though posts are not recommended by MINSA, 13 percent of women in rural areas have assisted deliveries in these posts, almost seven times more than women in urban areas. This shows even more inequalities in access to health services between populations living in different areas.

The establishments where deliveries take place is a useful proxy for quality of attention received in institutional deliveries. Assuming that the best place to give birth is a hospital, and the worst being one's own house or any other place, and then urban households not only have greater access to delivery health services, but also better quality than rural households.

Another indicator of quality is the caregiver's capability to lead the delivery. Doctors and obstetricians are the first in the ranking, followed by nurses, health specialists (*sanitarios)*, traditional birth attendants, and other possible caregivers including health auxiliary personnel, technicians, friends or family.[12]

Table 6 presents information on both place of delivery and type of health professional assisting delivery. It shows an expectedly higher participation of doctors and obstetricians in institutional deliveries. The importance of the category "Others" is quite relevant in non-institutional deliveries, even though there is no certainty about the level of skills and type of caregivers in this category.[13]

In terms of differences in the quality of attention at deliveries among urban and rural women by type of caregiver, Table 6 shows that even when the delivery is institutional, rural

[12] According to ENDES, if the woman listed more than one caregiver for her delivery, it is considered that the most qualified caregiver among them was in charge of the delivery.

[13] The "Others" category is constructed by considering deliveries attended by a "health worker" (not a specialist), a friend or relative, or "Others" as defined by ENDES, which is any uncoded person. The proportions of these differ by area of residence. In the aggregate, the proportion of relatives or friends is higher than the rest of the categories; while in the urban zone the "Others" are more important, in rural areas, relatives or friends are the main component of this category as shown in Table 6.

women are more likely to be attended by a nurse or an obstetrician, rather than a doctor. If the delivery is non-institutional, urban women are more likely to be attended by a traditional birth attendant, while a greater number of rural women are attended by caregivers in the "Others" category.

Table 6: Caregivers assisting delivery by geographic location and type of delivery

		Doctor	Obstetrician	Nurse	Health Specialist	Traditional Birth Attendant	Others	No one	Total
Non-institutional delivery	Total	4.0%	7.9%	4.7%	0.4%	37.8%	43.9%	1.3%	100%
	Urban	12.6%	10.8%	2.5%	1.3%	37.7%	34.1%	1.2%	100%
	Rural	1.4%	7.1%	5.4%	0.1%	37.8%	46.9%	1.3%	100%
Institutional delivery	Total	60.9%	35.6%	2.6%	0.1%	0.0%	0.8%	0.0%	100%
	Urban	67.3%	31.5%	1.0%	0.0%	0.0%	0.3%	0.0%	100%
	Rural	42.1%	47.9%	7.2%	0.2%	0.1%	2.4%	0.0%	100%

Source: ENDES 2009.

2) INSTITUTIONAL DELIVERIES AND CHARACTERISTICS OF WOMEN AND HOUSEHOLDS

Tables 7 to 11 sum up the situation regarding deliveries with respect to three features: the women's level of education, mother's language, and the household's wealth quintile using ENDES 2009.

Table 7: Distribution of deliveries by education level and area of residence

	Non -Institutional Delivery			**Institutional Delivery**		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
No education, preschool	9%	4%	11%	2%	1%	7%
Primary	63%	52%	66%	23%	14%	50%
Secondary	24%	31%	22%	47%	51%	37%
Higher	4%	13%	1%	27%	34%	6%
TOTAL	100%	100%	100%	100%	100%	100%

Source: ENDES 2009.

According to ENDES, most women giving birth in an institutional facility (74 percent) have completed secondary or higher education, while 72 percent of women giving birth in non-institutional establishments have not completed secondary education at all. This shows a clear correlation between level of education and type of delivery—the more educated the woman, the more likely she is to have an institutional delivery.

Table 8 shows that completing primary education increases the probability of having an institutional delivery by nine percentage points, while finishing secondary education increases the likelihood by 20 additional percentage points.

Table 8: Rate of institutional delivery by educational level

	Rate of Institutional Delivery
No primary	51%
Primary	60%
Secondary	89%
Higher education	96%
TOTAL	80%

Source: ENDES 2009.

Another important factor is the mother's language as the country is characterized by a diversity of cultures. Table 9 shows the proportion of institutional and non-institutional deliveries by language categories.

Table 9: Proportion of deliveries by the mother's language and area of residence

	Total		Urban		Rural	
	NID	ID	NID	ID	NID	ID
Spanish	17.2	82.8	6.9	93.1	42.9	57.1
Quechua	37.6	62.4	27.1	72.9	38.6	61.4
Aymara	48.6	51.4	47.7	52.4	48.7	51.3
Other indigenous languages	84.5	15.5	73.1	26.9	85.2	14.8

Source: ENDES 2009.

The Spanish-speaking population has the highest rate of institutional delivery (83 percent) followed by Quechua speakers (62 percent), Aymara speakers (51 percent), and other indigenous language speakers (16 percent). A possible explanation for the latter is that selvatic regions have the lowest ratio of doctors and obstetricians per 10,000 inhabitants; there aren't enough health professionals to tackle demand. Moreover, establishments in Aymara and Sylvan-speaking areas are usually heath posts with health technicians and auxiliaries. Although they do speak native languages, they are neither qualified nor authorized to conduct deliveries. Even though there is a clear problem on the supply side in handling institutional deliveries among this population, customarily, Aymara and Selvatic women also prefer to give birth without help and are not used to going to health establishments.

To capture exclusion and inequalities in access to institutional delivery, we consider the wealth quintile distribution of institutional and non-institutional deliveries. The differences between the richest and the poorest quintiles are vast. Fifty percent of women in the poorest quintile have an institutional delivery, as opposed to 98 percent women in the richest quintile.

Table 10: Proportion of deliveries by wealth quintile and area of residence

	Total		Urban		Rural	
	NID	ID	NID	ID	NID	ID
Poorest quintile	50.4	49.6	31.3	68.7	52.6	47.4
Second quintile	23.5	76.5	16.2	83.8	32.2	67.8
Third quintile	6.7	93.3	5.3	94.7	17.1	82.9
Fourth quintile	3.0	97.0	3.1	96.9	0.2	99.8
Richest quintile	2.4	97.6	2.4	97.6	0.0	100

Source: ENDES 2009.

3) INFORMATION ACCESS

Tables 11 through 14 present evidence on how access to information affects institutional deliveries. The variables considered are frequency of reading newspapers and listening to radio. As can be seen, reading a newspaper or magazine, even if less than once a week has a strong correlation with institutional deliveries. Table 11 shows that 42 percent of women who had non-institutional deliveries don't read newspapers or magazines. Reading even less than once a week can increase the likelihood of women opting for institutional deliveries. Table 12 shows this relationship clearly: the institutional delivery rate for women who don't read papers is 56 percent, while women who read more than once a week have a rate of 91 percent.

Table 11: Distribution of deliveries by frequency of reading and type of delivery

	For Women who had ID	For Women who had NID	For all Deliveries
Doesn't read paper	14%	42%	19%
Less than once a week	56%	49%	55%
More than once a week	10%	4%	9%
Everyday	20%	4%	17%
TOTAL	100%	100%	100%

Table 12: Type of institutional delivery by frequency of reading

	Rate of Institutional Delivery
Doesn't read paper	56%
Less than once a week	82%
More than once a week	91%
Everyday	95%
TOTAL	80%

The impact of frequency of listening to radio on accessing institutional deliveries is less evident, but is still important. The rate of institutional deliveries is 58 percent for women who don't listen to the radio, and up to 79 percent for women who do. Note that around 98 percent of women said they listened to the radio while only 80 percent said they read a newspaper or magazine.

Table 13: Distribution of deliveries by frequency of listening to radio and type of delivery

	For Women who had ID	For women who had NID	For all Deliveries
Doesn't listen to the radio	4%	7%	5%
Less than once a week	37%	37%	37%
More than once a week	3%	3%	3%
Everyday	56%	53%	55%
TOTAL	100%	100%	100%

Table 14: Type of institutional delivery by frequency of listening to radio

	Rate of Institutional Delivery
Doesn't listen to the radio	70%
Less than once a week	80%
More than once a week	81%
Everyday	81%
TOTAL	80%

4) INSURANCE

The SIS scheme is a government health insurance program directed to poor people with limited access to medical services. According to SIS's statistics, by the end of 2009, there were 11,815,242 insured. Data shows that over 317,000 deliveries were attended during 2009. The effectiveness of SIS in increasing institutional delivery coverage is shown in Table 15 which presents the type of delivery for women affiliated to SIS by area of residence.

Table 15: Type of institutional delivery by affiliation to SIS and area of residence

	SIS Insured
Total	
Non-institutional delivery	30.4
Institutional delivery	69.6
Urban	
Non-institutional delivery	10.9
Institutional delivery	89.1
Rural	
Non-institutional delivery	43.7
Institutional delivery	56.3

Source: ENDES 2009.

In aggregate terms, despite the fact that the majority of women affiliated to SIS (69 percent) have an institutional delivery, one out of three affiliated women prefer to give birth at home, with or without a traditional birth attendant. The situation is particularly critical in rural areas where almost half the women affiliated to SIS have non-institutional deliveries. Table 16 shows institutional delivery coverage for the poorest women in rural areas.

Table 16: Type of delivery for rural women from the poorest quintile by SIS affiliation

	NID	**ID**
Total	50.4	49.6
Not affiliated to SIS	54.3	45.7
Affiliated to SIS	48.8	51.2

Source: ENDES 2009.

It is clear that affiliation to SIS does make a significant difference for the poorest women in rural areas: the proportion of women giving birth at institutional establishments differs by 5.5 percentage points if they are affiliated to SIS or not. However, there are a huge

proportion of poor women affiliated to SIS who give birth in a non-institutional setting. This fact raises questions about the effectiveness and the quality of information that SIS affiliates receive regarding the best options in giving birth. It also raises questions about the availability of health services for those affiliated to SIS. Even though a woman might be affiliated, the health establishment may be too far away, or lacking a qualified staff or the medical equipment necessary; for these reasons, she still prefers to give birth somewhere else, usually at home.

Tables 17 and 18 present institutional and non-institutional deliveries for poor women (first and second income quintiles, respectively). The second row is the proportion of women affiliated to SIS at the national level. Only 66 percent of pregnant women from the poorest quintile were affiliated to SIS; 51 percent had an institutional delivery. Among women in the second lowest income quintile, 46 percent were affiliated to SIS and 76 percent of them had an institutional delivery. The coverage of pregnant women by SIS is still very low in the lowest income quintile.

Table 17: Type of delivery of women in the poorest income quintile affiliated to SIS

	Total	Affiliated to SIS	Not Afiliated to SIS
Total	100.0	65.7	34.3
Non-institutional delivery	50.4	48.8	54.3
Institutional delivery	49.6	51.2	45.7

Source ENDES 2009.

Table 18: Type of delivery of women in the second poorest income quintile affiliated to SIS

	Total	Affiliated to SIS	Not Affiliated to SIS
Total	100.0	45.8	54.2
Non-institutional delivery	23.5	23.8	23.3
Institutional delivery	76.5	76.2	76.7

Source: ENDES 2009.

Furthermore, when poor women do not access institutional establishments, it is not just the probability of death (for them and their children) that is higher. Consequences arising from limited access to health care, post-delivery complications, inadequate treatment of the newborn, etc. are also dangerous. This would generate a more health deficient population and reinforce a vicious cycle of disease and poverty. According to the INEI, 35 percent of Peru's population was poor in 2009.

The government still has a way to go in increasing the number of women affiliated to SIS, as well as in improving the ratio of institutional deliveries among women affiliated to SIS.

5) SUPPLY RESOURCES

A) Specialized Services and Infrastructure

The SIS system was created in 2002 and absorbed within it Child and Maternal Health Insurance. Since then, it has broadened its coverage. Attention to maternal health services from 2005 to 2007 is shown in Table 19.

Table 19: SIS for maternal health services 2005–2007

	Year		
SIS attention to:	**2005**	**2006**	**2007**
Deliveries	290,476	281,123	275,782
Cesarean sections	51,762	56,671	58,752
Prenatal care	1,587,762	1,710,545	1,779,591
Intensive care	722	696	663
Transfers	22,742	24,313	25,787
Iron for pregnant women	905,939	1,171,043	1,277,151
Folic acid for pregnant women	324,334	561,321	742,808
Complicated pregnancy or post-delivery	160,993	179,747	188,428
Deliveries with complications that required surgical intervention	25,602	33,754	38,332
Post-delivery care	294,221	304,296	310,590

Source: SIS.

Delivery attention has dropped since 2005, information that is consistent with MINSA data. The number of cesarean sections has increased significantly, as has prenatal attention and the provision of iron and folic acid to pregnant women. This probably means that maternal care has become more complete in that it oversees women not only during delivery, but during the entire process of pregnancy, delivery and post-delivery. Prenatal checkups could be more important now because of the “Juntos” program, the government’s conditional cash transfer program, which mandates compulsory checkups to avail of the benefits of the program. “Juntos” was put in place in 2006.

As part of the Performance Based Budget, the Peruvian Ministry of Health instituted physical goals for several indicators, including attention at deliveries. Table 20 shows the goals per region and type of delivery care expected compared with the number of women in their fertile age by region and live births per year. The goals show incongruence: there are regions where the goal is seven times the live births per year.

Table 20: Physical goals for the Performance Based Budget Program of Maternal and Neonatal Health, 2008

Region	Normal Delivery Attention	Non-Surgical Complicated Delivery Attention	Surgical Complicated Delivery Attention (Cesarean)	Total Delivery Attention (a)	Women in Fertile Age	Live Births Per Year (b)	Goal's Coverage of Total Births (a)/(b)	Rural Institutional Deliveries Coverage by Region
Amazonas	3533	442	692	4667	88563	8380	55.7%	52.2%
Ancash	17516	859	2744	21119	310235	19366	109.1%	60.3%
Apurimac	61122	596	1046	62764	93601	7938	790.7%	90.8%
Arequipa	15389	550	3470	19409	326500	18297	106.1%	86.1%
Ayacucho	20183	3136	3067	26386	146176	11669	226.1%	69.2%
Cajamarca	19101	3198	2364	24663	347158	27326	90.3%	39.6%
Callao	12120	545	3934	16599	249680	861463	1.9%	97.9%
Cusco	27733	3660	3429	34822	295444	20463	170.2%	69.0%
Huancavelica	13103	2302	1996	17401	104646	8654	201.1%	54.0%
Huánuco	13665	4484	2147	20296	185156	14663	138.4%	67.6%
Ica	23397	257	407	24061	194547	13320	180.6%	93.5%
Junín	20822	3580	3149	27551	319572	21851	126.1%	68.6%
La Libertad	26615	3885	6664	37164	428104	31971	116.2%	62.1%
Lambayeque	45930	927	1096	47953	305157	20705	231.6%	83.9%
Lima	97332	17997	33753	149082	2446521	132652	112.4%	96.1%
Loreto	44698	3714	4649	53061	217614	25483	208.2%	44.9%
Madre de Dios	4979	275	413	5667	29144	2489	227.7%	86.8%
Moquegua	1742	162	585	2489	44477	2468	100.9%	91.0%
Pasco	1813	222	351	2386	73306	5150	46.3%	68.7%
Piura	48871	5747	7362	61980	435466	36092	171.7%	74.6%
Puno	29279	4610	4385	38274	325592	20781	184.2%	42.4%
San Martín	16038	1094	1449	18581	180464	15634	118.8%	71.0%
Tacna	1532	90	1342	2964	85166	4567	64.9%	83.5%
Tumbes	2067	70	110	2247	53849	4136	54.3%	95.4%
Ucayali	12173	655	1817	14645	110911	11203	130.7%	71.1%
TOTAL	**580753**	**63057**	**92421**	**736231**	**7397049**	**1346721**	**54.67%**	**57%**

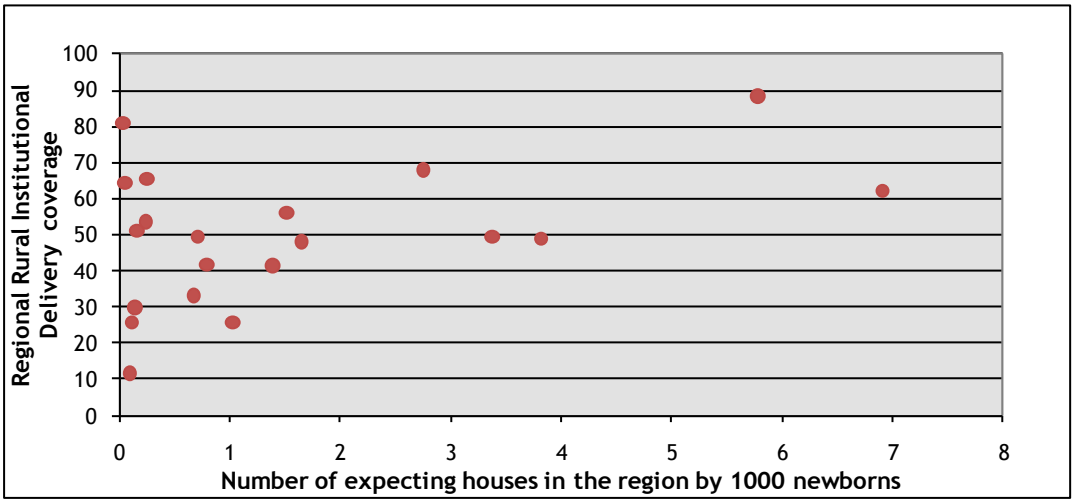
Source: MEF, 2007 Census.

Regarding cesarean sections, the national average is 13 percent cesareans, around the 15 percent WHO standard. There are, however, differences by region: 23 percent births in Tacna, Moquegua and Callao are by cesarean section, while there are less than 5 percent cesareans in Ica, Lambayeque and Tumbes.

One important and relatively recent government strategy in the field of maternal care is the establishment of "expecting houses". Developed in 1997, this is an attempt to overcome the problem women face in travelling long distances to give birth in health establishments. These houses are places where pregnant women and some relatives can live until their due date of delivery. These are equipped to handle unexpected emergencies.

By June 2010, 405 expecting houses were distributed throughout the country. Graphic 3 shows their allocation in the region controlled by 1,000 newborns.

Graphic 3: Number of expecting houses by regional rate of rural institutional delivery



*This graph considers regions with at least one expecting house (Tacna, Tumbes, Madre de Dios and Ica are excluded).

Cusco has the largest number of expecting houses (140) and 62 percent rural institutional deliveries (the ninth highest among the 24 regions).[14]

To analyze more specifically the availability of MINSA´s infrastructure for specialized maternal care, Table 21 presents the latest FON evaluation (FON stands for Obstetrical and Neonatal Functions [Funciones Obstétricas y Neonatales], in Spanish). MINSA performs evaluations of the capacity of establishments with FON since 2007 (authorized to perform obstetric and neonatal interventions).

[14] Information on the specific location of the expecting houses has been requested but is not yet available. Therefore, no distinction can be made between rural and urban locations.

There are four types of FON according to their level of complexity, from the simpler to the most complex: Primary Obstetrical and Neonatal Functions (FONP), Basic Obstetrical and Neonatal Functions (FONB), Essential Obstetrical and Neonatal Functions (FONE), and Intensive Obstetrical and Neonatal Functions (FONI).[15] Table 21 presents results from the FON evaluation for Capacity of Resolution (CR) at the national level for all available MINSA health directions.

Table 21: Results from FON evaluation of all available health directions 1/ (2007–2008)

		2007	2008
Total MINSA Establishments		**6486**	
Number of evaluated establishments with FON	FONP	3611	3773
	FONB	455	472
	FONE	72	85
	FONI	1	1
	TOTAL	4139	4331
Capacity of Resolution (CR)	CR larger than 80% for FONP	852	955
	CR larger than 80% for FONB	164	187
	CR larger than 80% for FONE	38	49
	CR larger than 80% for FONI	1	1
	CR larger than 80% for FON	1055	1192
% of FON health establishments with adequate CR	FONP		25.31
	FONB		39.62
	FONE		57.65
% of health establishments that applied FON evaluation		63.80	66.77
% of health establishments with more than 80% of CR		**25.50**	**27.50**
Percentage of advance in FON application		2.98	
Increment percentage of health establishment with adequate CR		2.00	

1/ Health directions were not available for Tumbes, Lima Norte and Ayacucho.

At the national level, the percentage of health establishments with a CR for FON higher than 80 percent is 27.5 percent, which implies that almost three out of every four health

[15] See Appendix 1 for a more complete description of the FON levels.

establishments which can legally attend deliveries do not have enough CR to do so[16]. This situation is predominant among the Primary FON establishments, which are the most numerous and, generally, the closest to poor people or those with limited access to more complex or alternative institutional health services.

These results show the deficient services and infrastructure that the government has to offer in maternal care. Some improvements have been made; say from 2007 to 2008, when the proportion of establishments with an adequate CR increased 2 percentage points. However, more improvements are necessary if the National Sanitary Objectives and the Millennium Development Goals regarding a reduction in maternal and infant deaths are to be fulfilled on time.[17]

In terms of human resources, two important problems arise. The first one has to do with the shortage of professionals needed to fulfill the demand. For example, WHO reported that in 2005, the number of physicians for 10,000 inhabitants in Peru was 11.7, while the average for Latin America was 18.4. The second is a problem of allocation: poor distribution of professionals, which makes this a management and legal issue. At this point, public sector laws regarding human resources are inadequate. For instance, it is not possible to move professionals from one place (district or region) to another without their consent.

[16] As can be seen in Table 21, the cut-off point to determine "adequate" CR is 80 percent, meaning that if an establishment has a CR of more than 80 percent, it is considered to be able to adequately perform institutional deliveries. This cut-off is the standard that MINSA works with.

[17] If all establishments performed the FON evaluation, it would be possible to match the places where women were attended to with the CR of those establishments. This would be a powerful tool to concentrate efforts to improve delivery facilities where they are most needed. Unfortunately, this is not the case.

III. EFFECTIVENESSS EVALUATION

To measure the effectiveness of policies designed to increase the rate of institutional deliveries,[18] we calculated an econometric model using an ordered logistic regression. The dependent variable is a binary outcome: whether or not the woman had an institutional delivery. This also helps ascertain the relation between the availability of health services and the probability of having an institutional delivery in a public health establishment.

Even though we would like to use information on maternal mortality, this information is scarce; yet, it is possible to rely on the established premise that institutional delivery is an important factor in preventing maternal mortality, and that a strong negative correlation has been found between the MMR and institutional deliveries for the 2000–2002 period. Internationally, institutional delivery has been found to be a good predictor of MMR.

This model uses various types of input variables. First, a number of variables describing characteristics such as frequency of reading newspapers, the woman's native language, the location of the household, etc. which affect a woman's demand for health services. Second, variables describing use of health and prenatal services, such as affiliation to insurance scheme, number of antenatal controls and use of government-assistance programs. Finally, the supply-side variables measuring the amount of health resources available in her district, such as number of doctors, obstetricians, nurses, health centers and posts per thousand inhabitants in the district.

We constructed a database combining information from the ENDES health survey, the Health Information System (HIS) from the Ministry of Health and the school census. The ENDES survey contains information on deliveries and demand control variables. It also has information on insurance coverage, including coverage by SIS, one of the policy variables. The HIS contains information on health establishments and human resources at the district level. The school census has information on undernourishment of children and participation in government programs like "Crecer" and "Juntos".[19] Given the differences in data collection from the various sources, our database contains information from 2005 to 2008 for all women in their fertile years.

1) MODEL

The model was defined as a binomial discrete selection model because the dependable variable—institutional deliveries—only takes the values of 1 or 0. Specifically, the model—

[18] Raising the number of institutional deliveries is not an outcome; it is in fact an output variable. Thus, we are estimating the marginal cost of an institutional delivery. However, we are using institutional deliveries in the regression instead of an outcome variable—such as the likelihood of an infant death or a birth complication—because of data limitations.

[19] The "Crecer" program is an integral development program which seeks to reduce poverty by utilizing focused government intervention. It is articulated because it includes intervention by regional, district and central government institutions.

specified to quantify the effects of different policy variables on the incidence of institutional deliveries—is a logit discrete selection, represented as:

$$p = \frac{e^{x'\beta}}{1 + e^{x'\beta}}$$

The estimated model is:

$$x'\beta = \beta_0 + \beta_1 Woman + \beta_2 Household + \beta_3\ District + \beta_4 Insurance + \beta_5 Prenatal + \beta_6 Prof + \beta_7 Estab + \xi$$

Where:

- **Woman** includes the following variables:
  - Woman's level of education measured in single years.
  - Woman's frequency of reading newspapers or magazines. Takes the value of 0 if she doesn't read any and 1 if she reads less than once a week.
  - A dummy variable that takes the value of 1 if the woman's native language is Quechua and 0 otherwise.
  - A dummy variable that takes the value of 1 if the woman's native language is Aymara and 0 otherwise.
  - A dummy variable that takes the value of 1 if the woman's native language is indigenous and different from Quechua or Aymara and 0 otherwise.
  - The number of children, including current children.
  - Woman's age at the time of birth.
- **Household** includes:
  - Dummy variables for the household's wealth quintiles.
  - The household's cluster altitude.
  - A dummy variable which takes the value of 1 if the household is located in a rural area.
- **District** includes:
  - The logarithm of the districts child malnutrition rate.
- **Insurance** includes:
  - A dummy variable for affiliation to SIS health insurance, taking the value of 1 if affiliated and 0 otherwise.
  - A dummy variable for affiliation to a health insurance different form the SIS.
- **Prenatal** includes :
  - A variable that takes account of the number of prenatal checkups only if at least one was performed by either a doctor or an obstetrician.
  - A multiplicative variable that takes into account the interaction between SIS insurance and prenatal checkups.
- **Prof** includes:
  - The number of MINSA's nurses per 1,000 habitants in the district.
  - The number of MINSA's obstetricians per 1,000 habitants in the district.
- **Estab** includes the following variables:
  - The number of MINSA health centers per 1,000 habitants in the district.
  - The number of MINSA health posts per 1,000 habitants in the district.
- **ξ** is the error term

The model is estimated for the complete sample and for a sample including only rural households. This is because the government has especially set goals for institutional deliveries in rural areas. Policy recommendations and their implementation vary according to location.

For the final estimation, two variables have been instrumentalized due to potential endogeneity problems: prenatal controls and affiliation to SIS.

In the case of the prenatal variable, it is possible that willingness to attend prenatal checkups is correlated to the willingness to opt for an institutional delivery. Both indicate an unobservable advantage a woman might have, like proximity to a health facility, or self recognition of the importance of maternal health. Since the willingness of the woman is not captured in the model, it may generate a correlation between the prenatal variable and the dependable variable.

In the case of affiliation to SIS, it is possible that women are more likely to get SIS affiliation if they are planning to get pregnant and are willing to have an institutional delivery.

In both cases, an instrumental variable method was used to correct the problem. For the first stages, a least squares method for the prenatal regression and a logit specification for the SIS variable were used against a set of exogenous variables included in the original model. The prediction was used as an instrument in the logit regression.

We are less concerned about an endogenous program placement—government constructing more hospitals, health centers and posts as well as assigning more obstetricians and nurses in areas with low institutional deliveries—because the correlation coefficients between the number of health establishments and poverty level, and thus institutional delivery, by region show a weak relationship between these variables.

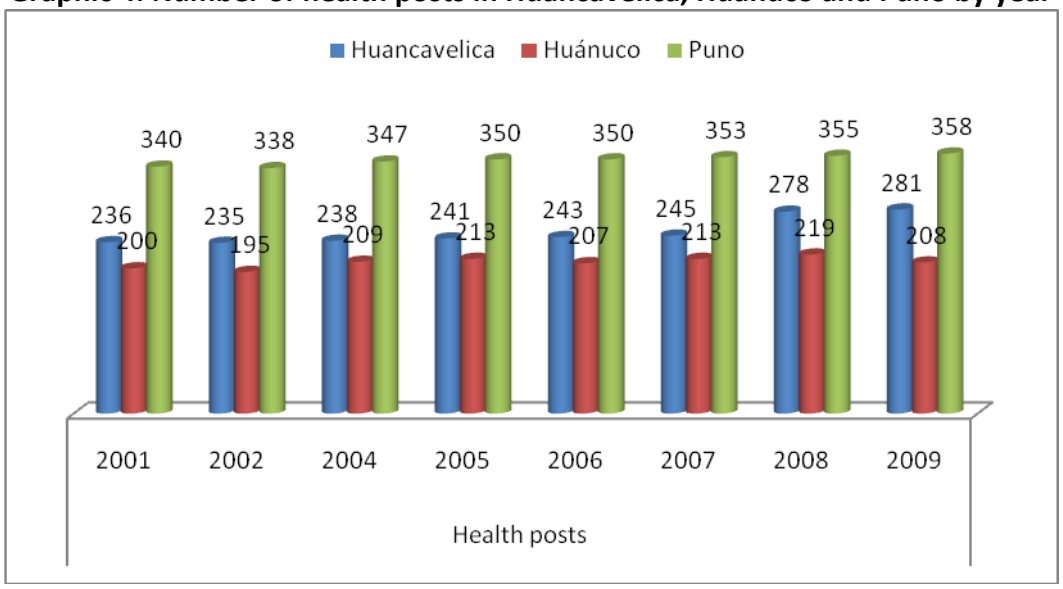
Table 22: Correlation between health establishments and poverty level by region

Type of Health Facility	2001	2005	2009
Hospital	0.09	-0.22	-0.01
Health center	0.12	-0.12	0.05
Posts	0.33	0.51	0.25

Source: INEI.

Even though the correlation between health posts and poverty level is higher, a more detailed analysis of the data shows no significant variation over time. Graphic 4 presents data on the number of health posts by region over time for three poorest regions in Peru: Huancavelica, Huánuco and Puno. According to the INEI, in 2000 these regions were among the five with the lowest incidence of institutional delivery. Despite this, the number of health posts has not changed significantly.

Graphic 4: Number of health posts in Huancavelica, Huánuco and Puno by year



Source: INEI.

2) RESULTS

The resulting coefficients for the complete model and for the rural sector are presented in Table 23.

Table 23: Results from effectiveness evaluation model

	Complete Model	Rural Model
WOMAN Variables		
Education	0.0616622	0.050198
Paper	0.0322503	0.121383
Quechua	0.5951073	0.873293
Aymara	-0.6691742	-0.51752
Other indigenous language	-1.342463	-1.19904
Children	-0.1652892	-0.15895
Age	0.0405503	0.03876
HOUSEHOLD Variables		
Wealth 1	-1.190265	-1.13902
Wealth 2	-1.084501	-1.01779
Wealth 3	-0.4745966	-0.34813
Altitude	-0.00012	-0.00011
Rural	-0.617209	
INSURANCE Variables		
Other_Insurance	0.5515561	0.776565
SIS*	0.6119348	0.840952
Prenatal Variables		
Antenatal*	0.1765799	0.190959
SIS x Antenatal	0.0667883	0.062747
DISTRICT Variables		

Obs_per1000	0.1649748	0.124468
Nur_per1000	0.2310663	0.187501
Cen_per1000	0.0684363	0.161009
Pos_per1000	0.0594537	0.039847
Log_undernourishment	-0.3742722	-0.2308826
CONSTANT	-63.94642	-85.30028

∗ Denotes where an instrumental variable has been used.

All coefficients in the table are significant at 5%.
The results for both models are consistent with the theoretical framework as well as the descriptive statistics section. For the 'Woman' variables, the coefficient associated with the years of education and the frequency of reading newspapers are positive; these variables reflect the quantity and, most likely, the quality of information a woman has, thus positively affecting the probability of having an institutional delivery. As for the 'mother's language', the Aymara and other indigenous language variables have a negative coefficient, reflecting the negative impact on institutional delivery rates. The number of children has a negative effect on the rate of institutional deliveries. The model estimation also shows that older women are more likely to have an institutional delivery.

The 'Wealth' index, the household location (rural/urban), and the cluster altitude (households located at higher altitudes have a lower probability of having an institutional delivery) are measures of access to health services.

We expected positive coefficients for the 'Insurance and Prenatal' variables and they are, in fact, positively correlated to the dependable variable. Having insurance implies lower cost of delivery and should increase the probability of women having an institutional delivery. Prenatal checkups give relevant information to pregnant women and a better informed woman is more likely to give birth at a better establishment (if possible). Prenatal checkups also provide opportunities to detect potential risks for women. Thus, prenatal checkups are shown as very important determinants for institutional deliveries.

The positive coefficient of the multiplicative variable between prenatal controls and affiliation to SIS **(SIS*antenatal**) reflects complementarities among these variables; for instance, women affiliated to SIS may access more prenatal controls.

In terms of the supply-side variables—physical and human resources—we expected a positive effect on institutional deliveries. Having more obstetricians and nurses, as well as more centers and posts in the region is useful to increase institutional deliveries. The magnitude of these coefficients is important for policy recommendations. Table 24 presents marginal effects for key variables for both the complete sample and the rural model. These effects show the impact of increasing one unit of the variables analyzed on institutional deliveries.

Table 24: Marginal effects from the effectiveness evaluation model

	Complete Model	Rural Model
Other–insurance	0.0467269	0.182654
SIS	0.07764	0.268046
Antenatal	0.016822	0.051291
Obstetrician per 1,000	0.016005	0.031046
Nurse per 1,000	0.0224169	0.046768
Center per 1,000	0.0066393	0.04016
Post_per 1,000	0.0057679	0.009939

Table 24 suggests that health insurance increases the likelihood of having an institutional delivery, although SIS insurance is more effective than other insurances for both the rural model and the complete model. With SIS insurance, the probability of having an institutional delivery increases, on average, by 7.7 percentage points for the complete model and 26.8 percentage points for the rural model. We suspect that SIS increases the productivity of health professionals and health establishments as well.

Using the information presented earlier of the coefficients regression, we simulate the rate of institutional deliveries for women under different demand-side circumstances. For the complete data sample, the average woman has a 78 percent probability of having an institutional delivery, while the average woman in the rural sample has only a 51 percent chance.

Using the complete sample coefficients, we simulate the likelihood of women with the lowest demand-side variables for health but with average supply-side variables: they have a 14 percent chance of opting for an institutional delivery; thus, one out of seven women with these characteristics—the Aymara woman, with no education, who doesn't read the newspaper, belongs to the lowest wealth quintile, lives in a rural area, with no insurance and no prenatal checkups—opt for an institutional delivery. On the other hand, a woman belonging to the higher wealth quintiles, with education and the habit of reading the newspaper, insured and with prenatal checkups but still living in a rural area and with the same average supply-side variables, has a 98 percent chance of having an institutional delivery.

In urban areas, the average woman has a 93 percent probability of having an institutional delivery. In the case of women who have the demand characteristics of poor rural women—lowest demand-side variables—but the supply-side and district variables of mean urban districts, their probability of having an institutional delivery would be 28 percent: 14 percentage points higher than women living in average districts in terms of supply-side variables but with lowest demand- side characteristics.

It is also possible to estimate the impact of the supply-side variables. An average woman in the complete sample would have a 98 percent chance of going in for an institutional delivery if she had the highest per capita rate of nurses and obstetricians in the country (five MINSA nurses and 3.5 MINSA obstetricians per 1,000 inhabitants), keeping the physical resources supply at their average. If, on the other hand, this woman had the highest rate of

physical resources (centers and posts) but average rate of nurses and obstetricians, her probability of having an institutional delivery would be 93 percent.

Table 25 presents the final outputs for both models—complete and rural samples. It shows the relative coefficients of comparable supply-side variables. These ratios give an idea of the relative impact of these variables on institutional deliveries: the relative magnitude of one unit increase in obstetricians over nurses, as well as the relative importance of one unit increase in centers over posts. This information will be fundamental for the cost effectiveness analysis that follows in later sections.

Table 25: Relative impact effects from effectiveness evaluation model

	Complete Model	Rural Model
Obstetrician / Nurses	0.713972	0.663826
Centers / Posts	1.151086	4.040672

IV. COST ESTIMATIONS

The cost estimations are the second input needed for the cost effectiveness analysis. There are a number of policy variables that have been identified as significant in the impact estimations. Cost estimations of these variables are required to make the alternative policies comparable. This section presents the methodology to calculate the costs as well as the resulting cost estimated.

1) METHODOLOGY

The cost estimation for SIS considers two inputs. Since the SIS is a subsidized insurance program, the main expenses are compensation to health providers for attending to SIS insured people. In our case, these transferences are relevant only for financing a delivery. This information was obtained from the independent SIS evaluation done in 2009 in the framework of the Results Based Budget. In addition to these transferences, it is important to consider SIS administrative costs since they are bound to increase with the eventual expansion of SIS coverage. The resulting per capita administrative cost is relatively low.

Given that SIS only transfers variable costs to health providers, we have estimated transfers only over these variable costs. This may underestimate the costs, especially if large increases in coverage are expected. However, no information on fixed cost is available.

Cost estimations for the physical resources supply variables (health posts and health centers) are based on the budget information for the years 2009 and 2010. The cost estimate is the average investment required to build and equip a single facility (data is available for some facilities in the budget analysis). Additionally, it is impossible to differentiate the costs of building physical resources by usage. As for human resources, the cost of providing additional nurses and obstetricians will be the average yearly payment to MINSA´s employees. This information is collected directly from MINSA.

2) RESULTS

SIS Costs

The cost estimation for SIS is divided into the estimation of variable costs and individual administrative costs. The variable cost is the tariff SIS pays for attending deliveries. This tariff is PEN 21.5 for a normal delivery and PEN 53 for a caesarian section. Using Household Survey data, it is possible to estimate the proportion of institutional deliveries by caesarean section: 13 percent in rural areas and 26.5 percent at the national level. Weighting the tariffs by the proportion of deliveries with and without caesarean section, the average delivery tariff is PEN 29.8 nationally and PEN 25.6 for rural areas.

As for administrative costs, the executed budget for the year 2009 was PEN 458,519,244. This budget is divided over three aspects in the report: government planning, management, and individual health. Administrative costs are considered in both management and government planning, and they represent PEN 18,919,035 from the total budget. To calculate the unitary administrative cost, we require an estimation of country-wide affiliation to SIS. The SIS website reported 11,815,242 affiliates for the year 2009; this renders a unitary administrative cost of PEN 1.60. When adding this amount to the average tariff for deliveries, we arrive at the cost of including one woman to the SIS and of that woman having an institutional delivery: PEN 31.4 at the national level and PEN 27.2 for rural areas.

These calculations consider the costs of covering a single woman's delivery needs. If we add the average cost of prenatal checkups, the expense increases. Rural women affiliated to SIS average five prenatal checkups while the national average is six. Using crossed frequency between caesarean sections and prenatal controls at formal health establishments, the average cost of insuring a pregnant woman is PEN 66.7 for the complete sample and PEN 54 for the rural sample. With the administrative expenses, costs are PEN 68.3 and PEN 55.6, respectively.

We also need to estimate the cost of other health services that women affiliated to SIS might have. Budget information for 2009 presents a PEN 100 million transfer for maternal and neonatal health, leaving PEN 335 million for other programs. Dividing these transfers by 11 million affiliates for 2009, we estimate a PEN 28.73 additional transfer per affiliate. The estimated cost of an affiliated pregnant woman is PEN 97 at the national level and PEN 84.3 in rural areas. The National Household Survey (ENAHO) 2009 shows that pregnant women represent 6.8 percent of SIS affiliates in the country, and 6 percent in rural areas: for every pregnant woman in the SIS scheme, there are 14 non-pregnant women affiliated in Peru; in rural areas, for each pregnant woman, SIS affiliates 15 additional people. Thus, given the current SIS system, expanding institutional deliveries would imply expanding the entire SIS coverage. Thus, it is necessary to cover a total cost of PEN 513 for the complete sample and PEN 560 for rural areas.

3) PHYSICAL RESOURCES

Physical resources costs have been estimated using budget data for costs associated with the construction and equipment of health posts and health centers. Budget costs are assigned according to the National Public Investment System (SNIP). Due to inefficiencies in project formulation, mostly from municipal governments, the data from the national budget had to be sanitized using the SNIP reports. Failure to do so would have resulted in too much variation for the cost estimations as poorly formulated projects tend to overestimate or underestimate investments. The cost estimation shows a cost of PEN 351,000 for health posts and PEN 1,526,000 for health centers. This makes the health centers 4.35 times more expensive than health posts.

4) HUMAN RESOURCES

Human resources costs pertain to salaries of nurses and obstetricians. In addition to a fixed salary, health employees in Peru receive a number of incentives for their services. These incentives are not the same for all workers and differ between regions and level of facility. Since this information is only available for Lima, differentiation between average national payments from average payments for rural areas is not possible. The best possible estimation is the average fixed salary paid to nurses and obstetricians in Lima and extending it to the rest of the country. These estimations will be a good measure of the relative cost of nurses and obstetricians under two assumptions. The first one is that the difference in the variable component of the payments for nurses and obstetricians is proportional to the difference in fixed payments. The second is that the proportion of the salaries for nurses and obstetricians is, on average, equal in Lima than in other parts of the country.

Thus, the average fixed payment in the country for nurses and obstetricians is PEN 986 and PEN 984, respectively. On average, obstetricians cost the same as nurses.

V. COST EFFECTIVENESS ANALYSIS

SIS CEA

SIS costs to cover pregnant or non-pregnant affiliates are estimated at PEN 513 at the national level and PEN 560 for the rural sample.

A yearly investment of PEN 513 translates as a 7.7 percentage point increase in the probability of having an institutional delivery in the national sample (see Table 24). An investment of PEN 560 translates as a 26.2 percentage point increase in the rural area. Increasing SIS coverage through yearly investment at the national level is less cost effective than increasing it in rural areas. While the likelihood of institutional delivery increases 1.5 percentage points per PEN 100 invested at the national level, it increases by 4.7 percentage points for the rural sample; thus, it is three times more cost effective.

1) PHYSICAL RESOURCES CEA

The estimated impact effect for the complete sample is 0.66 percentage points for health centers and 0.57 percentage points for health posts. For the rural sample, the impact effect is 4 percentage points for health centers and 1 percentage point for health posts. With construction costs at PEN 1.5 million for the centers and PEN 350, 000 for the health posts, the latter are 3.8 times more cost effective than health centers at the national level and 1.08 times for the rural sample.

2) HUMAN RESOURCES CEA

An additional nurse per 1,000 inhabitants has an impact effect of 2.24 percentage points for the complete model and 4.67 for the rural sample. For obstetricians per 1,000 inhabitants, the impact effects are 1.6 and 3.1 percentage points for the national and rural samples, respectively. The cost of hiring obstetricians—following the assumptions stated in the cost estimation section—is 1, the same as hiring nurses. Thus, nurses are 1.4 and 1.5 times more cost effective than obstetricians for the complete sample and the rural sample, respectively.

VI. CONCLUSIONS

In the last fifteen years, Peru has seen a significant decline in maternal mortality rates. These improvements, however, were neither adequate, nor did they resolve problems of inequality across different groups and areas. Given the scarce information on maternal mortality, we rely on the premise that institutional delivery is an important factor in preventing maternal mortality, and it is a good predictor of this rate. Institutional deliveries have increased significantly in the last decade, but inequalities continue to marginalize different groups in the country. Women living in rural areas, the Selva region, and poor and uneducated women have lower rates of institutional delivery than the rest of the population.

There are three important barriers to institutional delivery: economic, accessibility, and cultural barriers. Although important efforts have been made by the government to lower these barriers, they have primarily focused on economic factors.

One of the most influential government policies to alleviate economic issues has been the creation of the health insurance program for poor and extremely poor people: the SIS. The cost effectiveness analysis provides information on the value of SIS in increasing institutional deliveries, especially in the rural areas.

Accessibility barriers are particularly important, especially in the amazonic region, where geographic dispersion and high transportation costs hamper access to health facilities for proper attention during delivery. Accordingly, it's important to increase the number of health facilities as well as improve the existing facilities so that a wider range of complications may be addressed. In this sense, it is fundamental to focus on the low resolvent capacity of the health facilities. The institutions in which mothers give birth must

have all the required equipment. More than half the health facilities in the country fall in the lowest resolvent capacity, with a very narrow capability to solve problems during delivery. Even when the cost of transforming these facilities to the second level costs almost PEN 278,000 for each facility, MINSA should consider which facilities are convenient to improve. The cost effectiveness analysis provides evidence of the potential impact of improving health posts. Similarly, it is important to hire the appropriate combination of nurses/obstetricians, following WHO standards and considering the effectiveness of each type of human resource.

An important experience that has helped increase institutional deliveries and which could be expanded further are the expecting/waiting houses. Pregnant women can go to these houses some weeks before giving birth, moving to the health facility closer to the time of delivery.

Cultural and language barriers are important, as shown by the disadvantages that indigenous minorities face. The government should be more culturally sensitive and give thought to a woman's comfort level. Some practices could be very useful, such as vertical delivery, the possibility of burying the placenta, the presence of relatives during delivery, adjusting room temperature to the mother's convenience (rather than the doctor's), among others.

One international experience that should be evaluated to combat the economic barriers is the conditional cash transfer program, "Juntos". This program includes pre and postnatal controls for the mother as well as growth controls for the infant as requirements to avail of the cash transfer. More inclusive mechanisms to account for institutional deliveries as conditions for payments have been used in other countries. India has been running a well defined program since 2005. In four years, it has increased its beneficiaries from 740, 000 to 8.43 million (almost a third of the number of women who go into labor each year). For the 2009–2010 fiscal years, it is expected that 9.5 million women will be covered with a budget of US$ 342 million. The results were found to be positive: the institutional delivery rate increased (almost by 50% from a national mean of 54.1 percent) and prenatal deaths were reduced by 14.2 per 1,000 pregnancies (from a national mean of 37.5).

PLANS FOR DISSEMINATION

The dissemination of this study will be done in three spheres: academia, public opinion, and the public sector.

- ⇨ Academia: It is planned to publish the results in the university's journal and magazine. This will be complemented with an exposition of the results in the university's research center (CIUP) with the participation of researchers and research assistants. The results of these meetings will probably stimulate further research on the effectiveness of public spending in the health sector.
- ⇨ Public opinion: Meetings with the directors of national non-governmental organizations will be scheduled when the final version of the CEA has been accepted. This will be done with the intention not only to disseminate the results of the

research, but also to promote their diffusion through the information network and publications of these organizations.

- ⇨ Public sector: Meetings will be scheduled with MINSA´s officers to discuss the results of the research.

  Additionally, we are creating a micro portal for the GDN project as an extension of the university web page. The portal will include research results and executive summaries of the project

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APPENDIXES

APPENDIX 1 – SPECIFICATIONS OF OBSTETRIC AND NEONATAL FUNCTIONS

Obstetric and Neonatal Functions (FON)
These are activities related with identifying, attending, monitoring and care of gestation, delivery, and the newborn's health according to the level of complexity of health establishments and to the role they accomplish in local health system. They are typified as:

Primary Obstetric and Neonatal Functions (FONP)
These are the maternal, perinatal and birth control activities that can be done by establishments that may or may not have health technical staff, and those that may or may not have health professionals. These health establishments generally provide 12-hour attention, going up to 24 hours eventually, don't have a delivery room, laboratory, facility for immediate attention to newborns or a hospitalization area (they are mostly health posts).

Those activities are:

- Basic prenatal and birth control attention.
- Imminent delivery and basic attention to ensure a healthy newborn.
- Identification and timely transfer of pregnant and puerperal women, and of complicated newborns.
- Obstetric and neonatal emergencies (DST).[20]
- Post-delivery birth control (orientation/counsel, provision of barrier, hormonal, oral or injectable methods—transfers should be made for other methods).

Basic Obstetric and Neonatal Functions (FONB)
These are functions in the maternal and perinatal interventions that must be done by all health establishments that have medical professional staff, obstetricians and nurses. These health establishments generally provide 24-hour attention, have a delivery room, laboratory, an area for immediate attention to newborns and hospitalization facility without surgical centers (mostly health centers)

The activities are:

- Prenatal focalized attention and birth control.
- Eutocic delivery, basic normal delivery, or with minor problems requiring newborn attention.
- Dystocic delivery or complicated delivery (DST).
- Newborn with complications (DST)
- Uncomplicated placenta retention.

[20] DST: Diagnosis, Stabilization, Transfer.

- Complicated placenta retention (DST).
- Pregnancy induced mild hypertension.
- Pregnancy- induced severe hypertension (DST).
- Minor hemorrhage.
- Severe hemorrhage and hypovolemic shock (DST).
- Maternal or neonatal sepsis (DST).
- Incomplete abortion (DST). [21]
- Vaginal tear level I and II.
- Vaginal tear level II and IV (DST).
- Repair of cervix tear.
- Obstetric surgery (DST).
- Post-delivery/post-abortion birth control (orientation/council, provision of barrier, hormonal, oral or injectable methods and DIU—transfers should be made for other methods).

Essential Obstetric and Neonatal Functions (FONE)

These are activities in the maternal and perinatal interventions that must be carried out by all health establishments that are equipped with specialized professional staff in gynecologic-obstetrics, pediatrics, surgery, anesthesiology, interns and other specialties such as neonatal nursing. These health establishments generally provide 24-hour specialized care and have a delivery room, laboratory, newborn emergency area, hospitalization area and surgical centers (mostly hospitals).

The activities include:

- Prenatal focalized attention and birth control.
- Dystocic delivery or complicated delivery (DST).
- Newborn with complications.
- Complicated placenta retention.
- Incomplete abortion.
- Pregnancy- induced moderate to severe hypertension and eclampsia.
- Severe hemorrhage and hypovolemic shock.
- Maternal or neonatal sepsis.
- Vaginal tear level II and IV.
- Cesarean
- Laparotomy
- Abdominal hysterectomy.
- Uncomplicated surgical neonatal pathology.
- Post-delivery/post-abortion birth control (orientation/council, provision of all methods, including voluntary surgical birth control).

[21] It is not DST if the FONB establishment has adequate equipment and competent staff to perform Manual Vacuum Aspiration (MVA).

Intensive Obstetric and Neonatal Functions (FONI)

Maternal and perinatal intervention functions that must be done by all health establishments with specialized professional staff in gynecologic-obstetrics, pediatrics, surgery, anesthesiology, interns, and other specialized facilities such as neonatal nursing. These health establishments give 24-hour care and have a delivery room, laboratory, emergency area for newborns, hospitalization area, surgical centers *and* a functional Intensive Care Unit (ICU).

The activities are:

- Prenatal intensive re-focalized attention (APRI).
- Deliveries of women with APRI.
- Newborn with complications requiring ICU.
- Complicated incomplete abortion.
- Hypertension induced by delivery, HELLP syndrome attended in ICU.
- Severe hemorrhage and hypovolemic shock requiring ICU.
- Maternal or neonatal sepsis requiring ICU.
- Cesareans of women with APRI.
- Complicated laparotomy.
- Complicated abdominal hysterectomy.
- Complicated surgical neonatal pathology requiring ICU.
- Post-delivery/post-abortion birth control (orientation/council, provision of all methods, including voluntary surgical birth control according to patient's condition).

Source: MINSA, 2007.

APPENDIX 2 – SUPPLY GAP IN INFRASTRUCTURE

With respect to infrastructure and supply of health services, the Peruvian government has a universal insurance scheme for which it prepared a technical report of human and infrastructure deficits in health, focusing on the 880 poorest districts of the country. The results indicated that, instead of increasing the number of health establishments, the existing ones should be improved with better equipment and capacity to attend to more complicated cases. There is also an important deficit in the cold chain and in the number of health professionals in these districts. The report estimated that an investment of PEN 517.18 million was needed over a 10-year period to close the estimated gap (Interministerial Committee for Social Affairs (CIAS), 2009).

APPENDIX 3 – REGRESION RESULTS

Regression results for the complete sample

Dependable Variable: **DELIVERY**						
Variable	**Coefficient**	**Std. Err.**	**Z**	**P>Z**	**[95% Conf. Interval]**	
WOMAN Variables						
Education	0.061662	0.000021	2932.39	0	0.061621	0.061703
Paper	0.03225	7.97E-05	404.41	0	0.032094	0.032407
Quechua	0.595107	7.83E-05	7603.31	0	0.594954	0.595261
Aymara	-0.66917	0.000175	-3826.91	0	-0.66952	-0.66883
Other_ethnicity	-1.34246	0.00029	-4625.96	0	-1.34303	-1.34189
Children	-0.16529	2.25E-05	-7344.46	0	-0.16533	-0.16525
Age	0.04055	6.75E-06	6006.12	0	0.040537	0.040564
HOUSEHOLD Variables						
Wealth 1	-1.19027	0.000254	-4688.4	0	-1.19076	-1.18977
Wealth 2	-1.0845	0.000201	-5402.43	0	-1.0849	-1.08411
Wealth 3	-0.4746	0.000149	-3193.31	0	-0.47489	-0.47431
Altitude	-0.00012	2.93E-08	-4089.14	0	-0.00012	-0.00012
Rural	-0.61721	0.00013	-4756	0	-0.61746	-0.61695
INSURANCE Variables						
Other–Insurance	0.551556	0.000149	3709.34	0	0.551265	0.551848
SIS	0.611935	0.000222	2754.12	0	0.611499	0.61237
Prenatal Variables						
Antenatal	0.17658	9.83E-05	1796.52	0	0.176387	0.176773
SIS x Antenatal	0.066788	1.22E-05	5475.82	0	0.066764	0.066812
DISTRICT Variables						
Obs_per1000	0.164975	0.000189	871.74	0	0.164604	0.165346
Nur_per1000	0.231066	0.0001	2307.67	0	0.23087	0.231263
Cen_per1000	0.068436	0.00029	235.66	0	0.067867	0.069005
Pos_per1000	0.059454	9.98E-05	595.56	0	0.059258	0.059649
Log_undernourishment	-0.52681	8.78E-05	-5999.05	0	-0.52698	-0.52664
CONSTANT	-0.96317	0.000622	-1548.87	0	-0.96439	-0.96195

Regression Results for the Rural Sample

Dependable Variable: **DELIVERY**						
Variable	**Coefficient**	**Std. Err.**	**Z**	**P>Z**	**[95% Conf. Interval]**	
WOMAN Variables						
Education	0.050198	2.57E-05	1949.94	0	0.050148	0.050249
Paper	0.121383	9.09E-05	1335.79	0	0.121205	0.121561
Quechua	0.873293	9.23E-05	9458.74	0	0.873112	0.873474
Aymara	-0.51752	0.000217	-2381.98	0	-0.51794	-0.51709
Other_ethnicity	-1.19904	0.000342	-3511.27	0	-1.19971	-1.19837
Children	-0.15895	0.000026	-6112.95	0	-0.159	-0.1589
Age	0.03876	8.20E-06	4725.82	0	0.038744	0.038776
HOUSEHOLD Variables						
Wealth 1	-1.13902	0.000418	-2724.71	0	-1.13984	-1.1382
Wealth 2	-1.01779	0.000382	-2663.06	0	-1.01854	-1.01704
Wealth 3	-0.34813	0.000368	-946.86	0	-0.34886	-0.34741
Altitude	-0.00011	3.64E-08	-3093.3	0	-0.00011	-0.00011
INSURANCE Variables						
Other–Insurance	0.776565	0.000234	3315.43	0	0.776105	0.777024
SIS	0.840952	2.47E-04	3406.47	0	0.840468	0.841436
Prenatal Variables						
Antenatal	0.190959	0.000116	1644.64	0	0.190732	0.191187
SIS x Antenatal	0.062747	1.38E-05	4558.6	0	0.06272	0.062774
DISTRICT Variables						
Obs_per1000	0.124468	0.000212	586.57	0	0.124052	0.124884
Nur_per1000	0.187501	0.000121	1544.24	0	0.187263	0.187739
Cen_per1000	0.161009	0.000302	532.86	0	0.160417	0.161601
Pos_per1000	0.039847	0.00011	362.48	0	0.039631	0.040062
Log_undernourishment	-0.3545	0.000115	-3081.75	0	-0.35472	-0.35427
CONSTANT	-1.65648	0.000693	-2390.52	0	-1.65784	-1.65513