Inequalities in Child Malnutrition in Honduras and Nicaragua:

The role of antenatal care

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List of Acronyms

CAC	Complete Antenatal Care
MDG's	Millennium Development Goals
MINSA	Ministry of Health
HAZ	Height for age z score
IAC	Incomplete Antenatal Care
WHO	World Health Organization
DHS	Demographic and Health Survey
UNICEF	United Nations Children's Funds
UN	United Nations
UNDP	United Nations Development Programme
NCHS	National Centre for Health Statistics
SD	Standard Deviation
OLS	Ordinary Least Squares
FIODM	Funds for the Development Objectives of the Millennium
AC	Antenatal Care

Abstract

This study seeks to analyze the role of antenatal care in determining children malnutrition inequalities among the population living in the rural and urban areas of Honduras and Nicaragua. Using Demographic and Health Surveys for Honduras and Ministry of Health (MINSA) Database for Nicaragua, as well as interviews with professional physicians and patients in the Antenatal Care Department of Health Centers, this study presents updated empirical evidence for these two Latin American countries. Complete or incomplete antenatal care does not seem to have an effect on child's health and postnatal growth. A potential explanation is that the relation between antenatal care and a newborn's health depends on the geographical location, health care facility and quality of antenatal care women received during the pregnancy period. In well-developed countries, the role of antenatal care may be considered significant to determine child's health due to low socioeconomic discrepancies and equal accessibility and quality of antenatal care.

In the case of Honduras and Nicaragua, socioeconomic differences and genetic factors are the two main aspects influencing malnutrition. These findings indicate that in order to tackle child malnutrition among children, income inequalities need to be overcome and quality of care should improve in order to consider antenatal care as policy tool to reduce children malnutrition.

Relevance to Development Studies

Undernourishment among children living in the poorest areas of Latin American countries is still considered a relevant issue, where Honduras and Nicaragua are included. Even though Latin America has the lowest percentage of malnutrition (6.1%) compared to Asia (12.7%) and Africa (20.5%), life expectancy among these countries, 76 years in Honduras and 78 yeas in Nicaragua, compared to developed countries. Maternal health and children health and postnatal growth are goals not only present in the Millennium Development Goals (MDG's), but they are also goals present in the government's allocation resources plans of Latin American countries in order to commit the countries to improve the nutritional condition of the population since they are infants. It is necessary to pay attention to the child growth indicators because good nutrition status is not only needed to survive but also to generate better health outcomes in future years. In addition, better health status in childhood represents better economic progress of a country.

Keywords

Children malnutrition, inequalities, antenatal care, Nicaragua, Honduras, Height for Age Z score

"Stunting and other forms of undernutrition epitomize societal inequities, and stunting serves as a marker for poverty and underdevelopment"
(UNICEF 2013, p.2)

Chapter 1
Introduction

Chronic Malnutrition in children less than five years increases their risk of death, inhibits their cognitive development and affects their health for their entire life. Child malnutrition is one of the most important social and development issues affecting Latin American developing countries. Child malnutrition, in children from newborn to five years, takes away the necessary nutrients in the most important period of their growth, and damages their neurological and cognitive development, which in most of the cases is irreversible and permanent. For instance, according to The World Bank (2012, p. 1), "More than seven million children under age five suffer from chronic malnutrition in Latin American. This statistic is especially alarming considering that the first 1,000 days are the most crucial in a child's life". Based on three indicators of malnourishment - including wasting, stunting, and underweight, 6.1% of children in Latin American are being affected by this issue (World Hunger 2015). In Latin American countries, infants suffering from stunting during the first years of their childhood are concentrated in specific groups of the society, where the living conditions and easy access to services between the urban and rural areas is still very severe.

While wasting and stunting are the immediate consequences of malnutrition there are broader consequences. Malnutrition affects the economic progress of a country and imposes additional costs on society, adding pressure on the education and health systems.

Malnourished children start their lives with serious difficulties, high risk of dying during the first days or weeks of newborn life because they are more vulnerable to infections, which consequently reduce appetite, prolonged malnutrition and inhibit growth.

Malnutrition has a great impact on the poor, least educated population. Therefore, indigenous children, especially those living in rural areas, have twice of possibilities of suffering growth delays compared to non-indigenous children. According to previous studies, if most developing countries effectively invested in addressing the key factors affecting nutrition, children would have greater opportunities to survive and grow up healthy (The World Bank 2012). Even though Africa and Asia can present higher levels of malnutrition, this research study is based Latin American because it is a region where food production capacity exceeds the needs of the whole population. Even though governments have signed agreements against the scourge of hunger and malnutrition, the persistence of these problems is a reflection of serious inequalities in health and nutrition status.

Maternal nutrition, maternal illness, and antenatal care are amongst the most relevant determinants of child health because diseases may be transferred to children during the pregnancy period (Larson K et al. 2008). According to empirical studies, having access to antenatal care is considered one of the most

important factors determining a child's postnatal growth because if a pregnant woman does not receive the necessary nutrients during her pregnancy, the probability of having an undernourished and underweight child are higher. After childhood, pregnancy is the first time when women seek for health care services to learn how to take of their health and their babies' health; therefore, the nutritional guidance must be included in the antenatal care programs of the different health centers. "Women's deprivation in terms of nutrition and healthcare rebounds on the society as a whole in the form of ill-health of their offspring-males and females alike-both as children and as adults" (Osmani & Sen 2003, p.1). In Latin America, 53 million people lack the necessary food and nutrients to meet their needs (UNICEF 2006).

Figure 1.1
Determinants of child nutrition
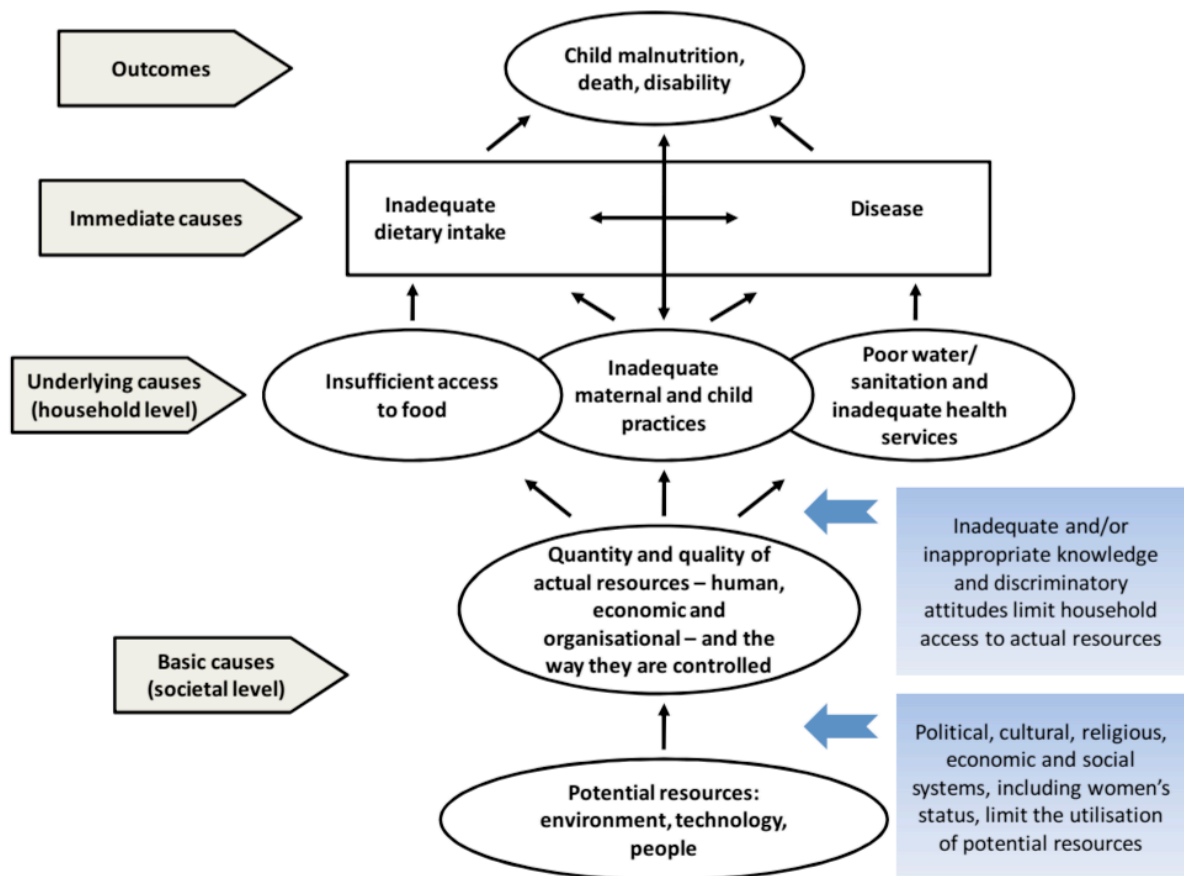
Source: UNICEF 1990 (15), UNICEF 1998 (14) cited in Kamiya 2009

To conceptualize the factors that may drive malnutrition, consider the figure 1.1. In this figure, child malnutrition is being influenced by different factors which are categorize from bottom to top as: 1) Basic causes: these causes involve quality and quantity of human and economic resources that may be accessed by children and families including jobs, education, health care systems. Antenatal care programs are part of the health care services being provided to women to generate better birth outcomes and avoid malnourishment among children. 2) Underlying causes: these involve household-level factors that may affect child growth and development. Mother's education, regarding the im-

portance of breastfeeding and how to monitor the child's growth and development is likely to influence child health; 3) Immediate causes: these causes are determined by the mother's education regarding the balance diet and nutrients that they must give their children in order to avoid child malnutrition, death or disability during the first years of children's lives.

"Efforts to improve the nutrition of entire populations do benefit women, and governments can use a variety of approaches to ensure that their citizens receive enough calories and nutrients" (Ransom & Elder 2015, p.1). Besides being related to social factors, access to antenatal care service is a matter of household level practices (inadequate maternal and child practices), where Latin American countries' government, in this case the Honduras and Nicaragua's government, has given importance to the use of antenatal care to improve maternal and child health. Through the use of antenatal care, pregnant women are able to identify any possible problem infants could have after their birth, such as growth-retard problems. Based on the regulations of the Ministry of Health of Honduras and Nicaragua, health centers must follow specific guidelines, which are evaluated later by the head officers of the Ministry of Health in order to see if these guidelines were successfully achieved. (Endesa 2001).

This study pursues one main question. After controlling for other relevant factors, what is the effect of access to antenatal care on child malnutrition in Honduras and Nicaragua? By focusing on antenatal care and controlling for a set of other variables, it will be possible to identify the effect of access to antenatal care on child health indicators in countries with similar economic and political conditions. Analysis of this issue will permit an assessment of the importance of antenatal care and whether it translates into better health and nutrition for children. Furthermore, it will provide an updated assessment of the effectiveness of antenatal care policies in Honduras and Nicaragua. A previous study was done six years ago with 2009 data (Forero 2010).

The paper focuses on Honduras and Nicaragua, which despite their differences are the two poorest countries in the Central American region of Latin America. Honduras is considered a middle low- income country dealing with many significant challenges. This country presented an economic growth of 3.0% to 4.0% from 2011 to 2012 respectively, with more than two thirds of the population living in extreme poverty, "in rural areas 6 out of 10 households live in extreme poverty" (The World Bank 2014). On the other hand, Nicaragua presented an economic growth of 4.6% by 2013, with 46.2% of the population living in extreme poverty (Index Mundi 2015).

Urban unemployment in Honduras and Nicaragua has been kept relatively similar during 2014, 4.8% and 4.5% respectively (Trinchera de la Notica 2015). In Honduras, 39% of the population is involved in the rural economic activities (production of bananas, plantains, rice, beans), whereas, by 2012 around 20% of the population were involved in the industrial sector. In Nicaragua, the rural sector (agricultural sector) employs around 33% of the population; 32% is working in the trade sector, 18.6% is working in the service sector and only 16% in the industrial sector (IFAD 2014). Due to the social and economic conditions affecting these two countries, the incidence of malnutrition among children is still present. At the national level, in Honduras, stunted children has been reduced from 30% to 22%, from 2006 to 2012, while in Nicaragua, it has been reduced from 31% to 22%, from 2008 to 2013 (USAID 2014). Nonetheless the nutrition status of the Honduras and Nicaragua's population has been slowly improving, further effort needs to be done in order to attack the low

levels of balance diet, breastfeeding, hygiene practices that mothers have during pregnancy.

"Poverty in Latin America affects the third part of population and one sixth part of the region is undernourished" (Jimenez-Benitez et al. 2010). Households' socioeconomic condition is one of the main problems affecting Honduras and Nicaragua's economy. Therefore, in order to tackle poverty in these two countries, access to better nutrition among children from vulnerable socials groups should increase, especially women and children from rural areas. In this particular sense, Honduras and Nicaragua have more comparable scenarios than other developing countries in Latin America such as Costa Rica (with better economic performance) and Haiti (with high levels of extreme poverty).

This research is relevant to the Honduras and Nicaragua's economic development, as both countries have been involved in many international programs to reduce malnutrition among children under five years old through the improvement of antenatal care and postnatal growth. Nicaragua was involved in a National Breastfeeding Program with the support of UNICEF (United Nations Children's Fund) and OPS (Pan-American Health Organization) in order to implement "11 steps for a better breastfeeding result" in the children's hospitals of the country (MINSA 2008). Also, Honduras has been involved in special programs with FIODM (Funds for the Development Objectives of the Millennium) to improve the conditions of health care systems being provided to the households of the urban and rural areas.

The rest of the paper is organized in the following way: Second part presents the antenatal care policies being implemented in Nicaragua and Honduras. Section three summarizes the literature. Section four presents the theoretical framework. Section five explains the empirical methodology being used to analyze this document. Section six provides the results, and the last section presents the conclusions.

Chapter 2
Background

2.1 The importance of Antenatal Care Programs in Honduras and Nicaragua

"1) One out of every 12 children born today (almost 11 million children per year) dies before his or her fifth birthday; 2) Of the 129 million children born each year, at least 4 million die within the first month of life and another 6 million die within the first five years; 98 per cent of these deaths occur in developing countries; 3) An estimated 16 million low-birth-weight babies are born each year; 4) An estimated 174 million children under age five are malnourished; and 5) The leading causes of child death – infectious diseases (including diarrhea, pneumonia, measles, and malaria) – are either preventable through vaccines or treatable through low-cost intervention" (Save the Children 2008).

Maternal and infant mortality in Latin America countries are good indicators of the social, economic, and health conditions that the population has. According to the Millennium Development Goals (MDGs) to be reached by the end of 2015, nutrition has always been an important pillar in order to eradicate hunger, child mortality and improve maternal health (UN 2015).

Figure 2.1
Maternal Mortality Ratio in Central America 2013
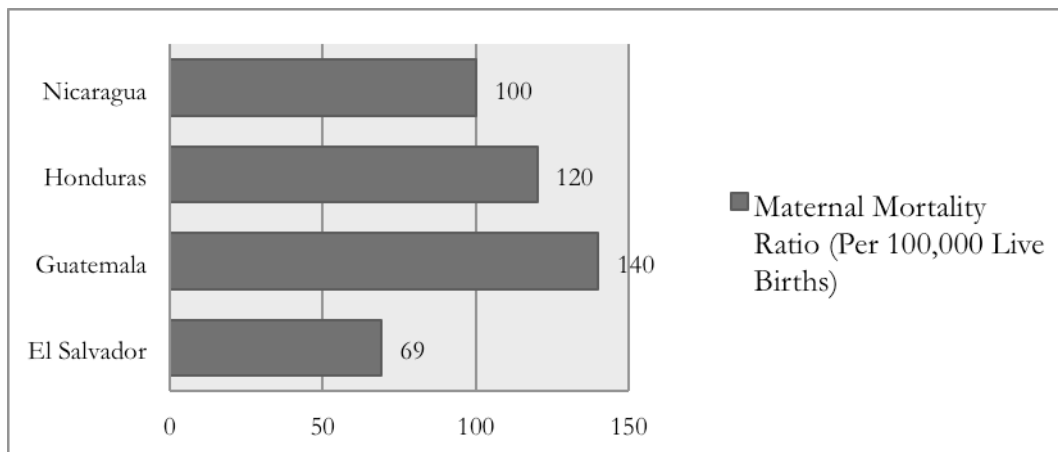
Source: The Henry J. Kaiser Family Foundation 2015

Figure 2.2

Infant Mortality Ratio in Central America 2013

Source: Kaiser Family Foundation 2015
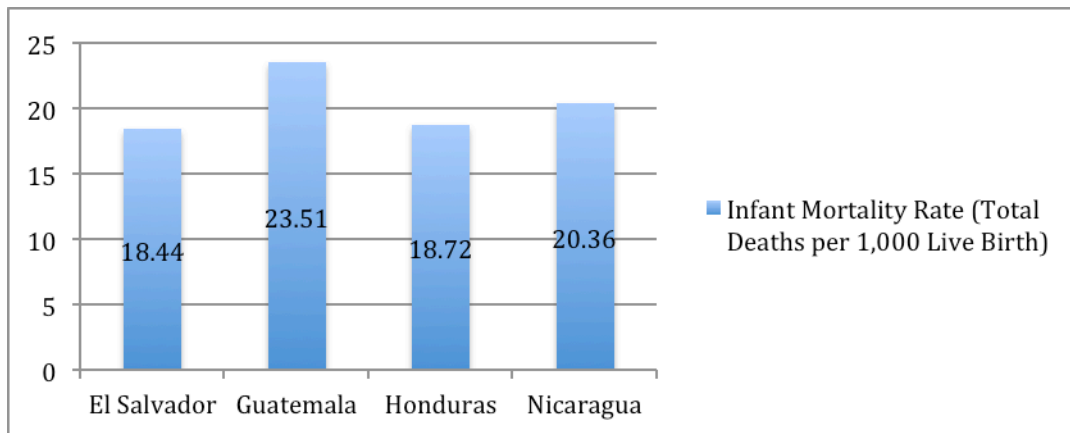
Figure 2.1 and 2.2 help us to view that maternal health and infant mortality are still relevant issues to be addressed by both governments. In Honduras, 69% of maternal deaths occur among the group of women between 18 and 35 years and 65% of maternal deaths takes place in rural areas hospitals such as Lempira, Intibuca and La Paz (Pan American Health Organization 2012).In 2013, infant mortaliy in Honduras was 18.72%, still a little high, but less than the infant mortality rates presented by Guatemala and Nicaragua.

In Nicagua, it is important to mention that the maternal mortality occurs as follow: 22% during the pregnancy period, 25% during the delivery time and 59% during the postnatal care (MINSA 2008). The Maternal Mortality percentage distribution in Nicaragua is associated with many factors, especially the high level of poverty, where more than half of the women living in the rural areas (55%) give birth at home and most of them (65%) are illiterate. "Every 38 hours in Nicaragua, a mother dies either giving birth or shortly after. 23 in every thousand births result in the death of the child. Nicaragua is not the most extreme example of both of these two phenomena, but it is a stark one" (Lake 2011, p.1). Due to the consciousness that governments and communities acquired on the importance of protecting and caring about the individuals of societies in order to generate better economic progress, maternal and child health and nutrition level has been declared a priority issue for Honduras and Nicaragua in the past two decades. That is why in Nairobi in 1987 in the statement of "Motherhood Safety" a commitment of countries to identify and implement national strategies to reduce maternal and neonatal mortality is reflected (Secretaria de Salud 2010). In order to reduce these two issues, Honduras and Nicaraguas' government decided to partner with the Ministry of Health to help reduce maternal and infant mortality, as well as to reduce malnutrition among children, through the right implemention of antenatal care programs in the health centers.

During antenatal checkups, pregnant women should have a good communication with their physicians, especially teenagers who are pregnant, in order

to receive the necessary psychological and nutritional assessment. The first antenatal checkup should be done after the first period stops; therefore, women will be able to receive their medical evaluation and at the same time they will start to take the necessary micro nutrients such as iron, vitamin A and folic acid to reduce the risk of acquiring congenital anomalies such as anemia. The antenatal period is the most important period for newborns babies because they will receive the necessary nutrients to grow and develop their brains and bodies in a normal way.

Honduras Antenatal Care Program is a program financed by the government and UNDP (United Nations Development Programme) which consists of three important factors: 1) Identify the main factors during pregnancy period, including habits and behaviors that could affect or put the women and newborn's lives in risk; 2) Promote actions to improve the health of pregnant females and newborns; 3) To guide couples on choosing to postpone pregnancy until woman reach the appropriate conditions to have a baby (Secretaria de Salud 2010). The government of Honduras has been developing a series of strategies to improve the quality of care and accessibility to health care facilities in order to generate better pregnant outcomes (which means better child health) and at the same time teach women about the importance of family planning. Based on the Ministry of Healh of Honduras, the antenatal care program has been introduced as a required program; therefore, all women must attend to their checkups during the pregnant period.

Nicaragua Antenatal Care Program is offered to all pregnant women within the country. This program is financed by the local government and different organizations, such as UNICEF and UNDP (United Nations Development Programme). "Antenatal care is the recommended strategy for the early detection risks during pregnancy, establishing suitable management, preventing complications and preparing pregnant females for birth and parenting" (Caceres-Manrique 2009, p.1). According to World Health Organization, the antenatal care must be considered priority for all the governmental public policies in order to improve pregnancy outcomes. Ideally, antenatal care must meet basic attributes: precocity (early attendance), periodicity, completeness, coverage and free attendance. In Nicaragua, antenatal health care has a standard model, where pregnant females should consult the health care center immediately after their first period stop and continued to check once a month during first six months, every two weeks the next two months, and once a week during the last month until delivery.

In both countries the first antenatal care should be performed by the physician/doctor. After the first checkup has been done, the antenatal care control can be performed either by the medical physician or the nurses. In Honduras, midwives nurses are being certified in order to perform the same functions as physicians (Secretaria de Salud 2010). According to MINSA (2008), all midwives nurses working for the health centers in Nicaragua should receive the necessary training in order to provide women the same services as a professional physician during the pregnancy checkups, but compared to Honduras, Nicaragua's nurses are not certified. They should receive the necessary training during the first month they start working in the Antenatal Care Department. In the urban areas of Honduras and Nicaragua, one physician and three nurses form most of the Antenatal Care Department of centers; whereas, in the rural areas of both countries, one physician and one or two nurses form the Antenatal department. In developing countries, where the staff worker is very limited

compared to the number of pregnant women, the purpose of having trained nurses is to provide antenatal care to all pregnant women in an effective and efficient way. In Honduras, the number of births being performed by skilled physicians in the country has increased from 35% to 69% on 2014 (Organizacion Mundial de la Salud 2014). In case any possible complications arise, nurses must work in hand with the physicians or medical specialist (obstetrician) in order to ensure that the mother and the newborn receive the proper attention to the their condition. In Nicaragua, the socio-demographic differences have a great influence on the personal assistance pregnant women received during the antenatal care. Managua (urban area) has the highest percentage of births attended by medical staff members (94% overall, where 39% is being performed by obstetrician, the medical specialists), while the rural areas are the ones with less coverage of antenatal care being performed by medical physicians (below 38%) (Organizacion Mundial de la Salud 2014).

The biggest challenge for Nicaragua is to provide better conditions for the antenatal care practices, as well as to provide high qualified professionals during the checkups and at the delivery time. "Nicaraguan doctors and nurses receive wages barely over that of doctors and nurses in Malawi—an extremely poor African country whose per capita income is 80 percent below Nicaragua's. At the same time, Honduras, a neighboring country whose per capita income is comparable, pays doctors three times the wages of those in Nicaragua. Although Nicaragua receives a large amount of international aid, both fiscally and in the form of volunteers from developed nations, combating the country's endemic health problems will necessitate more resources put in the right hands" (FSD 2015, p.1). In addition, Nicaragua needs to increase the delivery coverage, especially for the women living in extreme poverty, where only 6.3 % of the population has full insurance coverage (FSD 2015).

2.2 A correct antenatal care

In order to generate better child health outcomes, antenatal care should be perfomed in a very efficient and effective way. As mention in Chapter 2, antenatal care is not optional, it is a requirement; therefore, all pregnant women should have at least one antenatal chekup before giving birth. The first antenatal care visit should last between 40 to 45 minutes: firstly, to collect the medical history and background of the women; secondly, to perform a complete checkup and finally to provide mothers with the necessary indications to take care of themselves and their babies. From the second to the last checkup (before giving birth) should last between 15 to 20 minutes, where advice about the importance of nutrition and breastfeeding should be included. In Central American countries, medical health centers have a specific antenatal care sheet that doctors and nurses must fulfill since the first checkup until the moment the baby is born. Appendice B presents an example of this sheet (spanish version) where it explains the correct way antenatal care should be perfom:

1) *First antenatal care visit:* the doctor collects necessary information from the pregnant women:
   a. General information includes birth date, marital status, education level, age and ethnic group.

b. Medical history includes family antecedents such as turbeculosis, diabetes, hypertension, kidney infection, high blood pressure, preenclansia, heart problems and HIV.

c. Obstetrics history includes the date of the last birth, the number of children she has, if the labor was normal or through cesarean section, if the the last labor had any complications, if the children were born death or alive, if the pregnancy was planned or it happpened due to a failure of contraceptive methods.

d. Habits includes if they regularly drink or smoke.

e. Vaccines include if they have receive the tetanus injections before. The tetatnus injections are divided into two doses, the first is put at 20 weeks of the gestional age and the second dose at 24 weeks of gestional age.

f. After these questions, the doctors check the women's weight, in order to see their current weight (how much they have gained since the pregnancy started) as well as the women's height. In addition, the doctor also checks the breasts of the mother and does an ultraound in order to chek that the fetous is in perfect condition.

g. After doing all the checkups, the doctor send the mother to take some tests before including blood test, VIH, syphilis, urinary and toxoplasmosis test. All of these must be taken before the second antenatal care checkup.

h. The last thing doctors must do is to prescribe the mothers all the necessary micronutrients and vitamins that they should start taking. In addition, doctors give mothers advices about the balance diet that they must have and give some space for the women to ask questions or doubts that they can.

2) *From second to last antenatal checkup:* During these next appointments, doctor or nurses are in charge of written down every detail of the regular checkup. It includes:

a. Date of the appointment
b. Gestional Age (weeks)
c. Mother's weight
d. Mother's blood pressure
e. The measure of mother's belly (in order to see the growth of the baby according to the gestional age)
f. The heart beats of the child

After checking all these details, the doctor or nurse checks all the tests that they sent to the mother in the first checkup. They also ask the mother if they have any illness. In case the mother has, the doctor is in charge of prescribing all the necessary medications needed to improve the mother's health, without harming the baby's life. If the mother suffer any complication before the second checkup, the health center is responsible to take care of her urgently.

All these information is required by the Antenatal Care Department in order for doctors and nurses be able to help women during the whole pregnancy period. "A succesful birth outcome is defined as the birth of a healthy baby to a healthy mother. Numerous factors have been found to influence birth outcomes, including the mother's health at the beginning of the pregnancy and throughout, genetics, drug, alcohol and tobacco intake, nutrition, the quality and quantity of antenatal care, social, economic and

finanacial status, and family support" (U.S. Department of Health and Human Services 2004, p.1).

Chapter 3
Theoretical Framework

This chapter presents the theoretical framework behind the study. First, it explains the links between antenatal care and child's health and nutrition and next it discusses the rationale for using child height as an indicator of child health.

3.1 Child health and nutrition as an outcome of antenatal care

Life is a course that starts from the moment of birth, which continues in childhood and adolescence, until it reaches adulthood. According to many medical studies, life should be a priority to be taken care since the baby has been conceived in order to generate a positive impact in the baby's health and his or her development in the future years. "Within the life-course, the period of life before adulthood is divided into three age subgroups, based on epidemiology and health-care needs: (1) the first five years (children under-five years), (2) the next five years (older children), and (3) the second decade of life (adolescents). The WHO (2008), argued that, in order to address the specific health challenges and needs of young children more effectively, the first five years of life are further subdivided into the neonatal period (the first 28 days of life), infancy (the first year of life) and pre-school years (1−5 years)" (WHO 2008 cited in Sereti 2014, p. 9).

Besides preventing women from having pregnancies complications and helping the foetus to develop normally, antenatal care can have an impact on the nutrition of the child. During antenatal care checkups, three of the most important supplements, plus vaccination, needed for a healthy pregnancy are given to the mother in order to transfer all the necessary nutrients to the baby. These supplements are: vitamin A, folic acid, iron and tetanus injections.

1)   Vitamin A is necessary complements needed to repair and maintain damage tissues or cells, while at the same preventing children from dying of common childhood before they reach 5 years old due to many deficiencies created since the foetus stage.

2)   Folic acid capsules "are given to prevent cognitive damage from insufficient maternal thyroid hormone" (Lamberg 1991 cited in Gajate 2009, p.5). During the pregnancy period, mothers should take at least 400 micrograms of folic acid capsules daily. By doing this, mothers help their babies to create a better immune system and at the same time prevent them from having permanent mental retardation.

3)   Iron tablets are very important in order to tackle anemia, which is one of the most common problems affecting pregnant women by making them feel more weak, tired and dizzy. By taking the necessary amount of iron tables, mothers are lowering the risk of having a preterm delivery and low birth weight newborns; while at the same time boost the intellectual development of the babies.

4)   Calcium is one of the micronutrients that women should take since day one of the pregnancy period. Calcium are very important because it "has the potential to reduce adverse gestational outcomes, in particular by decreasing the risk of developing hypertensive disorders during pregnancy, which are associated with a significant number of maternal deaths

and considerable risk of preterm birth, the leading cause of early neonatal and infant mortality" (WHO 2013, p.1). In addition, the baby inside the womb needs the calcium to develop strong bones and teeth, as well as a healthy heart, nerves and muscles to grow during his or her childhood.

5)   Tetanus injections are a priority for the antenatal care checkups because they can prevent infants to die from neonatal tetanus. " This infection is acquired due to limited or absent clean delivery services (when sterile procedures are not observed in cutting the umbilical cord)" (Gajate 2009, p. 5). According to the WHO, if the infection is treated with no hospital care, infant mortality is 100% possible. On the other hand, if the baby receives any type of hospital care, infant mortality is between 10 to 60% possible. Tetanus injections should be given between the first four months of the pregnancy, which are divided in two doses (Gajate 2009).

    In addition, besides taking the necessary complements, pregnant women receive the right indications in order to maintain an appropriate diet. Mothers should increase high-energy foods (which means more calories) and proteins in order to delivery a more health and nourished child. Regarding calories, pregnant women increase 80,000 calories during the whole pregnancy period, which represents an average of 286 kcal per day, spread over 150 kcal per day in the first trimester, and 350 kcal per day in the second and third trimester. Regarding protein, pregnant women should increase 12% of food with high levels of proteins. The total accumulation of proteins in pregnancy period is 925 grams, equivalent to 0,95 grams per day.

Figure 3.1
Curved Line Patter for Weight-Height Gain during Pregnancy

Curved Line Pattern for Weight Gain during Pregnancy
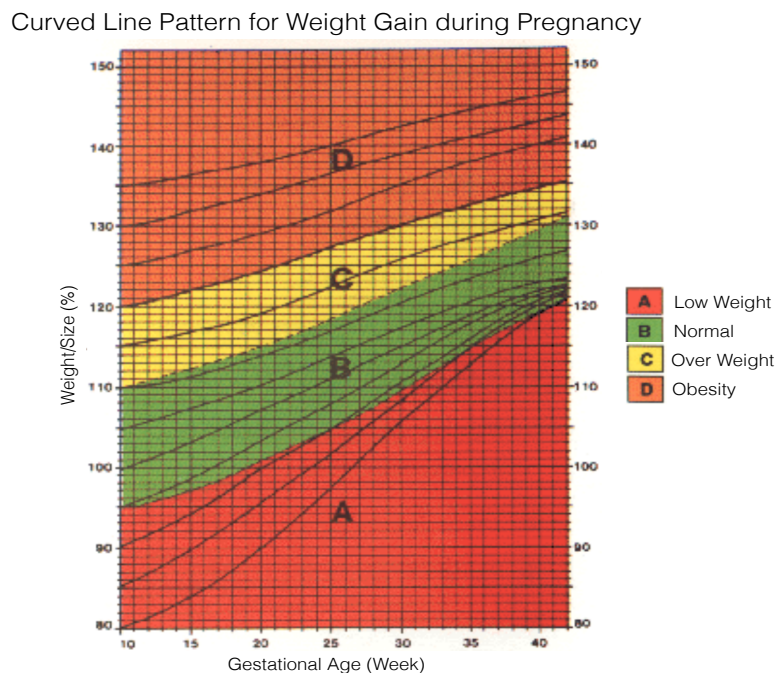
Source: Oyarzun and Badia 1985

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According to Figure 4.1, for pregnant women with low weight the nutritional objective is to increase their weight over 20% than the initial weight before the pregnancy in order to reach an average of weight-height index of 120% at the pregnancy. Mothers with normal weight should only increase 20% than their initial weight in order to reach an average between 120 and 130% of the weight-height index at the end of the gestational age. On the other hand, overweight mothers should increase just a small percentage that can help them to be between 130 and 135% of the weight-height index at the end of the gestational age. In addition, obese pregnant women should increase their weight not less than 5.7 kilos and not more than 10.5 kilos. A weight range in this range will not only protect the mother's health, but also the baby's future health.

Antenatal care is the ideal period to counsel mothers about the importance of breastfeeding, where educational content is designed to support and assist pregnant women for a successful breastfeeding stage. According to MINSA (2008), breastfeeding has some specific objectives that are taught during the antenatal care: 1) Identify the factors that can delay the breastfeeding process, especially for those first time mothers; 2) Educate about the importance of preparing and taking care of the mother's nipple; 3) Educate about the breastfeeding's technique; 4) Educate how to extract the milk, how to store and how to use it for the future. By providing the mother with sufficient information about breasfeeding, health care centers are also taking of the newborn's health and nutrition. Regarding the newborn's life, breastfeeding helps to: 1) Provide better immune system's defenses by lowering the risk of getting infectious diseases (bronchitis, ear infections, diarrhea) due to the transfer of antibodies from the mother to the child through the milk; 2) Provide a numerous of nutritional properties because breast milk is considered the best food for infants, it has the right temperature and it has the perfect formula for the a newborn's digestion, it has the necessary amount of nutrients for the day and it is very hygienic because it passes straight from the breast of the mother to the child's mouth, which allows a proper growth and development of the child and at the same time it can prevent the child from becoming obese; 3) It favors the child in order to create a closer bond with the mother.

3.2 Child height as an indicator of child heath

According to the World Health Organization, the health indicators determining child growth and development are weight-for-height, height-for-age, and weight-for-age. Children whom are under the weight-for-age are considered to be stunned. In addition, children under the weight-for-age index are referred as wasted (Arnold et al 2004). Besides using these indicators to determine child's health, deficiencies in iron, vitamin A and folic acid each, as well as low level of antibodies are considered among the top 10 leading causes of child mortality and child stunting (WFP 2005).

Regarding to child subsistence, low or normal height for age can help to determine long-term outcomes. "Adult height is determined by genetic potential and by net nutrition, the balance between food intake and the demands on it, including the demands of disease, most importantly during early childhood" (Deaton 2007, p.13232). In addition, people with higher height perform better in cognitive tests, which can be interpreted that they had better child welfare and health.

"Height is determined by genetic potential and by net nutrition, most crucially by net nutrition in early childhood" (ibid, p. 13232). Therefore, disease environment in childhood combine with malnutrition, socioeconomic factors (water and food supply), low breastfeeding habits, low health care access (antenatal care) and mother and father's education about nutrition will influence the child's height in the future life. Malnutrition and disease problems are not considered a problem for rich countries, "but the process is certainly far from complete in poor countries, where infant and child mortality rates remain high, and average nutritional intake is low" (Deaton 2007, p. 13232). In the two Central American countries being analysed child height is considered a relevant indicator to determine child nutrition, as well as child's future living standards.

According to Mosley and Chen (1984, p.5) "the 'production' of a healthy child requires a mother's time for antenatal visits, attendance at the well-baby clinic, breastfeeding, food preparation, (...), and sickness care." This research project will use HAZ (height-for-age) to represent the health and nutritional condition of the child. By using child height as the proxy of health, this paper will emphasize the importance of antenatal care in order to take care of the infant's life since he or she is formed inside the mother's womb, which can be transferred in better mother's nutrition level and as a result better child's health outcomes.

Chapter 4
Literature Review

This chapter presents the link between antenatal care and child health and postnatal growth from a medical perspective, as well as it presents the factors determining child malnutrition inequalities in Latin America.

4.1 Antenatal Care and Postnatal Growth

"Malnutrition is now considered not as just a clinical problem or the lack of any specific nutrient, but as a state in which the physical function of an individual is impaired to the point where he or she can no longer maintain an adequate level of performance of such things as physical work, resisting or recovering from the effects of disease, maintaining an adequate level of growth, or the processes of pregnancy or lactation" (Biswas and Pinstrup-Andersen 1985 cited in David et al. 2004). Improving child's nutrition and health require a great improvement in the antenatal care being provided to pregnant women in the different health center facilities. The nutrition process for the baby starts since the baby is a foetus. This foetus receives the food and oxygen from the mother's placenta, which is attached to the uterine wall and connects to the foetus through the umbilical cord. Breeze and Lees (2007) indicates that malnutrition, maternal low weight and the constant habits of smoking and drinking alcohol are directly related with growth retard infants. According to Ozor and Omuemu (2014), "under-nutrition continues to be a public health problem. On the other hand, it has been established that women who take antenatal services have progressively higher infant survival rates compared to women who did not." How does antenatal care contribute to better pregnancy outcomes?

Figure 4.1
Safe Motherhood initiative

Pillars of Safe Motherhood
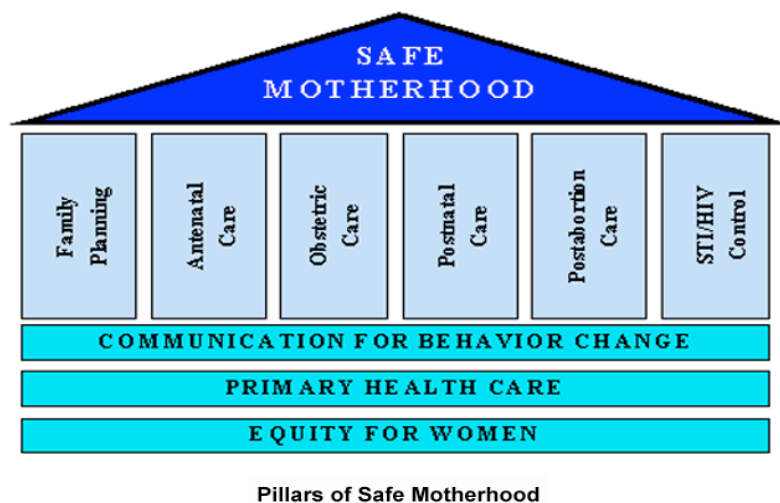
Source: The World Bank 2013

As presented in figure 4.1"antenatal care is one of the pillars of SAFE Motherhood Initiative aimed at preventing adverse pregnancy outcome" (Chukwudi et al. 2012, p.1). During the process of antenatal care, preventive measures can be taken when abnormalities are present, such as: growth retard infant, anemia, vaginal bleeding, abnormal fetal position after 36 weeks, growth or abnormal fetal movement, malaria, malnutrition through serious examinations (either clinically or ultrasound) and be able to treat them through medication, nutrition and education (Ahmed and Das 1992, Alexander and Korenbrot 1995, Bloom et al. 1999, Hollander 1997 and Magadi et al. 2000).

Besides being able to access to ultrasound and clinical tests, antenatal care can be successfully achieved when good communication between the professional physicians and the patient (pregnant women) is present. During the checkup, all the women's background and indications should be written down as part of the women's record. In addition, all the information should be clear and understandable, especially for women with learning disabilities or for those that illiterate.

Based on the Minsitry of Health, the frequency of antenatal controls helps to control any possible complications since the beginnig of the pregnancy. The frequency of antenatal control varies depending on the level of risk presented by the pregnant women. Women with low risk pregnancy require between 4 and 6 antenatal control appointments; whereas, pregnant women with high level risk will require more than 6 antenatal control appointments. Women whom do not receive the antenatal checkups are six times more risky to have low birth new borns and stunted children or to have babies that could die before reaching one year old. Also, they are five times more likely to have stillborn (fetal death after 20 weeks of gestation). During these montlhy checkups, pregnant women are subjected to different abdominal tests in order to evaluate if the baby has a usual or unusual growth (Bricker and Mahsud-Dornan 2009). However, even though very specific mechanisms are being used to detect unusual growth, there are many cases that the growth-restricted problems are not being detected; therefore, the role of good quality antenatal care is very important to help detect these problems before the delivery time (Bricker and Mahsud-Dornan 2009).

When children are born stunned and wasted, it always represents that mothers had nutritional problems during the whole gestation stage. "Thinness and shortness at birth could lead to interference in insulin and growth hormone sensitivity, respectively, in later life" (Barker 1995 cited in Cheung et al. 2000, p. 1). In addition, according to Martorell (1999), growth delay is directly related to low consumption of vitamin A and anaemia problems. All the micronutrients deficiencies and diseases are always present during the more risky and defenceless period, when the foetus is in the utero or the baby has not reached three years old, which has been more predominant in developing countries. Most of the biological effects of the vitamins and micronutrients help to increase the defences of the mother's immune system and they also contribute to the weight gain and growth of the foetus (Tayie and Lartey 2008). According to Tayie and Lartey (2008, p.293), "pregnant women who seek antenatal care early are likely to be cared for and be on prescribed nutrient supplements for a longer duration than those who delay." Also, during the antenatal care checkups, the importance of breastfeeding is introduced to the women. "Maternal knowledge on breast feeding practice is important for child growth.

Exclusive breast-feeding can prevent early child malnutrition. Knowledge on appropriate procedures for breastfeeding practices is essential for child nutrition" (Chowdhury 2005, p.7). Therefore, through antenatal care programs, besides learning the importance of breastfeeding, women receive all the micronutrients and vitamins needed not only to prevent diseases but also to protect the mother's and infant's health during and after the pregnancy.

A case study in Bangladesh presented that antenatal care services have been increasing among pregnant women. "Bangladesh has been having huge successes in reducing maternal mortality, increasing family planning, vaccination coverage and the reduction of infant mortality. Antenatal care is thought to be one of the key components for ensuring better maternal health to ultimately reduce maternal mortality" (Chowdhury 2005, p. 15). In addition, through the antenatal care service, mothers learn how to take care of their infants, which help mothers to protect the babies from any possible infections during the first years of the newborn's life, which is also considered one of the main reasons for children to grow undernourished.

In conclusion, the effective practices of antenatal care paired with complementary interventions can avoid obstetric complications during the pregnancy and delivery time (that can put the baby's and mother's life at risk), as well as it can help to the early detection of any possible anomalies that can interfere in the infant's postnatal growth.

4.2 Child malnutrition inequalities in Latin America

Even though, mortality and malnutrition among children has been declining during the last years, inequalities between the poor and wealthy children, as well as children living in rural and urban areas are still predominant in Latin America countries. Also, significantly differences are still present regarding health status and access to health facilities between children coming from indigenous and non-indigenous background. Progress has been occurring in many different Latin American countries, but child health and postnatal growth are still considered important issues for the countries' agenda to fulfill. UN considered child malnutrition as a relevant subject to be included in the Millennium Development Goals (MDGs) to be reach by the end of 2015. By checking this issue, malnourished children under 5 years old suffering from underweight has been declining from 25% to 16%, from 1990 to 2011 respectively. In addition, the percentage of stunted children has significantly reduced from 40% to 26% during the same period of time, but still there is more to do about this subject and by 20 UN is expecting that less than half of developing countries can reach the Millennium Development Goals (MDS) (Bredenkamp et al. 2014).

According to Wagstaff and Watanabe (1999) concentration index for malnourished children is considered one of the ways to compare the socioeconomic factors and undernourishment among children in less developing countries, Latin American countries have so diverse economic growth; therefore, it is possible to see that poorer children are usually more stunted and underweight than those children with higher socioeconomic levels within the countries. A previous study about persistent inequalities in Latin America shows that most of the malnutrition cases are still concentrated among the poor people within the country, where Nicaragua, Honduras and Guatemala have a concentration index between 0.3 and 0.4, which is less than Peru (the country

with the highest level of inequality) with a concentration index of 0.4 (Bredenkamp et al. 2014).

Even countries with similar economic conditions can present different levels of child malnutrition inequalities within the countries. In a Vietnam case study done by Wagstaff et al. (2003), authors were able to analyze child health inequalities by mainly using the negative of HAZ as the proxy for child malnutrition. According to the Cummis (2013, p. 2) "biological effects on children of chronic under nutrition and poor health cause a rapid loss of HAZ over the first few years of life, generating a strong, non-linear relationship between HAZ and age-at-measurement (the HAZ-age profile)." In addition, many studies include antenatal care as a determinant of child malnutrition or as a determinant of child malnutrition inequalities, but in some cases the variables that are being used as controls variables are not always complete so most of the results sometimes do not reflect the effect that antenatal care has on child's health and postnatal growth. Despite this, there is a lack of general agreement on the way it may have affected birth consequences. An example is Guilkey et al. (1989), which presents positive as well as negative consequences regarding birth weight and height, dependent on the geographical location, provider type and health care facility. On the other hand, Deb and Sosa Rubi (2005) took data from Mexico and found that having antenatal care at early stages of the pregnancy produced zero impact on the birth weight, yet the frequency of antenatal care yielded a bigger and positive impact.

"Environmental conditions also have huge impact on child malnutrition especially in developing countries" (Chowdhury 2005, p. 8). According to UNICEF (2006) variables affecting children malnutrition inequalities in Nicaragua and Honduras should be seen in two different dimensions: First, they are directly related to environmental conditions (natural, social and economic); Secondly, to biological factors (individual and collective). When referring to (1) *Environmental factors:* Approximately more than half of malnourished children live in rural areas, where they are more exposed to environmental changes. The highest rates of child malnutrition have been seen in countries where agriculture is constantly affected by natural disasters. The constant amount of hurricanes, droughts and earthquakes also generated "direct" and "indirect" risks to the households living around, where "direct" costs refer to the multiple obstacles to access to food, and "indirect" costs to the economic and social problems that are generated from these natural disasters. The households of malnourished children are those households with constant lacking of drinking water and sanitation that are needed for children to grow healthier. Therefore, there is an increase probability of a child to get multiple diseases such as diarrhea and parasites, as well as respiratory and cardiac problems (developed in the antenatal care period) creating a vicious circle that increase the risk of malnutrition among children under five years old, which is more predominant to occur in Nicaragua. Also, *Socio-economic and cultural factors:* (i) The low level of income per house limits the family to access high quality food and nutrients needed for a healthy childhood; (ii) The low level of parents' education represents high level of ignorance about nutrition and balance diet that children must have during the first years of their lives. In addition, (2) *Biological factors:* (i) The absence of the necessary breastfeeding period (first six months) exposes the child to eat unhealthy food that do not meet the nutritional requirements for a child to growth as well as to develop a good immune system to protect themselves from future diseases; (ii) The limited availability of com-

plementary nutrients, besides breast milk, do not allow the child to ingest the needed macro- and micronutrients to develop physically and mentally.

"There is evidence to show that there is a link between lack of formal education and malnutrition. Mothers who lack formal education are far more likely to give birth to a baby of lower birth weight" (Savage, 2013, p.). According to Desai and Alva (1998) mother's education and child health and postnatal growth (including height for age, infant mortality and children's immunization) in developing countries –Nicaragua and Honduras- have a positive correlation. As mothers' have better education level, there will be more knowledge on the importance of attending antenatal care programs in order to have more healthy infants.

Chapter 5
Methodology

The paper relies on two sources of data - qualitative and quantitative. The qualitative research provides information from medical staff members and pregnant women regarding the antenatal care attention being provided in Nicaragua and Honduras. The quantitative research: 1) explains the source of the data for each one of the countries; 2) outlines the choice of the variables; 3) presents how the quantitative data is constructed on the basis of the empirical strategy for this study. Combining the qualitative and quantitative methods, a more clear understanding of the study will be created in order to analyze the findings and finally answer the main research question.

5.1 Qualitative Research:

"Qualitative research methods serve to provide a bigger picture of a situation or issue and can inform in an accessible way" (Nicholls 2011). Firstly, this case study will include ten interviews with health care professionals (physicians and nurses) in the Health Care Centers in the areas (rural area and urban area) of Honduras and Nicaragua. Interviews with the medical staff members and pregnant women were carried out in Spanish. When doing the interviews to the medical staff members, I used the same interview guide, which includes questions about the informants' views on indicators in general, especially the importance of antenatal role, and whether they considered stunning as an indicator of malnutrition among children. In addition, ten interviews were done to the pregnant women in each of the countries. The interviews that I did to the patients included questions about the attention that health centers provided during the antenatal and postnatal checkups. All interviews were taped and I transcribed all the recordings.

5.1.1 Limitations

The presence of governmental authority was one of the main limitations when doing the interviews to the staff members of the medical health centers, especially in Nicaragua. Doctors and nurses are expected to provide better services during the antenatal care checkups, but due to the low conditions health centers have (few staff members, great amount of pregnant women, few medical equipment, monetary constraint in order to provide women with the necessary medications) the service can not be as expected. Since all the medical centers are under the authority of a person working in the government's political party, most of the doctors and nurses do not feel comfortable of telling the true stories about the antenatal care service inside their working environment. Therefore, I went to each one of the houses of the 20 staff members interviewed in order to get a deep insight of how the antenatal care was being performed, while at the same providing a more comfortable and safe environment to the interviewed to tell the stories.

5.1.2 Ethical Issues

When doing qualitative research one of the most important things is to negotiate the things that can be published and those that cannot be reported. Therefore, in order to respect the identity and maintain the job position of the medical staff members interviewed, as well as to keep the transparency of the study, I did not use the real names of the doctors and nurses that I interviewed.

5.2 Quantitative Research:

5.2.1 Data

Secondly, this study will use the cross-section data provided by the DHS for Honduras (2012), and MINSA (National Health Care Centers) Nicaragua (2012). The DHS collects detailed questions about women between 13 and 49 as well as about their under-five-year-olds. Given the focus of this research, the relevant information that the DHS offers is found at the women's level for those who have under-fives.

DHS provides the ideal database to do this study because all the information was gathered when the mothers where pregnant or their children where under five years old. In addition, this database shows the impact of antenatal care, childrearing attitudes as well as socioeconomic and cultural factors on the children's growth and the living conditions of the household. The DHS survey includes the most relevant information about children's and mother's height, as well others variables including breastfeeding, mother's and father's education level that are fundamental to compute children growth indicators.

The information provided by these surveys is complete because it provides the antenatal care that mothers received with the last child under five years old, such as the timing and frequency of the consultations and who practiced them. Therefore, the sample is restricted to last born babies between 6 and 59 months. A total of 10,888 women were eligible, where out of the 10,888, almost two-thirds live in the urban areas and one-third live in the rural areas of Honduras. DHS surveys for Honduras are representative at both the urban and rural levels, and also for some of the countries it is also representative at the level of regions or departments. Even though, some of the surveys did not have the complete answers, I did not exclude any of the surveys provided by the DHS. By excluding some of the surveys, the information of the study will be creating some bias results; therefore I examined the full sample with all the surveys and without the surveys with missing data in order to see if there was a difference in the proportions of the outcome variable in the two examples. The proportions were very different (+/-0.6 standard deviation). For this reason, I decided to use the full sample including all the surveys.

For Nicaragua, I personally collected the information by going to MINSA (Ministry of Health), where all the records of the women living in the rural and urban areas were filed. I revised all the files of the women who were pregnant for the year 2012. When collecting the information from the files, I used the same variables that were presented in the DHS for Honduras. A total of 6,986 were eligible, where one third of the sample was coming from rural areas, and almost two thirds were coming from the urban areas. When collecting the information, some of the files did not have the complete information. As men-

tioned before with the DHS database, in order to avoid bias results, in the case of Nicaragua I also used full sample with all the surveys.

5.2.2 HAZ as Determinant of Malnutrition

As mentioned in Chapter 3, through this study child height, or HAZ (height for age), is being used as an indicator of child health. By using both the DHS and MINSA collected database, HAZ for each one of the children is obtained through this formula:

$$HAZ = \frac{Height_i - Median}{Standard\ Deviation}$$

Source: London of School of Hygiene and Tropical Medicine

Height refers: for children under five years height = the length of the infant, whereas for children over two years old is considered as height. Median and Standard Deviation are taken from the National Centre for Health (NCHS), where the median and standard deviation are based on the sex and age (in months) of the infants. If the value of HAZ is under two standards deviations (-2SD), it represents chronic malnutrition, whereas if the value of the HAZ is below three standards deviations (-3SD), it represents a severe level of undernourishment.

5.2.3 Empirical Strategy:

In addition, according to Thomas and Strauss (1992), parents are one of the main factors maximizing a child's heath, presented as this:

$$Max_{x.l.\theta}\ U(x_t,\ l_t,\ \theta_t(h_t);\ z_{ht},\ \Phi_t)$$

where: (x_t) represents the consumption of goods and services of the family;

(l_t) represents the leisure time of all the family members;

(θ_t) it is a vector that exemplifies the quantity of children a family has, as well as the quality of life each child has, where in this particular case study, child height can be considered as one of the quality aspects;

(z_{ht}) represents the mother and father's height and education level;

(ϕ_t) presents the unobserved preferences of the parents

As mentioned in literature review, two of the important factors that can help to maximize the production function of the child height (as an indicator of child health) are: wealth index of the household and the parents' education level; therefore, from the previous formula, two more formulas are derived in order to maximize the outcome of child height will be like this:

$$h_t = f_t \left(h_{t-1}, M_t, z_{it}, z_{ht}, \check{z}_{ct}, v_{it} \right) \qquad (1)$$

The current child health (child height) depends on the following:

(h_{t-1}) represents the height of the child in the previous period;

(M_t) represents the health practices that the child receives such as balance diet, intake of vitamins, breastfeeding;

(z_{it}) represents the age and sex of the child;

(z_{ht}) represents the characteristics of the parents such as age;

$(\tilde{z}_{ct})$ represents community characteristics where the child grows;

(v_{it}) represents the unobserved characteristics of the child and the community

The second restriction determining child health involves the economics resources available at home:

$$p_t x_t = w_t \left(T_t + l_t \right) + y_t \qquad (2)$$

where $p_x x_t$ represents price for goods and services consumed at home and the right side represents the income that the person in the household earns, and (y_t) represents the non labour income inside the household.

In order to answer the question raised in this study about the common factors associated with child malnutrition in Honduras and Nicaragua, a child health production function is estimated by OLS by using four groups of variables. This study is a cross section analysis and by trying different tests, OLS was the most significant in order to present the results in both countries regarding the variables chosen for the study. Therefore, the estimation for this OLS regression is explained as this:

H = β0 + β1 AntenatalCare+ β2 Postnatal care +β3 HouseholdAttributes + β4 ChildAttributes+ μi

Table 5.1 explained each one of the variables included in the group variables. All of the variables chosen for this study where based on the theoretical framework and literature review presented in chapter 3 and 4, including the main factors affecting malnutrition among children. The dependent variable is the negative of HAZ (height for age) representing child heath, where all the coefficients will be interpreted in terms of the impact on malnutrition among

children. The higher the value means higher the level of malnutrition among children.

5.2.4 Limitations

When I was checking the DHS database for Honduras and collecting the database for Nicaragua, one of the limitations was the absence of the calcium variable. There was no record of this variable in both countries, which was very surprising for me because this variable is included in other Latin American countries' databases. Therefore, in this study it is not possible to measure the impact that calcium (an important micronutrient that should be taken during pregnancy) has on child growth, health and nutrition.

Table 5.1

Descriptive Variables

	Variables	Description
Antenatal care and complementary behavior (AC)	Complete antenatal care, incomplete antenatal care.	The variables take the value of 1 if the antenatal care was complete or incomplete respectively, and the reference category is not having had any antenaatal care at all, where complete antenatal care means to have 6 or more appoint-ments with trained physicians
	Tetanus	If the mother had one or more (1) or not (0) injections.
	Iron	If the mother took iron pills (1) or not (0) during preg-nancy.
	Folic Acid	If the mother took folic acid (1) or not (0) during preg-nancy.
	Vitamin A	If the mother took Vitamin A (1) or not (0) during pregnancy.
	Smoke	If the mother smoked (1) during pregnancy or not (0).
Post-natal care	Nutrition	Child received baby formula during the first 3 days as a newborn
	Breastfeeding	The child has ever been breastfed (1) or not (0)
	Mother takes cares of the child	Whether the mother takes care of the child (1) or not (0), referring to whether the mother works or not.
Household Controls	Mother's height	Mother's height in meters.
	Mother's age	Mother's age in years and its squared.
	Education of the mother	Mother's level of education
	Education of Partner	Education level of the mother's partner.
	Wealth Index	Wealth Index according to World Bank
	Marital Status	The mother lives is married or lives with a partner (1) or not (0).
	Region	Urban (1), or (0) rural.
	Source of water	Source of water is piped (1) or not (0).
Child Controls	Age, Age2	Age in months of the child and its squared.
	Gender	Male (1), Female (0).
	2nd, 3d, 4th born onwards	Birth order of the child are dummy variables, using the first born as the main or reference category
	Siblings	Number of living siblings.
	Indigenous	Belongs to a ethnic group (1) or not (0)

Chapter 6
Results

6.1 Quantitative Data

6.1.1 Descriptive Statistics

Table 6.1
Descriptive Statistics

	Honduras		Nicaragua	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*
No Antenatal Care	0.08	0.31	0.10	0.38
Complete AC	0.06	0.43	0.13	0.52
Incomplete AC	0.72	0.21	0.64	0.31
Tetanus Inj. =1	0.65	0.22	0.64	0.24
Iron	0.43	0.42	0.31	0.46
Vitamin A	0.31	0.18	0.24	0.19
Folid Acid	0.21	0.54	0.33	0.43
Smoke	0.32	0.09	0.42	0.10
Nutrition 1st days	0.14	0.23	0.12	0.32
Breastfeeding =1	0.44	0.25	0.38	0.42
Mother cares =1	0.65	031	0.54	1.98
Mother´s Height	162.98	7.21	152.67	12.31
Mother's Age	28.08	4.90	22.90	2.20
Mother's Edu	1.50	0.37	1.78	0.54
Edu. Partner	1.60	0.12	1.87	0.18
Wealth	2.45	1.23	1.89	1.34
Married=1	0.52	0.45	0.45	0.32
Urban	0.36	0.49	0.31	0.64
Water=1	0.50	0.21	0.56	0.54
Age in months	0.91	0.23	0.81	0.09
Gender=1	0.65	0.12	0.56	0.04
2nd born	1.39	3.21	1.45	2.45
3rd born	0.31	1.89	3.35	0.09
4th born	4.89	2.34	2.32	3.87
Siblings	4.32	2.87	3.65	1.20
Indigenous	0.62	0.43	-	-
N	**10,888**		**6,986**	

Table 6.1 summarizes the descriptive statistics of the independent variables affecting child health of lastborns children under five years old for Honduras and Nicaragua. Antenatal care information in both databases is related to the lastborns children. Even though Honduras and Nicaragua comes from very similar economic and political background, some household and child controls vary from country to country. In Honduras and Nicaragua more than two thirds of the women received incomplete antenatal care, which means they received between 1 and antenatal care checkups. In the urban and rural areas of both countries, most of the women have a very strong habit of smoking, 33% in Honduras and 43% in Nicaragua. Even though, more than one of third of the women gave breastfeeding in both countries, the question about breastfeeding in both databases just explained if women have ever breastfeed or not, but this question does not provide more explanation about how long women breastfeed, so it is not a very predominant factor to influence in child health.

In Honduras and Nicaragua more than thirds of the women had one or more tetanus injections during the pregnancy period. In Honduras, the average height of women is 157 cm, whereas, in Nicaragua the average height is 152 cm. On average, the age of pregnant women in Nicaragua is 22 years old and in Honduras is 28 years old. Nicaragua is the country with the highest percentage of teenager pregnancies (almost 20% in 2013) (Baeza 2013). In Honduras, 52% of the women are married or lives with a partner. On the other hand, in Nicaragua, less than 50% of the women are married or have a partner. More than two thirds of the population in Honduras comes from indigenous communities. On average, most of the women in Honduras come from middle class income households, where families usually have four children per couple and 65% are boys. On the other hand, in Nicaragua comes from low class income, where households have at least 3 children per family and 56% of them are boys.

Table 6.2
Descriptive Statistics

Antenatal care	Honduras		Nicaragua	
	Average HAZ	% Malnourished children	Average HAZ	% Malnourished children
Complete Antenatal care (CAC)	-0.83	6.42	-0.76	13.02
Incomplete Antenatal Care (IAC)	-1.90	72.20	-.187	64.93
Ever breastfed				
Yes	-1.56	49.19	-1.64	23.55
No	-1.13	41.91	-1.25	14.12
Tetanus injections				
1 or more	-0.87	24.70	-0.97	31.91
None	-1.97	63.15	-2.01	58.20
Mother cares the child				
Yes	-0.98	27.39	-1.24	46,48
No	-1.98	23.15	-1.86	34,33
Wealth				
Poorest	-2.04	32.02	-2.20	42.84
Poorer	-1,56	20.69	-1,80	30.58
Middle	-1,12	14.87	-1,46	18.99
Richer	-0,87	12.14	-0,69	11.66
Richest	-0,56	5.85	-0,60	3.10
Mother's Education				
No education	-1,89	63.45	-2,34	44.80
Primary	-1,76	25.55	-1,87	23.73
Secondary	-1.09	3.76	-1,22	21.05
Higher	-0,46	1.80	-0,89	2.03
Region				
Urban	-0,78	22.83	-0.69	34.13
Rural	-1,76	60.71	-1,89	51.33
Sex				
Male	-1.48	45.36	-1.52	46.48
Female	-1,12	43.41	-1.20	45.22
Ethnicity				
Indigenous	-1,67	64.39	-	-
Non-Indigenous	-0,80	22.29	-	-
Number of Observations	**10,888**		**6,986**	

As presented in Chapter 5, in this case study HAZ formula (height for age) is used as the dependent variable in order to determine child health. Table 6.2 presents the descriptive statistics of the average HAZ (dependent variable) in function of some relevant independent variables, including antenatal care, tetanus injections, breastfeeding, wealth index, parenting, region area, ethnicity and sex of the child to determine the prevalence of malnutrition among last-born children under five years old.

According to UNICEF (2013), Nicaragua has reduced chronic malnutrition from 25.8% to 21.7% between 2001 and 2008. On the other hand, even though child undernourishment has been reduced in Honduras, the country is still present one with highest level of undernourishment among Central American countries, with a 27.4% in 2008 (UNICEF 2011). Based on the average HAZ, the highest percentage of malnourished children is among women whom did receive an incomplete antenatal care compared to those women whom received a complete antenatal care; especially in Honduras with -1.90 as an average HAZ for incomplete antenatal care (representing 72% of malnourished children).

Tetanus injections during the pregnancy period are one of the most important things that medical health centers promote during the antenatal care. Tetanus is an infectious disease caused by a bacterium that infects the wounds and produces a toxin (tetanus), which can be mortal. The vaccine stimulates the production of antibodies in the mother's blood and protects the baby from neonatal tetanus. As previously discussed, most of the pregnant women in Honduras and Nicaragua usually attend to one antenatal checkup, which means that they at least receive one of the two doses of the tetanus injections. Children whose mothers did not received any tetanus injections during pregnancy have higher HAZ average compared to those whom received between one or more; therefore, the presence of malnourished children among mothers who did not receive tetanus injections is higher in both countries.

HAZ average for mothers who ever breastfed has a higher value compared to those who never breastfed in both countries. As we mentioned before, breastfeeding is not a very determinant factor influencing malnutrition among children due to the lack of information in both databases. DHS and MINSA databases just explained if children were ever breastfed or not. Based on the literature and theory, mothers should breastfeed their children for at least 6 months after giving birth. According to Marquis et al. (1997) "one would expect breastfed children receiving complementary foods to be protected against growth faltering from illness and poor weaning diets and, therefore, be as tall or taller than non-breastfed children. Yet this has not been observed consistently." Some studies suggest that mothers, who keep breastfeeding their children even after they turned two years old, they are probably reducing the consumption of other complementary foods or solid food (such as vegetables, fruits, beans, whole grain breads and cereals) without increasing the consumption of human milk, which is translated in a reduction of total energy. The negative relation that breastfeeding suppose to have with children's health (especially children's height) can be linked with a reverse causality, where children's growth) "is a causal factor of the predictor (e.g. breast-feeding), and not vice versa. Studies not designed to detect reverse causality would conclude that breast- feeding was deleterious to growth when, in fact, breast- feeding is not responsible for poor growth but, rather children continue to be breastfed because of their poor growth"(Marquis et al. 1997). Children whose mothers take

care of them have lower HAZ values compared to those children whose mothers do not take care of them. In both countries usually the father is the only working in the household, so the mother stays at home taking care of the children.

"The wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using easy-to-collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities"(The DHS Program 2004). Based on the average HAZ of wealth indicators, households living in the poorest areas from both countries present a very severe malnutrition among children under five years old. As families are becoming richer, the average HAZ value is lower; therefore the prevalence of children malnutrition is very small

Also, based on the HAZ average, the higher educated the mother, the lower the value; which means that the prevalence of malnourishment is among children whose mothers have low education level for both countries. As presented in the table 6.1, only one third of the population lives in the rural areas; therefore, in Honduras and Nicaragua, the HAZ value is higher in the rural areas indicating higher levels of children malnutrition. Ethnicity is one of the variables only available for Honduras, where non-indigenous children have lower HAZ value compared to those children coming from indigenous communities.

By looking at this summary statistics, Honduras is the country with the more relevant percentage of malnutrition among the various groups. By being the two less wealthy countries in Central America, Honduras and Nicaragua have similar patterns when it comes to the prevalence of malnourished children, which are present more in the rural areas and in poorest households. In addition, undernourished infants are more predominant among less educated women with incomplete antenatal control.

Table 6.3

Ordinary Least Squares Regression

	Nicaragua		Honduras	
	Model 1	*Model 2*	*Model 1*	*Model 2*
	Wealth	*Education*	*Wealth*	*Education*
Complete AC	-0,018	-0,021	-0,123	-0,234
	(0.25)	(0.46)	(0.32)	(0.21)
Incomplete AC	0,070	0,074	-0,138	-0,145*
	(.045)	(0.46)	(0.21)	(0.32)
Tetanus Inj.	-0,022*	-0,024**	0,030*	0,027*
	(0.43)	(0.34)	(0.46)	(0.49)
Iron	0,023	0,023	-0,084	-0,087
	(0.45)	(0.46)	(0.41)	(0.49)
Vitamin A	-0,234	-0,237	0,074	0,072
	(0.34)	(0.38)	(0.47)	(0.52)
Folid Acid	0.005	0.005	0.018	0.012
	(0.45)	(0.39)	(0.39)	(0.43)
Smoke	-0,068	-0,065	-0,031	-0,023
	(0.45)	(0.39)	(0.41)	(0.51)
Nutrition 1st days	-0,012*	-0,017*	-0,031*	-0,025*
	(0.31)	(0.47)	(0.41)	(0.31)
Breastfeeding	-0,025**	-0,025**	-0,038*	-0,047**
	(0.42)	(0.34)	(0.43)	(0.34)
Mother cares	-0,012*	-0,012*	-0,072**	-0,075**
	(0.41)	(0.45)	(0.35)	(0.42)
Mother´s Height	-5,457***	-5,890***	-5,101**	-5,134**
	(0.42)	(0.23)	(0.24)	(0.21)
Mother's Age	-0,085***	-0,086***	-0,078***	-0,094***
	(0.81)	(0.76)	(0.67)	(0.65)
Mother's Edu	-	-0,024***	-	-0,031***
		(0.008)		(0.004)
Edu. Partner	-	-0,143***	-	-0,124***
		(0.010)		(0.12)
Wealth	-0,308***	-	-0,266***	-
	(0.45)		(0.39)	
Married	0,014	0,012	-0,081	-0,034
	(0.43)	(0.51)	(0,012)	(0.34)

Urban	0,039**	0,045**	0,127**	0,135**
	(0.24)	(0.42)	(0.43)	(0.45)
Water	-0.234**	-0.281**	-0.145	-0.146
	(0.42)	(0.34)	(0.42)	(0.45)
Age in months	0,046*	0,041*	0,020*	0,015*
	(0.56)	(0.43)	(0.32)	(0.45)
Gender	0,061	0,06	-0,050	-0,041
	(0.42)	(0.43)	(0.32)	(0.42)
2nd born	0,130**	0,125**	0,426***	0,425***
	(0.23)	(0.42)	(0.34)	(0.12)
3rd born	0,283**	0,287**	0,160**	0,154**
	(0.23)	(0.43)	(0.22)	
4th born	0,323***	0,345***	0,310***	0,346***
	(0.25)	(0.42)	(0.34)	(0.43)
Siblings	0,123***	0,134***	0,136***	0,132***
	(0.53)	(0.39)	(0.42)	(0.46)
Indigenous	-	-	0,430***	0,432***
			(0.34)	(0.420)
Constant	11,234***	12,346***	13,214***	13,654***
	(13.21)	(12.31)	(12.23)	(12.09)

*** 1%; **5%; * 10%.
Source: DHS (Honduras, 2012) MINSA (Nicaragua 2012)
The parentheses refers to the Robust standard

6.1.2 Analysis

The section presents the OLS robustness estimations for malnourished children by using the negative of HAZ (Height for Age Z) as the dependent variable and wealth index and mother and father's education level as the independent variables. As it was discussed in the chapter 5 in the empirical strategy, socioeconomic factors and parents' education level are two of the most important factors associated with child's health and postnatal growth. These two factors are included in the formula that maximizes the production function associated with child stature. Model 1 presents wealth index as the independent variable and model 2 presents parents' education level as the independent variable.

Table 6.3 presents that complete antenatal care is not statistically significant for both countries at 95% confidence level. Even though the literature presents that healthier children comes from mothers whom received complete antenatal care, this is not the case of less developing countries as Honduras and Nicaragua. In addition, incomplete antenatal care is only statistically significant for the case of Honduras and by taking in consideration that the reference group are those children without any antenatal care, in model 2 as mothers in-

crease one antenatal checkups, children are almost 14 percentage points less likely to be malnourished in Honduras. Mothers who during the pregnancy smoked during the pregnancy do not seem negatively affect their infants' health.

Mothers take caring of their babies, as well as breastfeeding are statistically significant at 95% confidence level. In Model 1, if mothers ever breastfeed their children, these children are 2.5 percentage points more likely to be healthier in Nicaragua, and 3.8 percentage points more likely to be healthier in the case of Honduras. Therefore, in Honduras and Nicaragua, mothers who breastfeed and take care of their infants can positively affect their children's health, especially those mothers whom during the antenatal care received the necessary indications about how and how long their infants should be breastfeed.

In both countries, mothers' height is statistically significant for both models. Based on the literature, "mother's height is expected to have a stronger effect than father's height since the mother is recognized to have an environmental effect through the womb" (Marini and Gragnolati 2003). Honduras and Nicaragua's surveys only collect mothers' height. Therefore, as taller the mother is, as healthier the child will be. Also, the mother's age have a positive effect on child's health because pregnant women before 18 years old have higher risks of having prematurely, underweight and undernourished children due to the low level of education they have regarding pregnancy and parenting. Therefore, in model 2, as mothers have one more year old, children in both countries are 5 times more likely to be healthier.

On the second model, the mother and father's education coefficients are also statistically significant at one per cent in both countries. Higher education level represents more knowledge and "mothers with higher levels of nutrition knowledge, acquired primarily outside of school, are able to choose a more diversified diet for their children, and, broadly speaking, to utilize food more effectively" (Burchi 2010). If the mother is well educated, it also means more wealth for the family and less gender disparity. In model 2, as mothers increase one year of education, children are 2.4 percentage points (Nicaragua) and 3.1 percentage points (Honduras) less likely to be malnourished. In addition, father's education is important too because higher education represents more qualified job opportunities, which at the end "improves the allocation of resources in regard to children's well-being and the care for the child" (ibid). Therefore, in model 1, children coming from wealthier family background are 30.8 percentages points (Nicaragua) and 26.6 percentage points (Honduras) more likely to be healthier compared to those children coming from poorer and less educated families.

Having source of drinking water is statistically significant for Nicaragua but not for Honduras, which was unexpected. According to the literature, families with better household conditions including source of drinking water provide better nutritional status to the their children because clean water is considered an important source to provide children with better living conditions and at the same time to avoid getting diseases or infections during childhood. Also, living in urban areas is associated with better living conditions for a child to growth and develop. According to model 1, if children grow up in urban areas, they are 3.9 percentage points (Nicaragua) and 12.7 percentage points (Honduras) more likely to be healthier than those children living in rural areas because rural areas tend to increase the chances for under five years old

infant to have chronic diseases that can affect their normal growth and development; therefore, they tend to be more stunted. In addition, living in rural areas mean that families come from low-income class, where children are not able to consume all the necessary nutrients and vitamins needed to reach the child stature according to their age. Through these living conditions, it is possible to see the level of inequalities that exits in less developing countries between urban and rural areas.

Lastly, based on the child control variables, child's age is statistically significant. In model 1, if a child, coming from low-income class and less educated parents, increases one more year, he or she is 4.6 percentage points (Nicaragua) and 2.0 percentage points (Honduras) more likely to be malnourished compared to those children with richer background and higher educated parents. For both countries, if the mother has a second, third or fourth child, it is statistically significant at 1 and 5 per cent. This means that second, third or fourth child will be healthier than the first one because parents (especially the mother) will have better knowledge about the parenting experience. However, even though parenting experience helps the mother to positively influence the next child's health, you can see that the coefficient for siblings is statistically significant at 1 per cent for both countries, which means the higher the number of siblings a child has, the higher the level of malnutrition for that child.

Usually families that live in rural areas and have less education about birth controls tend to have bigger families due to unplanned pregnancies. "In all family types the proportion of families with young children is greater in the rural sample, as is to be expected in view of the higher birthrate in rural areas" (Sanders and Carl 1939, p. 38). This is true because as bigger the family is, fewer the economic resources the families have available for each one of the members regarding education, health care, food and necessary nutrients. Therefore, there is an increase of malnutrition among children under five years old. Also, it is important to remember that children in the rural areas are also part of the labor force, especially in the agricultural arena, in order to help their families. In Nicaragua, almost 40% of the population is involved in the agricultural labor activities (BCIE 2010). In Honduras, the agricultural sector employs around 39% of the population living in the rural areas (FIDA 2011). Therefore, as much time children spend working in the agricultural sector, less time parents have to pay attention to their children's health and nutrition level. This is a great example to see the great disparities that exist between the rural and urban areas in both countries.

In Honduras, being an indigenous child has 43 percentage points more likely to be stunted as they grow up compared to those children whom are not indigenous. Indigenous population is divided as follow: 2% of the population is white, 3% is black garifuna, 6% is other indigenous groups (such as Pech, Tawahkas, Lencas, Tolupanes, Chortis) and 90% are predominantly mestizo (a mix of white and black garifuna people).

When looking at all the results, they imply that having complete antenatal care, coming from poor family background, being part of an ethnic group and living in rural areas are factors that are strongly associated with malnourished children.

6.2 Qualitative Data

Semi-structured individual interviews with medical staff members and pregnant women were made in order to have a deeper and richer insight about the study being analyzed. 10 interviews were conducted with physicians and nurses in the health centers located in the rural and urban areas of Honduras and Nicaragua. In addition, 10 interviews in each country were conducted with women between 16 and 49 years old whom attended to these health centers during their pregnancy.

The locations of Honduras's interviews were in Tegucigalpa, San Pedro Sula (Urban areas) and Choluteca, El Paraiso and Copan (Rural areas). In addition, Nicaragua's interviews locations were in Managua (Urban area) and Boaco, Rivas, Carazo and Chinandega (Rural areas). The locations in the rural and urban areas were randomly chosen. In this study, the qualitative data enriches the analysis by understanding the perspectives of the medical staff members and pregnant women regarding the role of antenatal care and the determinants of child malnutrition in both countries.

Table 6.4
Medical Staff members Interviewed

	Honduras			Nicaragua	
	Rural	Urban		Rural	Urban
Doctors			**Doctors**		
Dr. Freddy Castillo	Materno Infantil		Dr. Luis Sanchez		Centro de Salud "Primero de Mayo"
Dra. Minolva Espinoza		Centro de Salud "Mario Mendoza"	Dr. Mario Linarte	Centro de Salud "El Paraiso"	
Dr. Jose Larios	Centro de Salud "Santa Rosita"		Dra. Vera Mercedes	Centro de Salud "Nuevo Amanecer"	
Nurses					
Luis Ulloa	Martinez Valenzuela		Rosario Lacayo		Centro de Salud "El Militar"
Alfredo Borge	Mario Catarino Rivas		Humberto Alvarado		Centro de Salud "Regional Santiago"
Flavia Mairena	Puerto Cortes		Maria Esther Paiz		Antonio Lenin Fonseca
Aurora Picado	Gabriela Alvarado		Francisca Rivas	Centro de Salud "El San Jose"	
Violeta Arroliga		Manuel de Jesus Subirana	Kenia Grillo	Centro de Salud "La Trinidad"	
Carolina Diaz		Centro de Salud "Tela Integrado"	Wendy Idiaquez	Centro de Salud "Amistad Japon-Nicaragua"	
Yelba Logo		Centro de Salud "Regional del Sur"	Xinia Saballos		Bertha Calderon

Table 6.4 summaries the sample of the 10 staff members interviewed from Honduras' and Nicaragua's health centers. 11 questions were done in order to get a deeper insight of the antenatal care that health centers provide, as well as the most predominant child malnutrition indicator. Through the process of the interviews, I tried to be very careful in collecting the information due to ethical issues; therefore, I am not revealing the original names of these people.

6.2.1 Antenatal Care

"Due to the experience of working in the Antenatal Care Department, I have a very good knowledge about the antenatal care guidelines, but I was never trained in this area."

When doing the interviews, 70% of the medical staff members working in the Antenatal Care Department were nurses. As it was explained in Chapter 2, nurses are the highest percentage of staff members providing the antenatal care

service in Honduras and Nicaragua. Even though 70% of these nurses are in charge of the antenatal care department; some of them told me that they never received a proper training about the antenatal care guidelines, especially in Honduras, where they should be certified in order to provide these services. In Chapter 4, you can find the guidelines that doctors and nurses must follow in order to provide an ideal antenatal care service. From the 20 members interviewed (doctors and nurses), 16 of them said that these guidelines are not followed as indicated; therefore, the antenatal care service sometimes cannot be as provided as expected. According to the medical members, here are some of the differences between the ideal and the real antenatal care being provided by the health centers in both countries:

Table 6.5

Antenatal Care Service		
	Honduras	**Nicaragua**
Ideal	Real	Real
First Antenatal Care Visit:		
It should last between 40 to 45 minutes	It only last between 12 to 15 minutes	It only last between 10 minutes
Doctor collects all the needed information regarding personal information and usual habits, medical and obstetrics history	Doctors usually collect all the information needed	Due to the time constraint, doctors sometimes do not have time to collect the obstetrics history
Tetanus injections are separated in two doses. The first dose is given when the woman reaches 20 gestional weeks and the second dose when the woman reaches 24 gestional weeks	The second dose is not always given because some of the women just visit the health centers for one antenatal care checkup before giving birth	
Doctors check the mother's weight and height, and also does an ultrasound	Due to economic constraints, most of the health centers in the rural areas do not have the necessary equipment to perform ultrasounds; therefore, some of the women have to travel long distances to do it	It happens the same as Honduras. In addition, due to lack of knowledge about the importance of ultrasound, women do not go to any places to do it
Doctors ask mothers to do blood test, VIH syphilis, urinary and toxoplasmosis test, which doctors or nurses should check the results on the next appointment	Doctors only ask mothers to do the blood and urinary test. Due to time constraint, doctors usually do not check the results in the next visit (only when the mothers express that they have been ill)	
Since the first appointment, doctors must advice the women about the balance diet that they should take. In addition, they prescribe to women the vitamins and micronutrients that they should start taking since the beginning of the pregnancy	Mothers receive all the necessary micronutrients and vitamins needed during the pregnancy period.	

	Honduras	Nicaragua
Ideal	Real	Real
From Second to the Last Antenatal Care Visit:		
It should last between 15 to 20 minutes	It only last between 5 to 8 minutes	
Doctors or nurses should record the date of the appointment, the gestional age, the mother's weight, height and blood pressure. In addition, physicians should check the mother's belly and child's heart beats in order to detect any possible irregularities that could occur during the pregnancy stage.	Nurses are the ones who performed the next antenatal care checkups. They do the checkup very quick and try to write down just the most important things such as mother's weight, height and blood pressure.	
Doctors or nurses must remind the mothers to keep the balance diet and tell them about the importance of breastfeeding.	Health centers provide at a least one small talk about the importance of breastfeeding, but not all of them indicate women about the balance diet they should have	
Doctors or nurses must follow up the illnesses the mothers present during the pregnancy period and give a space for mothers to ask questions or doubts	In most of the cases, there is no time for answering questions or doubts. Nurses try to follow up the mothers' diseases during the pregnancy, but sometimes they just follow up those diseases that can seriously harm the baby's life	

Even though, both regression models present that a complete antenatal care does not have any effect to reduce malnutrition among children, professional physicians agree that the antenatal care could have a positive impact in mothers and children's health if they could provide better services. Even though, there are some minor differences between the antenatal care provided in Honduras and Nicaragua, it is possible to see that most of the information presented by the databases of both countries can tally with the information presented above. Based on the databases, more than one third of women ever breastfeed their children. As presented before, even though the attention time is very short, most of the health centers provide at least one talk about the importance of breastfeeding. All health centers in the rural and urban areas provide the necessary vitamins (vitamin A) and micronutrients to the women, including Iron and Folic Acid.

"One of the micronutrients women must take during pregnancy is Calcium. Calcium is not equally distributed in health centers, especially in health centers located in rural areas. Some of the doctors prescribe it during the antenatal care visits, but some do not do it. I do not know why the Ministry of Health of Honduras do not promote the intake of calcium as an essential micronutrient (because of the benefits that it has)."

Calcium helps the baby's bones and teeth to grow. In addition, it is essential for the development of the circulatory, muscular and nervous system of the baby throughout the pregnancy in order to work properly during the childhood. In the qualitative sample only 3 out of 20 health centers are prescribing calcium in the first antenatal care checkup, and at the same time doctoras are advising women about the importance of calcium to take care of their health and their babies' health. According to the staff members interviewed, there is a deficiency in this area and antenatal care programs, in both rural and urban areas, must prescribe calcium to pregnant women since day one. Both regression models show that intake micronutrients and vitamins are not relevant to determine children health and postnatal growth. As you can see, there is no record of calcium intake as a variable in the DHS and MINSA database, maybe because the number of health centers that give calcium to the women is very reduced. As mentioned in Chapter 3, calcium, as well as other micronutrients, is included as an important part of antenatal care in order to generat better pregnancies outcomes and less malnutrition among children. I consider this issue as relevant issue, as well as an area of opportunity for policy makers in order to generate deeper insights about the reasons why calcium is not equally distributed between the different health centers of Honduras and Nicaragua.

"According to the government's plans regarding health care programs, antenatal care is not considered as choice for women during the pregnancy. They must have at least one antenatal care checkup record in their files before giving birth. In some cases (especially rural areas) nurses have to go to the houses of the women in order to force them to assist to one antenatal care checkup."

As said in Chapter 2, according to the Ministry of Health antenatal care programs are mandatory, where pregnant women must have at least one antenatal care checkup before giving birth. According to the staff members interviewed, all of them agreed that some women do not visit health centers because health centers are long walking distance and they do not have enough economic resources to pay for transportation to go to the centers, especially when men are the only ones working in the household. In addition, because it is required by health centers to have at least one antenatal care checkup, some of the nurses that sometimes they went to the houses of the women to ask them to have one checkup, which usually occurs in the rural areas of the country. Nurses think that there is no cultural habit in the countries to educate and create awareness to women about the importance of receiving antenatal care during pregnancy.

From this qualitative sample, 30% of the staff members said that most of the pregnant women, attending to the health centers they work, had at least 1 checkup before giving birth. In addition, 40% of them said that mothers had between 2 to 4 checkups. On the other hand, 30% of them said that mothers receive more than 4 antenatal checkups before the baby is born. According to the National Health Center, doctors and nurses know that 4 antenatal care checkups must be done before pregnant women deliver the baby, but they know that most pregnant women are not able to complete the 4 checkups due to the reasons previously discussed; therefore, the risk of having underweight and malnourished children is higher. Even though, the regression models show that rural areas are the ones presenting higher levels of undernourishment

among children under five years old, in the case of Nicaragua, doctors and nurses believe that health centers in the urban areas have also decreased the quality of service because there has been an increase of population moving from rural to urban areas. The amount of staff members is not enough to provide a good quality of service to all women. Therefore, during the last years, living in the capital city of Nicaragua (Managua) seems to harm children's nutritional status, even though the percentage of the population living in the rural areas is still higher (Naciones Unidas 2007).

6.2.2 Child Health Indicators

"Child height is one of the common indicators of child health. If mothers do not keep a balance diet, take the necessary nutrients, and give at least 6 months of breastfeeding, there is high probability for children to be stunted and underweight. Sometimes child malnutrition is present due to genetic factors such as mother's height.

According to the personnel interviewed, 80% of them said that most of stunted children are more coming from mothers living areas with low education level, low-income sources. All of the doctors and nurses said that almost 80% of them women give 2 or 3 months of breastfeeding to their infants. By doing this new mothers are harming their babies' postnatal growth and at the same time making their babies' immune systems more vulnerable to infections or diseases that can interrupt the babies' normal growth during their childhood. One or three months of breastfeeding is not enough because it "not only not only provides important nutrients but also protects the child against infection. The timing and type of supplementary foods introduced in an infant's diet also have significant effects on the child's nutritional status" (Sharma 2011, p. 12-13). Besides producing diarrhea, these prelacteal feeds are also contributing to the malnutrition of the child during the first years of his or her life. As regressions models presented, breastfeeding is statistically significant, but the information provided by the databases is not complete relevant because it just expresses if babies were ever breastfed, which can be just one month or even just two times. In addition, all of the personnel interviewed agreed that they have some fault regarding the balance diet because due to time constraint they know that sometimes they talk to the women about the importance of keeping a balance diet, but sometimes they just forge it.

Table 6.6
Women Interviewed

	Honduras			Nicaragua	
	Rural	Urban		Rural	Urban
Marcela Martinez (27 years old)	Materno Infantil		Luisa Gomez (41 years old)		Centro de Salud "Primero de Mayo"
Luisa Cortes Espinoza (24 years old)		Centro de Salud "Mario Mendoza"	Geraldine Avila (26 years old)	Centro de Salud "El Paraiso"	
Norma Mendoza (16 years old)	Centro de Salud "Santa Rosita"		Cristina Miran (31 years old)	Centro de Salud "Nuevo Amanecer"	
Carolina Posada (30 years old)	Martinez Valenzuela		Camila Guerrero (33 years old)		Centro de Salud "San Jose"
Paula Lucia Perez (23 years old)	Mario Catarino Rivas		Paola Lopez (29 years old)		Centro de Salud "Regional Santiago"
Tatiana Rios (25 years old)	Puerto Cortes		Belen Mendez (19 years old)		Antonio Lenin Fonseca
Hanny Moncada (30 years old)	Gabriela Alvarado		Ana Paula Lindo (23 years old)	Centro de Salud "El Paraiso"	
Reyna Loaisiga (29 years old)		Manuel de Jesus Subirana	Linda Pereira (30 years old)	Centro de Salud "La Trinidad"	
Ximena Rodriguez (40 years old)		Centro de Salud "Tela Integrado"	Juliana Chamorro (28 years old)	Centro de Salud "Amistad Japon-Nicaragua"	
Flavia Vasquez (22 years old)		Centro de Salud "Regional del Sur"	Claudia Chavez (36 years old)		Bertha Calderon

Table 6.6 summaries the sample of the 10 women interviewed from each country, where 12 questions were done in order to get a better insight from patients' perspectives about the quality of antenatal and postnatal care that health centers in both countries, while at the same time to understand the influence of household controls variables in birth outcomes. In the table above, I present the age of the women when they had their lastborn.

6.2.3 Antenatal Care

"Even though the health centers' personnel was limited, the antenatal care service is fine" (Cortes 2015).

According to the 20 women interview, 70% of them considered that the antenatal care service in Honduras and Nicaragua was good, in both the rural and urban areas, but the positive answer towards receiving good antenatal care service was predominant in woman living in the urban areas. Even though, they believed that the health centers' personnel was limited, doctors and nurses

were very kind and patience. Women said that health centers' personnel tried to provide the best service in a very short period of time. Also, all of them agreed that they received at least one talk about the importance of breastfeeding during the whole pregnancy period.

From this 70%, almost 40% of these women presented urinary and kidney infections during their pregnancy; they all expressed that during the antenatal checkups, the nurse sent them to make blood and urine test so in that way doctors could prescribe them the necessary medications to avoid any possible infection or disease that could affect their health or produce some obstetric complications during the delivery time. In addition, during the next antenatal checkups, due to the time constraint only some of nurses followed up their diseases, as doctors and nurses expressed before. In both countries, women said that the National Health Insurance covered all the tests and medications they needed. According to the regression models presented before, households living in urban areas generate better birth outcomes.

"Even though the doctors and nurses provided me with all the necessary vitamins and micronutrients, I believe that the attention was not as good as I was expecting. Because I was not satisfied with the service and it was really from home, I just went to one antenatal checkup because I did not want to spend more money on transportation, I have a big family that I need to take care. " (Avila 2015).

On the contrary, 30% of the women, attending the medical health centers in the rural areas (Health Centers "Santa Rosita," "Puerto Cortes" and "Materno Infantil" in Honduras and Health Centers "El Paraiso," "Nuevo Amanecer" and "La Trinidad" in Nicaragua), considered the antenatal care programs not as effective as they were expecting due to two reasons:

1) Time constraint: as mentioned before, the physician should perform the first antenatal checkup, which it should last between 40 to 45 minutes (MINSA 2008). Women who believed antenatal care was not effective, all of them told me that the doctor who was in charge of performing their first antenatal checkup, but the checkup only lasted 10 to 15 minutes. They all expressed that the first checkup was performed in a very fast way, where they did not even have time to ask questions or clarify doubts. Some of the women believed that they doctors not even took notes about their status when they were doing the checkups, especially in Nicaragua. From the second to the last antenatal checkup, it should last between 15 to 20 minutes. All of these women interviewed expressed that from the second antenatal checkup until the last one, the nurse was the only one performing it and it only lasted 5 minutes. Women believed it was not effective, especially because they did not have time to clarify doubts or receive the necessary indications that they must follow to take care of their lives and their babies' lives.

Even though the service was not as good as they were expecting, all these women received all the necessary vitamins, micronutrients and tetanus injections that they needed during their pregnancy period. As descriptive statistics previously explained, as well as Avila commented in this interview, most of the families living in rural areas usually have 3 or 4 children.

2) Necessary Nutrition: these women told me that they did not receive any important indications of how to keep a balance and healthy diet to take care of the themselves and their babies' nutrition condition. Due to the limited economic conditions, they were only able to eat whatever they could afford,

where most of the cases they did not as healthy as they should do it. As presented by Honduras and Nicaragua's database, wealth index is a very relevant variable in order to determine birth outcomes; therefore, as mention before, poorer households are the ones with highest percentages of malnourished children.

Due to the fact that my qualitative sample was randomly chosen, from my full sample, I found that 85% of the women had between 1 and 4 antenatal care checkups, 10% had more than 4 checkups, and 5% had none antenatal care. When asking the reasons why they did not attend to more than one checkup, 70% of them expressed that the health centers were not walking distance and they did not have enough money to spend on transportation. Women, from both rural and urban areas do not work; the husband or mother's partner was the only one working. On the other hand, 30% expressed that they did not attend to more checkups because they did not know the importance of the antenatal care. This 30% of women, besides of having a very low education level (some just finished primary school), there was not cultural habit to teach them about the effect that complete antenatal care can have on a child's health and postnatal growth. In addition, all of these women received

6.2.5 Household Controls

"I just finished primary school and after I got pregnant I couldn't keep studying. I just went to one antenatal checkup because I thought that was enough and I went after three months of pregnancy. I didn't go early because I didn't know it was necessary to go since the first month of the pregnancy."

The significant coefficient of mother's and mother's partner education in relation to the growth of the child is intuitive as explained in the regression. When interviewing the women, 80% of them have primary education as the highest education level, 15% have secondary education and only 5% have a higher education. According to the mother's partner education, 85% of them have primary education as the highest education level, 5% have secondary education and the rest 5% have higher education. Less educated parents is transformed in less parenting knowledge of how to monitor the growth of the child since the moment the fetus starts to grow inside the mother's womb. As presented in both regression models, mother's age coefficient is statistically significant at 1%. When I was doing the interviews I found that those mothers whom had their babies when they were 25 years old, during their first pregnancy, had not idea about the importance of having 4 antenatal checkups before delivering the baby. Therefore, some of them went to the health centers after three months of pregnancy and some others did not go to any antenatal checkup during the whole pregnancy, especially in the rural areas. By providing more counseling sessions to teenagers about family planning, contraceptive methods and the importance of antenatal care since the beginning of the pregnancy period, health centers will help to have better birth outcomes and reduce malnourished children under five years old.

While the role that antenatal care has on lastborn children malnutrition has been the guiding tool for the qualitative and quantitative analysis, its inability to account for the first births outcomes must be outlined.

Chapter 7
Final Thoughts and Conclusions

This study has meant to focus on the role of antenatal care as a way to tackle undernourishment among under five years old children. Referring to the literature presented, antenatal care is considered a significant factor affecting children's health and postnatal growth. This study presents many variables that are directly associated with malnutrition among children, where policy-making are very limited. As early mentioned, this study does not present any deep analysis in order to identify antenatal care variables and children undernourishment as a possible causality. However, similar arrays where found within and between Honduras' and Nicaragua's current living and economic conditions, which give us a good perspective where these policy-making should be addressed.

Chronic children malnutrition has been always been a relevant issue affecting Latin American countries' economies. Even though, Honduras and Nicaragua are positioned as second and third place of countries with the highest number of stunted children in the Central American region, this chronic malnutrition not only affects children's health condition during their childhood, but it also impacts the economic progress of a country. Therefore, policy makers should prioritize children malnutrition and work in favor of reducing it.

Based on the main variables analyzed through this study, complete antenatal care does not have any effect on children malnutrition in both countries, which was an unexpected result given the medical's perspective that complete antenatal care can be translated into better birth outcomes. Nevertheless, the results of these studies showed that socioeconomic conditions and parents' education came to play an important factor in determining child malnutrition in both countries, making the role of antenatal care less relevant than expected.

Firstly, socioeconomic factors not only determines household living conditions and quality of antenatal care service, but they also determine the place where the family resides, which is directly related to the child's height. Women from urban areas receive better antenatal care service, which is translated into better birth outcomes and less undernourishment among infants. Better antenatal care means health centers with more professional personnel, better infrastructure conditions in order to facilitate women easy access to health centers. However, even though policy makers make efforts to improve antenatal care programs, they have to take in consideration important aspects of the society such as indigenous communities. In Honduras, policy makers must understand that the mentality, traditions and living conditions of indigenous people sometimes does not align with policy interventions; therefore, some of these policies could not be successful achieved.

Secondly, parents' with low education level (primary and secondary school) have less knowledge about how parenting, breastfeeding and keeping a balance and nutritional diet for the infant; therefore, families coming from indigenous background, in the case of Honduras, also influences in the growth of their children. Few decades ago, indigenous communities used to eat fruits and animals that they hunted but due to many environmental changes and insufficient nutritional knowledge, they started to feed their children with food made from flour and sugar, not health at all (BBC Mundo 2011).

Besides socioeconomic factors and maternal education, the age of the mother and genetic factors, such as height, are also main aspects to explain children malnutrition inequalities in Honduras and Nicaragua. Children coming from taller and more experienced mothers are healthier compared to those children coming from younger and shorter mothers.

Based on the literature review and the qualitative and quantitative limited findings, it is possible to see the role that complete antenatal care has on reducing children malnutrition inequalities in Honduras and Nicaragua. As previously mentioned, both governments have signed agreements against the scourge of hunger and malnutrition in order to improve the health and nutritional status of children. Taking this as an initial step, further research should focus more on the ways nutrition programs can help to reduce malnutrition. In order to this, small samples of follow-up children's data should be taken in order to see and understand the effect that nutrition programs can have on children's health and growth, where empirical evidence should also be taken in consideration.

In conclusion, antenatal care seems to be more relevant to determine child's health on developed countries, where quality of care is equally provided to all members of the society and income discrepancies are lower than those presented in developing countries. Together, these results indicate that reducing malnutrition inequalities in Honduras and Nicaragua seems to be a very challenging task. Even though policy makers concentrate their efforts on improving antenatal care programs, genetic factors and wealth conditions seem to be more related with child's health and postnatal growth. Therefore, income discrepancies should be overcome first to consider antenatal care as policy tool to reduce children malnutrition.

"Good nutrition is the cornerstone of the survival, health, and development of current and future generations"(The World Bank 2006, p.1).

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APPENDICE A: Qualitatitave Research Questions

<u>**Medical Staff Members Interview Questions:**</u>

1) Do you know all the guidelines in order to provide an ideal antenatal care to pregnant women? Do you have the guidelines accessible in each one of the Antenatal Care Department Offices?
2) Have you been trained to provide an effective and efficient antenatal care?
3) When is the correct time for a pregnant woman to start her antenatal care checkups?
4) How many antenatal care checkups does the mother need to have before giving birth?
5) Do you know the reasons why pregnant women do not finish their antenatal care program?
6) Is the antenatal care program an optional decision for the women? How is the antenatal care program introduced to the pregnant women?
7) What kind of vitamins and micronutrients does the medical health centers give to the women?
8) Why do you consider the age as an important factor the pregnancy of the women?
9) What are some of the main diseases that can be transfer to the baby during the pregnancy period and can affect the growth of the newborn?
10) During the antenatal care checkups, do you advice pregnant women about the importance of having a balance diet in order to avoid malnourished or low birth children?
11) How is the postnatal care being carried out? Do you think it is successful in order to take care of the mother and baby's health after the delivery time?

<u>**Pregnant Women Interview Questions:**</u>

1) How was the prenatal care service in the Medical Health Center during your pregnancy period?
2) Who was the person in charge of performing the prenatal care in the first checkup and after the first checkup?
3) How many prenatal care checkups did you have you during the pregnancy period? What are the main reasons you did not have a complete antenatal care?
4) How long did each prenatal care checkups last? Did they provide you with a comfortable environment for you to ask questions or doubts about general or specific indications being told by they physician?
5) What medicines did the physician require you to take during the pregnant period?
6) Did the medical health centers provide you with all the medicines required?
7) Did the medical health centers advise you with the necessary diet you must take during the pregnancy period?
8) Did you have a source of drinking water in your house?

9) If you suffered any type of illness during your pregnancy, did the physician follow up with you during prenatal care?
10) During the prenatal appointments, did they physician provide you with enough information about the importance of breastfeeding?
11) After giving birth, did you receive a very effective postnatal care? What kind of instructions did you receive from the physician during the postnatal care?
12) Do you live with your husband or partner? What is your and your partner level of education?

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