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Faculty of Social Sciences

Institute of Economic Studies

BACHELOR THESIS

How the Composition of Siblings Affects Child Health Quality

Author: **Dominika Šubáková**

Supervisor: **PhDr. Julie Chytilová Ph.D.**

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Declaration of Authorship

I hereby declare that I compiled this thesis independently, using only the listed resources and literature.

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Prague, July 31, 2013

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Bibliography

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Abstract

The core of the presented bachelor thesis is to determine the effects of sibling's composition on child health quality. The first part of the thesis is focused on the microeconomic description of Model of Human Capital Investment, the Gender-Specific Model in particular. Also other findings and the health system of the examined countries are presented. In the second part, based on the findings from the theoretical model, three hypotheses are stated. Methodology is explained and econometric model is presented. How the gender, ratio of sisters and birth order affect health of children are subsequently tested for chosen Asian countries, namely, Bangladesh, India and Nepal. The last part is devoted to the description of empirical results and the occurred differences are discussed. The sibling's composition has shown to be an influential factor, mainly gender and ratio of sisters.

Key words

child health, sibling structure, allocation of household resources, human capital investment

Abstrakt

Cieľom prezentovanej bakalárskej práce je zistiť ako štruktúra súrodencov vplýva na zdravie dieťaťa. V prvej časti sa venujem teoretickému opisu mikroekonomického modelu investícií do ľudského kapitálu a to najmä varianty, ktorá sa zaoberá pohlavím. V tejto kapitole uvádzam taktiež ďalšie zistenia a prezentujem zdravotný systém skúmaných krajín. V druhej časti prezentovanej práce sú uvedené tri hlavné hypotézy na základe teoretických zistení. Metodológia a ekonometrický model sú podrobne vysvetlené. Následne je empiricky testované ako pohlavie, pomer sestier a poradie narodenia ovplyvňujú zdravie dieťaťa. Pre výskum som zvolila tri ázijské krajiny a to Bangladéš, Indiu a Nepál. V neposlednom rade sa venujem výsledkom z empirických štúdií. V závere sú diskutované vzniknuté rozdiely medzi premennými a taktiež medzi krajinami. Štruktúra súrodencov sa ukázala ako faktor, ktorý do istej miery zdravie dieťaťa ovplyvňuje a to najmä pohlavie a pomer sestier v rodine.

Kľúčové slová

zdravie dieťaťa, štruktúra súrodencov, alokácia zdrojov v domácnosti, investície do ľudského kapitálu

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Acronyms

AIDS Acquired Immune Deficiency Syndrome

DHS Demographic and Health Survey

GDP Gross Domestic Product

GNI Gross National Income

H Human Capital

HIV Human Immunodeficiency Virus

RSBI Rashtriya Swasthya Bima Yojana

NRHM National Rural Health Mission

MDG Millennium Development Goals

PPP Purchasing Power Parity

SD Standard Deviation

USAID United States Agency for International Development

WHO World Health Organization

Bachelor Thesis Proposal

Author	Dominika Šubáková
Supervisor	PhDr. Julie Chytilová Ph.D.
Proposed topic	How the Composition of Siblings Affects Child Health Quality

Topic characteristics What determines child health, namely mortality, nutrition and medical treatment received, is an important question in developing countries, since it indicates current socio-economic welfare. It is known that family structure affects health. The aim of the present bachelor thesis is to determine the effects of sibling's composition on child health quality. The role of gender, age, birth order, number of siblings (sisters and brothers might show significantly different results) and other explanatory variables effect on health and child mortality within the family will be examined. The core of the thesis will be an empirical study of chosen Asian countries using data from the Demographic and Health Survey. For these analyses, the Probit regression model will be used. Within the results, chosen countries will be compared, and the occurring differences will be explained.

Hypotheses At this early stage of research, there are several questions that might come up. The most important of them are:

1. How the gender affects health of the child?
2. How the number of sisters affects health of the child?
3. How the birth order affects health of the child?

Methodology Probit regression model

Outline

1. Introduction
2. Background
3. Countries Overview
4. Data and Methodology
5. Empirical Results
6. Summary
7. Conclusion

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Author

Supervisor

Chapter 1

Introduction

"The world needs a global health guardian, a custodian of values, a protector and defender of health, including the right to health."

Dr Margaret Chan, Director-General, WHO

Health is one of the basic rights of every human being, based on the WHO Constitution: *"the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being..."*. The rights as providing healthcare, sanitation, immunization, free access to safe water and others are essential. However, not in every part of the world people have these rights ensured. In 2000, countries participating in the United Nation Development Programme promised to fight against extreme poverty and other implications related thereto. The Millennium Development Goals for 2015 were created. Improving health and promoting gender equalities are one of the main objectives of the MDG, namely, *Goal 3: Promote gender equality and empower women*, *Goal 4: Reduce child mortality*, and *Goal 6: Combat HIV/AIDS, malaria and other diseases* [United Nation, 2000]. Questions related to health and gender inequalities are one of the main issues in developing economics. Therefore, they will be discussed in detail.

The core of the presented thesis is to determine the effects of sibling's composition on child health quality. Discriminatory behaviour to females was often found in the less developed countries. The gender, birth order, number of female or male siblings could play a considerable role in providing healthcare.

Male children are often preferred by parents, mainly in countries where dowry or bride wealth is expected to be paid for daughters and the cost of the female child becomes higher than cost of the male child. The present study examines the occurrence of such discriminatory behaviour from the family or society. A large amount of researchers focused on these problems, particularly gender differences within health or education, but only few of them examined composition of siblings. In case of the exploring health, researchers used to employ econometric tools with nutritional status as explained variable. This thesis will follow these methods, moreover it will provide a research on the received medical treatment and acute morbidity as well. These additional issues are rarely examined and this thesis can bring new acquaintance. The empirical research will be applied on countries in south Asia, namely, Bangladesh, India and Nepal.

The thesis is structured as follows. In chapter 2, the theoretical dimensions of the research will be presented. Firstly, the microeconomic description of Becker's Model of Human Capital Investment (2.1) will be introduced. In addition, the Gender-Specific Model will be defined (2.2). Empirical studies of the others researches will be presented in the section 2.3. The measure of human capital (2.4), health in particular will be explained. Chapter 3 focuses on the examined countries overview. In the first part of this chapter (3.1), health system of each of the analysed countries will be described. Econometric background, Data and Methodology will be presented in chapter 4. Firstly, the data from DHS will be introduced in section 4.1 and the following section focuses on description of the variables (4.2) which will be used in the models. The general probit model will be presented in part 4.3 and three main hypotheses will be stated. Lastly in this chapter, the particular models will be introduced. Chapter 5 includes all the empirical results from the econometric research. The hypotheses presented in the previous section will be discussed. The other observations which are not directly linked to the composition of siblings, will be mentioned in last section. Towards the end, these results will be compared and close look at the differences amongst the countries in more depth, will be provided. Chapter 6 summarizes theory and empirical findings. Last, but not least, the Conclusion contains the most relevant results. The Appendix includes complete results in detail from the econometric regressions.

Chapter 2

Background

Poverty is one of the main problems in developing countries. Children from parents with lower incomes are often disadvantaged. One question that needs to be asked by parents is how to optimally invest in the human capital of their children. They must rationally allocate time and funds to each of their children. Thus siblings often become rivals, even without there being discriminatory behaviour from the family. This issue of allocating human capital investment is currently being examined not just with regards to economic sector, but also within the spheres of psychology and sociology. This chapter begins by laying out the theoretical dimensions of the research, looks at how the Becker's model of human capital investment works and what the implications are. In addition, a gender-specific model will be defined. According to this theoretical model, a hypotheses will be made and tested in the next chapter. Lastly, a look into the other factors surrounding this topic will be taken, with an explanation of how to measure the health, what is one of the indicators reflected human capital.

2.1 Model of Human Capital Investment

Neoclassical economist Gary S. Becker was one of the first who analysed the allocation of human capital investment. Becker, along with other economists, produced the elementary theoretical model, which explained decisions made within a household and the subsequent allocation of resources. There exist different variations of the model, but the main idea remains unchanged. The core concept of this model is related to the decisions made by parents, and asks question, "When is it best to invest in their child?" This includes deciding matters such as when to send children to the school or give them necessary medical treatment.

Before the model can be used effectively, some basic assumptions need to be fulfilled. Of these include: the household in question is limited by budget constraints (otherwise parents could invest until the return of the investment is the same as interest rate on the capital market and then the decision does not depend on the size of family - quantity of children). A second assumption to be made is that the household cannot borrow from the capital market (without imperfection on the capital market, parents could use loans to invest into their children). Other assumptions made by Becker and Thomas [1976] are that parents maximize resources of all the family first, then distribute it according to their preferences. The model explains why quantity and quality of the children is one of the most important commodities. Becker and Lewis [1973] recognized that with increasing quantity of children, the cost of the quality of children increases, and vice versa.

Among the implications of this model are: If we consider the household budget constraints, there is negative effect on all the children. Child born into the family with greater number of siblings will be invested in less, due to family income needing to be divided between more family members. Other important implication to consider is that into advantaged children will be invested in more [Becker, 1991]. In societies where pro-male prejudices exist, the siblings with a higher number of sisters will benefit more, than siblings with a higher number of brothers.

Other economists found similar conclusions. Behrman [1982] found that the advantages of having relatively more sisters will be diminished, when there is positive effect in the production of human capital inside the family. Also, it can be reduced if family invests fairly in all their children. In case the outcome is equalized across all children, the children gain when a high return child replaces a low return child.

2.2 A Gender-Specific Model of Human Capital Investment

Harold Alderman and Paul Gertler[1997] also analysed a model of human capital investment, specifically they studied variances in health care of children. They examined how the gender differences bias human capital allocation across different levels of household resources. Empirical studies were provided for the demand for children's medical care in rural Pakistan. This thesis will follow their model in exact form and show the theoretical explanation of parents decision in the allocation of resources. Following on from this, the data gathered from the countries within South Asia will be applied for the empirical study.

Alderman and Gertler assume two periods in their model, where in the first period parents work and in the second period they retire. Consumption in the first period is income without parent's human capital investments into their children. Consumption in the second period depends on the children's wealth, although this is dependent on the human capital invested into them in the first period. Parents decide the consumption and wealth of children. They need to trade-off between present and future consumption and their children's wealth. For simplicity, we will consider a family with two children, each of them being a different gender. We establish the market incentives and parent's preferences by allowing to remittance rates, return and marginal utility of children's human capital differ by sex. Then, parents utility function is in the following form:

$$U = F(C_1) + G(C_2, W_m, W_f) \tag{2.1}$$

where C_1 is consumption in the first period
C_2 is consumption in the second period
W_m is wealth of the male child
W_f is wealth of the female child

Assuming no preferences among gender. Theoretically this means:
$\frac{\partial G}{\partial W_m} = \frac{\partial G}{\partial W_f}$ and $\frac{\partial^2 G}{\partial W_m \partial W_f} = \frac{\partial^2 G}{\partial W_f \partial W_m}$ where $W_m = W_f$.

It is assumed that parent's second period consumption is given by transfers from their children. Mathematically, we can rewrite the consumption in the second period as:

$$C_2 = \beta W_m + \tau W_f \tag{2.2}$$

where
β is the rate of transfer per one wealth unit for a male child
τ is the rate of transfer per one wealth unit for a female child

The works of Alderman previously mentioned τ can even be negative, for example if we count the expenses for daughter's marriage, parents often need to provide a dowry. Children's wealth depends on their human capital:

$$W_m = r_m H_m, W_f = r_f H_f \tag{2.3}$$

where
r_m is a return of investment in human capital for male
r_f is a return of investment in human capital for female

If we add to this the family budget constraint, the equation is following:

$$Y = C_1 + P(H_m + H_f) \tag{2.4}$$

where
P is price of human capital
Y is family income

Parents need to choose H_m and H_f to maximize their utility function. If we substitute consumption and wealth into the utility function (2.1) by equations (2.2), (2.3) and (2.4), we obtain the following maximization problem:

$$max H_m, H_f = F[Y - P(H_m + H_f)] + G[(\beta r_m H_m + \tau r_f H_f), r_m H_m, r_f H_f] \tag{2.5}$$

Then, the first order conditions are following:

$$\frac{\partial F}{\partial C_1} P = \frac{\partial G}{\partial C_2} \beta r_m + \frac{\partial G}{\partial W_m} r_m \tag{2.6}$$

and

$$\frac{\partial F}{\partial C_1} P = \frac{\partial G}{\partial C_2} \tau r_f + \frac{\partial G}{\partial W_f} r_f \tag{2.7}$$

In the first order conditions is captured that parents invest into their children to the point where marginal cost of today equals the marginal benefit of tomorrow. So far, the implications of gender differences have not been discussed. Assuming there are pro-male preferences, the return of the boy's human capital is greater than girl's return of human capital, which means $r_m > r_f$. When parents prefer to invest into the boy, remittance rate of boys is greater than the one of girls, $\beta > \tau$ and parents expect greater wealth to be obtained by their son than they do their daughter, $\frac{\partial G}{\partial W_m} > \frac{\partial G}{\partial W_f}$.
Marginal cost, which is what is shown in the left part of these equations (2.6) and (2.7) is the same. Parents invest human capital into the boy and the girl to the point where marginal benefit of human capital belonging to the boy is equal to the girl's marginal benefit of human capital:

$$\frac{\partial G}{\partial C_2}\beta r_m + \frac{\partial G}{\partial W_m} r_m = \frac{\partial G}{\partial C_2}\tau r_f + \frac{\partial G}{\partial W_f} r_f \tag{2.8}$$

At the same amount of human capital, the left part of the equation will be greater than right part of equation, because $r_m > r_f$. Marginal benefit functions are decreasing in H (human capital), thus, the equation (2.8) remains in the point where $H_m > H_f$. When $\frac{\partial G}{\partial W_m} > \frac{\partial G}{\partial W_f}$ or $\beta > \tau$ marginal benefit of the boy's human capital is greater than marginal benefit of the girl at the same level of human capital. In line with this argument, investment in the boy will be greater than investment in the girl.

Empirical results based on the data from Pakistan [Harold Alderman and Paul Gertler, 1997] are consistent with the theoretical model presented above. There was found higher probability of taking son to the doctor than taking daughter. This difference is greater across lower income population. Older boys received medical treatment more often than younger children. The same results are for boys with just female siblings. They researched further remaining doubts, including whether the allocation of the human capital changes with an increase of price of human capital or when there is an increase of family wealth. The following results were found that families with higher income are more likely to look for a medical care in case their child is sick. There was found a higher price and income elasticity of investments in girl's human capital, compared to that of the boy's human capital. Marginal benefit of the boy decrease faster in H. These results lead to the conclusion that with an increase in income, there is a higher investment in human capital for girls than there is for boys. On the contrary, an increase in the price of human capital leads to a decrease in investment into the girl in a lower income family more than that seen in a family with a greater income. The gender differences can be dismissed by the arise of the income. This holds true specially among the poor.

2.3 Other Findings

A similar research was carried out for Ghana by A. Garg and J. Morduch [1998], where again the key assumption to make is that there is imperfection within the capital and labour markets, in which case parents cannot borrow to pay for the human capital of their children. In such a situation children "fight" for resources in the household. The findings and conclusions are similar to those found in rural Pakistan. The findings showed a gender gap and a figure of almost 40% better health indicators if the child has all female siblings, as opposed to the child with all male siblings. Rohini P. Pande [2003] analysed the role of the gender composition within siblings in rural India. He focused on child immunization and nutrition and discovered strong preferences towards sons, more to those who had been mainly born after multiple daughters.

Strauss and Thomas [Berhman, 1995] found that investments may differ not only in sons and daughters, but also due to birth order and biological factors or behavioural influence. For biological reasons first born children used to have lower birth weights. From the psychological point of view, there are some interesting observations, parents used to either favour the first born child or their youngest. Part of this can reflect the future expected returns. Similar results brought research by Susan McHale [2008]. She accomplished research about children's received medical treatment. The differences between mother and father medical care of their first born, second born and school-age child. This research into birth order was also examined by Black, Devereux and Salvanes [2005]. They focused on the birth order and family size and the influence this had on a child's education. Strong negative effect was found on children education with higher birth order. Birdsall [1979, 1991] analysed the impact of birth order on school's enrolment in urban Columbia, considering also the effects of family size, whether or not the mother works and household income. This showed a connection with a higher schooling attendance for the youngest and oldest siblings from a families in which there are three children and a non-working mother. There were also several other studies which focused on this problem in Taiwan by Parish and Willis [1993].

J. Moduch [2000] analysed sibling's composition versus education, including specifically school enrolment. There was found to be a positive association in having a sister and in school enrolment in Tanzania. Also, other authors focused on this problem. One of whom was Edmonds [2005] who did research about children's work and empirical studies in Nepal. He discovered that if there is an existence of domestic production, age layout and gender can play an important role and influence the supply for children's work. He found that the older sibling works more, because he has a comparative advantage in domestic production. Dalton Conley [2000] examined educational attainment connect with siblings, as well. There was found damaging effects on education for the child with the increase of siblings of the opposite gender.

Judith Blake [1981] accomplished family size, number of children - quantity and quality of children, in particular. Empirical studies were provided in America and the results are not surprising. The greater number of children, the lower quality of the child. A special part of this analyses were among adolescent boys, where with higher number of siblings, a strong negative effect on the education was found.

2.4 Measurement of Health

Over past few decades human capital has been measured not only by schooling and the highest grades achieved, but also by important multidimensional health. One of the most important health indicators is mortality, since this is easy to obtain. The other option for how to capture morbidity, is through examining an acute illness such as diarrhoea or fever, among others. Diarrhoea is one of the main causes of death of children under the age of five. The problem of this measurement can be their short-run consequences [Behrman, 1995]. On the other hand, if our aim is to examine decisions made within households, in the case of child illness, we can observe direct parental decision when a child is sent by his or her parents to hospital for treatment. Recently used, recommended by the World Health Organization (WHO) is to measure according to nutritional status.

Up to now, various methods have been developed and introduced to measure nutritional status. Based on Onis M's paper [2000] nutritional status can be assessed using clinical signs, biochemical indicators or anthropometry. Clinical and biochemical indicators are useful in more advanced cases of malnutrition. The most common tool employed is the anthropometric indicator, which is non-invasive, economical and easy to obtain. For these reasons, this has the advantage over biochemical or clinical indicators. There is also a lower probability of errors, because measurements are provided by data-collecting organizations. Anthropometric indicators consist of children's height, weight and age. Namely weight-for-height, height-for-age and weight-for-age. These are expressed in form of Z-score or standard deviation, which compare a child, or a group of children, to the reference population [Eyob Zere, Diane McIntyre, 2003]. The formula for Height-for-age Z-score takes the following form:

$$Z - score = \frac{H_i - H_r}{SD\ of\ the\ reference\ population}$$

where the H_i is the height of the i child (measured value); H_r is the median height (average value) in the reference population and SD is standard deviation of height of the reference population.

According to WHO, the malnutrition is defined as following:

(a) *stunting*: There is a difference between *severely* and *moderate stunting*. Child is severely stunting if height-for-age z-score is less than minus three standard deviation bellow the mean of the WHO international reference standards. Moderate stunting is a child whose value of height-for-age z-score is between -2 and -2,99 standard deviation bellow the mean of the WHO international reference standards.

(b) *wasting*: There is a difference between *severely* and *moderate wasting*. Child is severely wasting if weight-for-height z-score is less than minus three standard deviation bellow the mean of the WHO international reference standards. Moderate wasting is a child whose value of weight-for-height z-score is between -2 and -2,99 standard deviation bellow the mean of the WHO international reference standards.

(c) *underweight*: There is a difference between *severely* and *moderate underweight*. Child is severely underweight if weight-for-age z-score is less than minus three standard deviation bellow the mean of the WHO international reference standards. Moderate underweight is a child whose value of weight-for-age z-score is between -2 and -2,99 standard deviation bellow the mean of the WHO international reference standards.

Stunting and wasting are preferred to underweight, because they distinguish between long-standing and short-run malnutrition. Underweight does not distinguish between time, which can be problematic in its interpretation. The stunting is not sensitive to temporary changes. In contrast, the wasting reflects the current malnutrition.

In the presented thesis, firstly, the *Stunting* expressed by height-for-age will be examined, which has been used as well in the majority of the works referred to. The acute morbidity captured by disease *Diarrhoea* will be analysed. The last used variable is *Receive Medical Treatment* in case of child's illness. This issue will be discussed more closely in the Chapter Data and Methodology.

Chapter 3

Countries Overview

Before the methodology will be provided, the situation in the countries studied will be analysed. For research a countries, where in recent decades the dowry and bride's wealth has risen, are chosen. This practice can play an important role in parent's preferences with regards to their children, resulting, in some instances, in daughters being at considerable disadvantage, as we have already seen in the previous chapter. In India in recent years, there has been an increasing amount of literature focused on this problem. I intend to follow this research and adding to this, research for Nepal and Bangladesh, since, until now, these have been examined far less. The Health system in each of the countries will be examined, health financial system in particular.

3.1 Health System

The examined countries are located close to each other in the south of Asia. According to the World Bank all of them are from low middle income countries. The close look at the health system, which is comparable in each of the countries, will be provided. The health care and services do not have the same level as required by the international standards, in the main, access to hospitals and health centres in rural parts of these countries could cause large problems. The level of health services in urban areas is adequate to countries in south Asia comparing to generally very poor rural areas. Information used in this section regarding gross national income per capita (GNI), respectively purchasing power parity (PPP) in international dollar are freely available from World Bank datasets[1]. Information about health financing is available from World Health Organization datasets[2]. The main indicator of the health financing system is expressed by the ratio of private and public expenses on health.

3.1.1 Bangladesh

This country has population of over 148.5 million with GNI per capita 1.940 dollars. The total expenditure on health per capita is 67 dollar and the total expenditure on health as a percentage of GDP is 3.7. The volume of the health expenses are financed trough out-of-pocket by private resources, two-thirds actually. The rest of the expenses are financed by government and international development assistance. The Table 3.1 bellow shows the ratio of health expenses in Bangladesh in 2011, which gives us a clearer understanding of the weight of public and private spending in health expenditures. In the table we can see all of the core indicators of the health financing system. Government expenditures are twice less than that of private expenditures. We can deduce implication that people are willing to pay for better health care. On the other hand, low income units are also forced to pay for health care, which causes problems. The government have tried to improve inequalities in health care. The health policy followed in 1998 - 2003 was the initial *Health and Population Sector Programme* and in 2003 the *Health, Nutrition and Population Sector Programme* was then extended. The program should increase the effectiveness and efficiency of hospital services and nutritional status, whilst decreasing maternal mortality rate, injuries and diseases. Between 2000 - 2001 the government has been taking steps towards improve PHC services by building community clinics for rural populations. They are lead by the Community Clinic Management Group.

[1]information reached at http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD
[2]information reached at http://www.who.int/countries/

Table 3.1: Health Financing - Bangladesh

Bangladesh 2011	
Private prepaid plans as a percentage of private expenditure on health	0.3
General government expenditure on health as a percentage of total government expenditure	8.9
External resources for health as a percentage of total expenditure on health	6.6
Social security expenditure on health as a percentage of general government expenditure on health	0
Out-of-pocket expenditure as a percentage of private expenditure on health	96.6
Total expenditure on health as a percentage of gross domestic product	3.7
Private expenditure on health as a percentage of total expenditure on health	63.4
General government expenditure on health as a percentage of total expenditure on health	36.6

Source: WHO, 2011

3.1.2 India

The biggest country examined has the population of over 1.22 billion. The gross national income per capita (PPP international dollar) is 3.590. India is one of the largest economies in the world. This country has great opportunity for growth. However, the majority of India's population live under the poverty line mainly in the rural part of the country. The total expenditure on health is 141 dollars per capita and the total expenditure on health as a percentage of GDP is 3.9. The majority of the health care is part of the private sector, the rest is under the government. Similarly to Bangladesh the majority of the private sector consists of Out-of-pocket resources, exactly 86 %. Compared with the other two countries, India has some percentage in social security expenditure on health, precisely 16 %. For more information and better understanding of weight of public and private spending in health expenditures, see the following Table 3.2. Country has two main health policy programs, namely the *National rural Health Mission* (NRHM) and *Rashtriya Swasthya Bima Yojana* (RSBY) insurgence program under the Ministry of Labour and Employment, the program RSBY covers mainly people under the poverty line. NRHM program is led by Ministry of Health and Family Welfare, the core aim of the program is to better manage the health services in public facilities.

Table 3.2: Health Financing - India

India 2011	
Private prepaid plans as a percentage of private expenditure on health	4.7
General government expenditure on health as a percentage of total government expenditure	8.1
External resources for health as a percentage of total expenditure on health	1
Social security expenditure on health as a percentage of general government expenditure on health	16
Out-of-pocket expenditure as a percentage of private expenditure on health	86
Total expenditure on health as a percentage of gross domestic product	3.9
Private expenditure on health as a percentage of total expenditure on health	69
General government expenditure on health as a percentage of total expenditure on health	31

Source: WHO, 2011

3.1.3 Nepal

Relatively small country has population almost 30 million, GNI per capita (PPP international dollar) is 1.250. The total expenditure on health per capita is 68 dollars and the total expenditure on health as percentage of GDP is 5.5. The private expenditure on health is primarily as well as before. The 90 % of private resources are out-of-pocket. The table 3.3 refers in more detail to information regarding ratio of public and private spending on health. Due to the location of the central Himalayas, almost 80% of the population live in the rural areas of these countries. Access to medical centres in the mountains is not easy and makes it difficult for those who live there. Various measures of health policy have already been taken. The main elements of this framework started by the *Health Policy Plan* in 1991, where pact covers primarily built better conditions for rural parts through an improvement in the health infrastructure, in community participation and in local health management. The priority is to see a reduction in infant and child mortality. The *Second Long-*

Term Health Plan (1997 - 2017) includes an improvement in women and child status, in the rural population and among poor. Also included in the plan is the improvement of efficiency through redirection of resources from hight-cost and low-impact essentials to low-cost and hight-impact intervention of health care services. The following strategies were extended to this Second Long-Term Health Plan and they follow it.

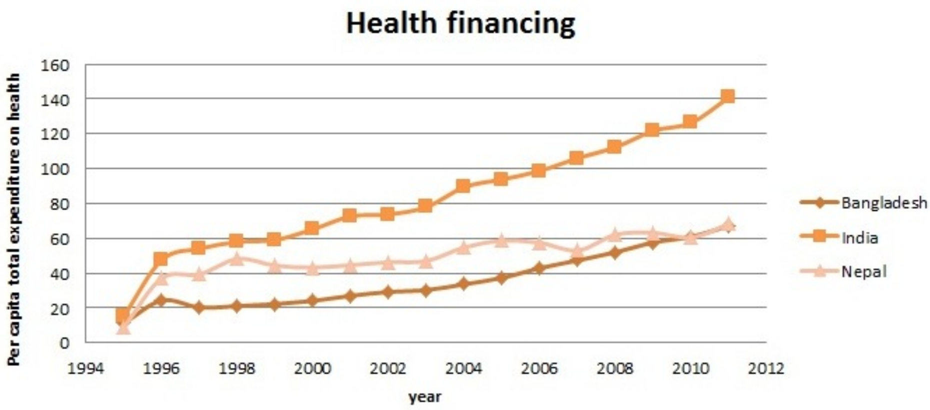
Table 3.3: Health Financing - Nepal

Nepal 2011	
Private prepaid plans as a percentage of private expenditure on health	0.2
General government expenditure on health as a percentage of total government expenditure	9.6
External resources for health as a percentage of total expenditure on health	14.6
Social security expenditure on health as a percentage of general government expenditure on health	4
Out-of-pocket expenditure as a percentage of private expenditure on health	90.4
Total expenditure on health as a percentage of gross domestic product	5.4
Private expenditure on health as a percentage of total expenditure on health	60.7
General government expenditure on health as a percentage of total expenditure on health	39.3

Source: WHO, 2011

To sum up the Health Financing, we can see that the ratios between public and private spending is quite similar in all of the observed countries. Over 60 % of the expenditures are financed by out-of-pocket private resources, the rest by the government.

Figure 3.1: Health Financing



Source: WHO, 2010

The Figure 3.1 reflects total health expenditure over 15 years in all the examined countries. There is increasing trend in Health Financing. Whereas on the x axis is captured progress in years 1995 - 2011, on the y axis is per capita total expenditure on health expressed in PPP international dollar, which is the base indicator of the health financing system. It is measured as a sum of expenses on the agents and funds for purchasing health goods and services [WHO-World Bank, 2000]. All the countries in 1995 were at the same level of around 10-15, but over the decade we can see moderate growth, where Bangladesh and Nepal are on the same level of around 70, and India, at a level of twice this figure.

The following Table 3.4 reflects the health infrastructure for each of the countries for total density per 100 000 population. The first variable *Heath Posts* is the number of health posts within either public and private sectors. Under health posts we can understand community centres or health environments with limited beds with care by heath workers or nurses. The second variable *Health Centers* is the number of health centres public and private sectors. The next variables in the table are number of rural or district hospitals and the number of provincial hospitals either public and private sectors. The last one is number of specialized hospitals, which can be regional or research hospitals or National Institutes in the public and private sector [WHO Medical devices, 2010].

Table 3.4: Health Facilities

	Total density per 100 000 population				
country	Health Posts	Health Centrers	Rural/ District Hospitals	Provincial Hospitals	Specialized Hospitals
Bangladesh	6.54	0.02	0.04	0.09	0.05
India	3.14	0.87	0.37	0.09	0.10
Nepal	2.33	0.67	0.22	0.10	0.04

Source: WHO, 2010

As mentioned before, the health care and services do not have the same level as required by the international standards. The majority of the items reach value bellow 1 hospital or health center per 100 000 population. The highest number *Health Posts* has a Bangladesh, on contrary Nepal has this number the lowest.

Chapter 4

Data and Methodology

4.1 Data

Data from Demographic and Health Survey (DHS) for 3 south Asia countries will be used in our analyses, namely Bangladesh, India and Nepal. DHS collects data from the countries participated in the MEASURE DHS program. The MEASURE DHS project[1] is funded by the U.S. Agency for International Development (USAID). Surveys are supported by the contributions from other donors and funds from participating countries, as well. The project is conducted by ICF International. Complete information about situation in the country is provided for better understanding of health and population trends in developing countries. I will use Standard DHS Survey, which offers information about child health what is needed for our analyses. Data were collected by filling the Questionnaire Modules. There are three types of questionnaires: Household questionnaire, Women's questionnaire and Men's questionnaire. Data for children are collected from in Women's questionnaire where detail information were obtained asking women about all children living in the same household.

The data for Bangladesh were collected in July 2011 - December 2011 by National Institute of Population Research and Training (NIPORT) and Mitra and Associates of Dhaka, for India in November 2005 - August 2006 by International Institute for Population Sciences - Mumbai and for Nepal in January 2011 - June 2011 by New ERA. The data were gathered for 17141 households in Bangladesh, for 109041 households in India and for 10826 households in Nepal ensuring sufficient number of observations. Before using data in analysis it was

[1] information reached at http://www.measuredhs.com/Who-We-Are/About-Us.cfm

necessary clear to datasets from unobserved data and missing observations. The last of the examined variable is *Received Medical Treatment*. Unfortunately, this variable has a lot missing and incorrect observations and regression needed to be control by "sick" children. After cleaning the dataset from these unobserved variables and "healthy" children, 395 observations were obtained for Bangladesh, 4440 observation for India and 341 observations for Nepal. Therefore, this variable can be problematic, because a huge amount of outage observations. Therefore, obtained amount of observations do not need to be sufficient. Despite incomplete dataset, the analysis for this variable will be provided.

4.2 Description of Variables

The Table 4.1 bellow contains list of all variables, explanatory and explained, which are used in my analyses. As mentioned in the second chapter, variables *Stunting, Diarrhoea* and *Received Medical Treatment* will be used as the explained variables. They reflect child health, respectively human capital of the child. The variable *Stunting* was created to be a binary variable with values 1 if the child was even moderate or severely stunting, this means that the value of their z-score of height-for-age is bellow -2 SD mean of the WHO international reference standards, and 0 if the child is not stunting. *Diarrhoea* has been chosen, because it reflects acute child morbidity, takes value 1 and 0. This variable originally took three values 1 if child was ill within the last 24 hours, 2 if child was ill within last two weeks (excluding last 24 hours) and 0 otherwise. In presented models, as mentioned variable takes value 1 if child was ill within the last two weeks including the last 24 hours and 0 otherwise. The variable *Received Medical Treatment* takes value 1, if the child received medical treatment by taking him to hospital or other health facilities, and 0 otherwise. However, the regression need to be controlled and we need to take in consideration only sick children. Otherwise, there could be some ambiguity in interpreting its meaning. The fact that a child did not get the medical treatment does not necessarily have to mean the child was not ill. Since these variables are binary taking values 0 or 1, Probit model is used. The emphasis will be given to sign of explanatory variables and their significance for models and the marginal effects will be used for interpretation.

As independent variables in the first model will be used just exogenous variables. Use of exogenous variables is important as they can not be influenced by respondents. Namely, we employ that *Gender* takes value 1 if the child is female and 0 if the child is male. The regression needs to be control by *Age*, children were divided between 6 categories: less then 6 months, 6-11 months, 12-23 months, 24-35 months, 36-47 months and 48-59 months. We took into consideration also *Region*, we expect that migration of all families is not common, therefore we can use it as exogenous variable. The data contains for Bangladesh 7 regions, for India 28 regions (28 states) and for Nepal 3 regions. Variable *Urban* captures type of place of residence, 1 if the residence is in urban part of country and 0 if the residence is in the rural part.

The effect of ratio of sister is one of the main variables on which the emphasis will be placed. The use of variable *Sisters* - total number of sisters and variable *Total Number of Siblings* is needed. The regression is controlled by number of siblings and coefficient belongs to variable *Sisters* refer ratio of sister to total number of siblings in household and this variable is exogenous compare with single variable number of sisters or number of siblings, which are endogenous. Parents can chose number of children. The use of endogenous variables cause problem of causality. In such case, the results may not be explained by our variables, but for example by *Poverty*. There is a hight probability in developing countries that people from poorer regions are less educated and they do not know how to protect against pregnancy.

There are several ways how to use endogenous variables in spite of the causality. One of the options is to find suitable proxy variable, what is in many cases difficult, or we can find Instrumental Variable. The third option would be to leave our model, how it is, but at the end we would have to think about interpretation as we would not have BEST model any more. In the second analysed model, also endogenous variable will be used, but the interpretation will be said with extra caution, as mention before. All the variables, which can cause different results will be included. Therefore, endogenous variables *Total Number of Households*, dummy variable *Mother - Head of Household* what is 1 in case of mother is head of the households and 0 otherwise, *Mother Education*, mother's the highest year of education, will be included in second model of an analysis. These variables could be important, because mothers used to take care about their children more than fathers, as well as fact, that if the mother is educated, she knows better what to do in case of child's illness and has more information how to prevent against diseases. The last, but not least, the variable *Wealth Index* containing 5 different level from the poorest to the richest, is included. As mentioned in the Chapter 2, the different results across different wealth levels, are expected.

There are some remarks to the data, which should be mentioned. The variables *Sisters* and *Number of Siblings* are not originally included in the datasets. However, variable *Number of Daughters*, respectively *Number of Sons* and *Total Number of Children* are available. Therefore, in the regressions under variable *Sister* is actually used variable *Number of Daughters* control by *Total Number of Children*. The same effects are presumed.

It would be interesting to capture effect of the *Dowry* as expected higher expenses for daughters and also future wealth of children and their wealth transfer to parents. Unfortunately, this variables are not available in our datasets and we can not observed them in this analysis.

Table 4.1: Description of Variables

	Explained variables
Stunting	Binary variable: Whether the child is stunting (1 if the child is even moderate or severely stunting, 0 otherwise)
Diarrhea	Binary variable: Whether the child had diarrhoea in the last two weeks (1 if the child was sick, 0 otherwise)
Received Medical Treatment	Binary variable: Whether the child received medical treatment (1 if the child was taken to hospital or other health facilities, 0 otherwise)
	Explanatory variables
Gender	Binary variable: Sex of the child (1 for girl, 0 for boy)
Age	Age of the child, 6 categories: less then 6 months, 6-11 months, 12-23 months, 24-35 months, 36-47 months and 48-59 months
Sisters	Number of sisters (daughters in household), taking values 0, 1, 2, 3,...
First Born	Binary variable: first born child (1 if child is first born, 0 otherwise)
Region	Bangladesh has 7 regions: Barisal, Chittago, Dhaka, Khulna, Rajshahi, Rangpur, Sylhet; Nepal has 3 regions: Mountain, Hill and Terai; India has 28 regions, it is dived by states
Urban	Type of place of residence (1 is the residence is located in the urban area, 0 if the residence is locate in rural area)
Wealth Index	5 different levels: Lowest, Second, Middle, Fourth, Higher
Others	Group of variables: Total Number of Household Members, Total Number of Siblings (children), Binary variable: Mother Head of Household (1 if the mother is head of the household, 0 otherwise), Age of Head of Household, Mother Education (in single years)

Source: Demographic and Health Surveys

4.3 Methodology

All dependent variables are binary, subset of limited dependent variables. This fact together with the fact that we can not use linear model brings us to the use of the Probit model which will be used in our analysis. In contrary to OLS models, we have to use Maximum Likelihood Estimates (MLE) for estimating Probit model. The Probit model [Wooldridge, 2002] is in the following form:

$$P(y = 1|x) = G(\beta_0 + \beta_1 x_1 + ... + \beta_k x_k) = G(\beta_0 + x\beta)$$

where the function $G(z)$ has values strictly between zero and one:
$0 < G(z) < 1$. In the Probit Model, $G(z)$ is the standard normal cumulative distribution function, which is expressed as an integral:

$$G(z) = \phi(z) = \int_{-\infty}^{z} \phi(\mathrm{v})\, \mathrm{d}v$$

where $\phi(z)$ is standard normal density given as:

$$\phi(z) = (2\pi)^{-1/2} exp(-z^2/2)$$

For each of the examined country, two models were created and three hypotheses will be stated. The answer on the following questions will be searched out.

1. How the gender affects health of the child?
2. How the ratio of sisters in household affects health of the child?
3. How the birth order affects health of the child?

In the previous literatures, discriminatory behaviour against female children was often mentioned as consequence of male preferences. Therefore, the gender will be studied to confirm or deny these previous findings. As mentioned in Chapter 2, the better health indicators were observed among children with a higher number of sisters, accordingly we expect for a higher ratio of sisters to the total number of siblings, similar effect. In some of the researches was found preference towards first born child. In the presented analysis children will be compared with the first born child, as well.

4.4 Models

The first model is the most straightforward. Just exogenous variables are included, for simplicity and better interpretation. Model 1 is in following form:

$$Stunting/Diarrhoea/Received\ Medical\ Treatment =$$
$$\beta_0 + \beta_1\ gender + \beta_2\ age + \beta_3\ region + u$$

Model 1 will analyse only first hypothesis, because only gender is included. We will run 9 regressions for each of the chosen countries, three for each of the dependent variables. First one will capture overall effect, other two will capture the effects among *poor* and *rich population*. Harold Alderman and Paul Gertler [1997] find the difference results according to family wealth. As mentioned before variable *Wealth Index* consist of 5 categories: Lowest, Second, Middle, Fourth and Higher. These 5 categories were joined into two categories *poor population* - lowest two classes merged together and *rich population* - three upper classes merged together and regression will be control by them.

In the second model also the endogenous variables will be included and we will use Model 2 as follows:

$$Stunting/Diarrhoea/Received\ Medical\ Treatment = \ \beta_0 + ...+$$
$$\beta_4\ sisters\ + \beta_5\ total\ number\ of\ siblings\ +$$
$$\beta_6\ first\ born\ + \beta_7\ total\ number\ of\ household\ members\ +$$
$$\beta_8\ mother\ head\ of\ household + \beta_9\ age\ of\ household\ head\ +$$
$$\beta_{10}\ mother\ education + \beta_{11}\ urban\ + \beta_{12}\ wealth\ index + u$$

Model 2 analyses all three hypotheses and additionally to Model 1, two more regressions will be run separately for *girls* and *boys*. These detail analyses will be provided for *Stunting* and *Diarrhoea*. However not for *Receive Medical Treatment*. As mentioned, there could be problem with number of observations, because a huge amount were outage from dataset. Therefore, regressions controlled by gender will be omitted.

Chapter 5

Empirical Results

In this chapter the empirical results from econometric research will be presented. Three hypotheses stated in the previous chapter will be analysed for each of the examined countries. Firstly, the close look to gender differences will be provided, than ratio of sisters to total number of siblings in household and birth order. Probit model was used, because of that we will focus on the significance and positive or negative sign of the variables of our interest. In general coefficients in Probit model do not have the same information value as in the linear regressions. However, we can interpret marginal effects and in Probit case statistical program Stata can be used. Than, they reflect how the probability of the outcome variable change the value of regressor holding all the other variables at the same level. For better interpretation marginal effects are used in all following tables in this Chapter and in Appendix. Empirical results will be compared with the theoretical background stated in the second chapter and also across the countries. Last, but not least, occurred differences will be discuss.

5.1 The Gender Effect

This section examines the first of three hypotheses stated previously. The effect of girl will by analysed. The results of all three explained variables for all three countries are stated in the Table 5.1 bellow which contains overall effects. Tables A1-A9 in the section Appendix contain more informations in detail for *poor* and *rich population*, *girls* and *boys* and I will refer to them. As mentioned before, Model 1 label as M1 contains just exogenous variables. Therefore, the effects are not biased. Model 2 label as M2 contains endogenous variables, as well. Therefore, during interpretation of results we must be extra careful.

Table 5.1: Gender Influence

Country	Explanatory Variable		Explained Variables: Stunting	Diarrhoea	RMT
Bangladesh	Girl	M1	0.020**	-0.006	0.003
			(0.010)	(0.004)	(0.045)
		M2	0.048***	0.009	-0.075
			(0.017)	(0.008)	(0.077)
India	Girl	M1	0.006	-0.011***	-0.032**
			(0.004)	(0.003)	(0.014)
		M2	0.031***	-0.011***	-0.039
			(0.007)	(0.005)	(0.025)
Nepal	Girl	M1	0.015	-0.043***	-0.066
			(0.019)	(0.014)	(0.053)
		M2	0.065	-0.033	-0.171
			(0.135)	(0.032)	(0.365)

Note:

1. coefficients stated next to explanatory variable girl
2. *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses
3. RMT - Received Medical Treatment
4. Complete information with all the variables in Tables A1-A9 in Appendix

The variable *girls* explaining *Stunting* has shown to be significant in Bangladesh and India, however not for Nepal. Model 1, which contains just endogenous variables is significant just for one country, Bangladesh at 5% significance level. Being a girl is connected with higher probability of being stunting by 2%. In India Model 1 has shown significance only after more detail regressions and the positive effect were observed among rich population at 10% significance level. However, the effect is not a huge, being girl means higher probability of stunting just by 0.9%. Interestingly this efect is more significant in Model 2 in comparison with the first model. At 1% significant level in Bangladesh, this probability is greater by 4.8% and at the same significance level in India by 3.1%. In close look at the Tables A1-A9 in Appendix we can see that this effect is stronger among rich population in India. This is in contrary with majority of previous researches. The opposite effect, the stronger influence among the poor population was expected, because an assumption of budget constraints was stated [Becker, 1976].

Other two explanatory variables reflect if there is higher or lower probability of female child to be sick, have a diarrhoea, and if there is sign of worse or better treatment in case child had this disease holding all other variables fixed. The gender has shown to be insignificant at 10% significance level explaining *Diarrhoea* or *Received Medical Treatment* for Bangladesh. Explanatory variable *Girl* is significant in Model 1 for explaining *Diarrhoea* in India and Nepal. This variable has a negative sign, accordingly girls have a lower probability of having this disease. This effect is stronger among the rich households. Model 2 has shown the same results. The variable *Girl* explaining *Received Medical Treatment* is significant in India for both models, specially for a rich population. There is a negative sign, as well. Being girl in India means the lower probability of receiving medical treatment. This effect is again greater among rich household. In Nepal the situation is comparable, where significance occur among *rich population* and the effect has shown to be a huge. As mentioned majority of the previous studies reported results in contrary with this findings. However, the similar results observed Václav Korbel [2011], when he tried to find a gender influence on child labour and school attendance in Niger and Sierra Leon. His results from the richer households were more significant than results from poorer households, as well. He mentioned several possible reasons for this occurrence. The data from DHS contains 5 different wealth levels. The reason of different results could be that the households are incorrectly classified into wealth categories. The difference between each of the levels does not need to be a large. Some of the households could be assigned to higher or lower wealth group. Or it is possible, that people from the poorest wealth index are so poor, that their budget constraints are strong limited and they can not allow treat better their preferred child because of existential reasons. The examined countries belong to low income countries. There is hight probability, that the highest level income group has a limited budget constraints, too. Therefore, the effects occur among these richer households. This is not in contrary with Becker, who assumed budget constraints. Towards the end of this Chapter, some other possible explanation will be mentioned.

Results between countries are slightly different. The positive effect occur in case of exploring variable *Stunting*. Being a girl in Bangladesh and India is connected with a higher probability of being stunting. Results for variable *Diarrhoea* has shown opposite trend. Female child has lower probability of having this disease compare to male child. The trend of male children being more susceptible to the diseases has been captured in all of the examined countries except Bangladesh, where this variable is insignificant. It is good to mentioned, that women were provided informations of children. If there is strong preference towards to sons and parents do not pay the same attention to daughters they do not need to observe girl's disease mainly in families with high number of children. In case of mother's incorrect answer this results could be biased. For the last variable *Received Medical Treatment*, after primary analyses *Girl* has shown to be significant just for a India, mainly for rich population. However, after close studies the 10% significance occurs among *rich population* in Nepal, where the probability of receiving medical treatment is diminished by 33.6% in case child is a girl. As mention before, this variable can be problematic, because of missing huge amount of observations.

5.2 The Effect of Ratio of Sisters

As mentioned in the chapter Introduction, gender differences are often examined by researchers. This thesis adds examination focussed on siblings differences. The number of sister respectively number of brothers can have effects on our explained variables. In this section the second hypothesis will be analysed. Parents can choose how many children they will have, hence quantity of children is not suitable variable for us. However, the gender of child can not be chosen. Because of endogenous effect of the variables number of sisters and number of brothers, it is preferred to use the ratio of sisters to total number of siblings. This means how the probability of child being stunting, has a diarrhoea respectively received medical treatment changes if we replace one sister for a brother in the same amount of siblings holding all other variables fixed. The regression contains both variables, namely, *Sisters* and *Total Number of Siblings* than regression is controlled by number of children and coefficient belongs to variable *Sisters* refers ratio of sister to total number of children in household and this variable is exogenous. This hypothesis is analysed within Model 2, which contains endogenous variables as well and biased results can occur. The extra caution is needed for deducting correct conclusion. However, the multicollinearity does not occur.

The Table 5.2 contains overall effects for each of the countries. The detail informations, and separate results for *poor*, *rich population* and *male* and *female* children are in Tables A1-A9 in Appendix. Similarity with results above for variable *Stunting* appliers. The variable *Sisters* has shown significance for Bangladesh and India, but not for Nepal. For these two countries ratio of sisters to total number of siblings shows negative effect, what is comparable with researches before. In Bangladesh, in case we change one sister for a brother holding fix amount of siblings, the probability of child being stunting decreases by 5.1% in 5% significance level. For *poor population* is this effect even greater, the probability decreases by 7% which confirms theoretical findings. For *rich population* the overall negative effect is 4.8%, but separate analysis for gender has shown this effect much greater for boys approximately 9.4% at 10% significance level. This means if child is boy with higher ratio of sisters the probability of this child being stunting is reduced by more than 9%. In India the results are similar, overall effect shows lower probability by 5% even at 1% significant level. As well as results from Bangladesh the effect is greater among *Poor Population*. On contrary, separate regressions by gender, have shown greater effect among girls. Being girl in poorer household, with higher ratio of sisters reduces the probability of being stunting by 12.5 % even at 1% significance level. For a girl from richer household, this probability is diminished by 7.9% at 1% significance level.

Observing effect of variable *Diarrhoea*, the ratio of sister used in overall regressions has shown to be significant for Bangladesh, but not for India or Nepal. In Bangladesh the negative effect has occurred as well as was captured in case of exploring *Stunting*. This means that with higher ratio of sisters the probability of having disease diarrhoea is reduced by 2.2% at 5% significance level. After closer study, the regression among girls in poor population has shown this effect greater. Exactly, the probability of child has diarrhoea is reduced by 7.8% at same significance level. Among girls in rich population is this probability reduced by 4.1%. This results among the girls means, that female child with higher ratio of sister has lower probability of having disease diarrhoea. In other words, female child with higher ratio of brother is more susceptible to disease. How we can see, this effect has occurred especially among the poor.

Table 5.2: Influence of Ratio of Sisters to Total Number of Siblings

Country	Explanatory Variable	Explained Variable Stunting	Diarrhoea	RMT
Bangladesh	Sisters	-0.051**	-0.022**	0.084
		(0.022)	(0.011)	(0.094)
India	Sisters	-0.050***	-0.001	0.026
		(0.010)	(0.006)	(0.034)
Nepal	Sisters	-0.059	-0.019	0.121
		(0.051)	(0.039)	(0.159)

Note:

1. coefficients stated next to explanatory variable sisters
2. *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses
3. RMT - Received Medical Treatment
4. Complete information with all the variables are in Tables A1-A9 in Appendix

The ratio of sisters has shown to be insignificant in case of observing effect on explained variable *Received Medical Treatment*. After, detail analyses just for a rich population in Nepal the significance occur at 10% significance level, but the effect is a huge, for a rich population. The child has a higher probability of receiving medical treatment with higher ratio of sisters by 33.2%. As mentioned in Chapter Data and Methodology, separate regressions for a *girls* and *boys* were not provided, because of insufficient number of observations.

To sum up this results, Bangladesh and India have been shown similar results as was presented in the Chapter 2 by A. Garg, J. Morduch [1998] and Rohini P. Pande [2003], whose found influence of siblings, specially influence of sisters in examining the variable *Stunting*. An analyses provided in this thesis, have found the same effect. As mentioned Becker [1991], Harold Alderman and Paul Gertler[1997], this influence is greater among the poor. By studying additional variable *Diarrhoea* the same effect has occurred, especially among the girls. Nevertheless, the significance has occurred just for Bangladesh. It can be said, that girls with higher ratio of sisters have lower probability of being sick. The effect for *Received Medical Treatment* have not be found among primary analyses. After closer studies only among richer households in Nepal the significant effect has occurred. Nevertheless, the results do not have to be entirely correct, because in this model endogenous variables are included as well. Therefore, it is necessary take them with caution.

5.3 The Birth Order Effect

The last one of the hypotheses focusses on the effect of the birth order, especially effect of first born child. Variable *First Born* compares first born child with other siblings, the regression is controlled by age, number of siblings and gender. Control by age is essential, because if the child is younger and more susceptible to the diseases than older siblings, it does not necessary mean worse parental care, their immune system does not need to be developed yet. However, the variable *Age* for all 6 categories is significant just for variable *Stunting*. This hypothesis as well as hypothesis before is examined within Model 2. A remainder, we need to be careful with deducting conclusions. The Table 5.3 contains overall effect for each of the examined countries. The results from regressions running separately for *poor*, *rich population* and *girls*, *boys* are in the Tables A1-A9 in Appendix.

The variable *First Born* child is insignificant and no effect has occurred for all three explained variables in Bangladesh. For explained variable *Stunting* overall results from primary analyses have shown negative effect in India at 1% significance level. Where being a first born child holding all the other variables fixed, this means a lower probability of being stunting by 2.1%. Results across poor population have not shown significance, on contrary the results among rich population have shown negative effect at 5% significance level. Results among girls from richer households have shown that, the first born girl has a lower probability of being stunting by 2.3%. In Nepal the variable *First Born* is significant only among rich girls as well. On contrary with India, there was strong positive effect, where being first born girl means higher probability of being stunting even by 18.6%.

For a variable *Diarrhoea* is birth order significant just for a Nepal, where the same positive effect as for variable *Stunting* has occurred. The first born child has a higher probability of having a disease diarrhoea by 4.5% at 10% significance level. For a explained variable *Received Medical Treatment* first born

Table 5.3: Influence of Birth Order

Country	Explanatory Variable	Explained Variables Stunting	Diarrhoea	RMT
Bangladesh	First Born	0.008	-0.000	-0.007
		(0.015)	(0.007)	(0.072)
India	First Born	-0.021***	-0.005	0.005
		(0.006)	(0.004)	(0.023)
Nepal	First Born	0.035	0.045*	-0.013
		(0.033)	(0.026)	(0.107)

Note:

1. coefficients stated next to explanatory variable first born
2. *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses
3. RMT - Received Medical Treatment
4. Complete information with all the variables are in Tables A1-A9 in Appendix

child is insignificant for all the examined countries, as well as for all regressions controlled by wealth or by gender.

The results for Nepal could be explained by Strass and Thomas [Berhman, 1995] as mentioned in Chapter 2. Their explanation states the biological reasons as cause of lower anthropometric indicators for first born child. Therefore, first born child could have lower weight and hight and there is higher probability of being stunting. Also, If parent prefer male child, and their first born child is girl, there can occur the results as we saw in Nepal among girls for explained variable *Stunting*. However, the contrary results occurred for India, where the explanation could be that parents prefer their first born child regardless of gender and health indicators of these children are better. This explanation was carried out by Jacques D. Marleau and Jean-Francois Saucier [2002].

5.4 Other Results

In this section other results from our analyses, which are not directly linked to composition of siblings, will be mentioned. A look to variables as *Mother Head of Household, Household Age, Highest Year of Mother Education* and *Weatlh Index* will be provided. However, the closer examination will not be provided, since it is not the subject of this thesis.

The variable *Mother Head of Household* has not shown to be important variable in Bangladesh and India, where an insignificance has occurred almost in all the regressions. The analysis explained *Diarrhoea* among rich population in Bangladesh has shown the exception, where this variable has a negative sign and for child having a mother as head of household, this means a lower probability of having disease diarrhoea by 2% at 10% significance level. On contrary, in India is this variable significant just among *"poor boys"*. In Nepal the situation is slightly different. This variable has shown significance at 10% significance level for all of the examined variables, especially for a poor population, where the effect is negative between 4 - 15%. These results are available in Tables A1-A9 in Appendix. The variable *Household Age* is not significant for this analysis. If the significance occurred, the effect was negligible and the maximum reached the point 0.2%.

In Bangladesh and India the explanatory variable *Highest Year of Mother Education* has shown significance at 1% significance level for explained variable *Stunting*. In overall analyses this effect was not huge. With the higher mother education the probability of child being stunting approximately decreases by 1% in both countries. However, the separate analysis for a girls ad boys have shown greater effect for a girls. On contrary, in Nepal, this variable has shown to be significant for all explained variables only among poor, especially boys.

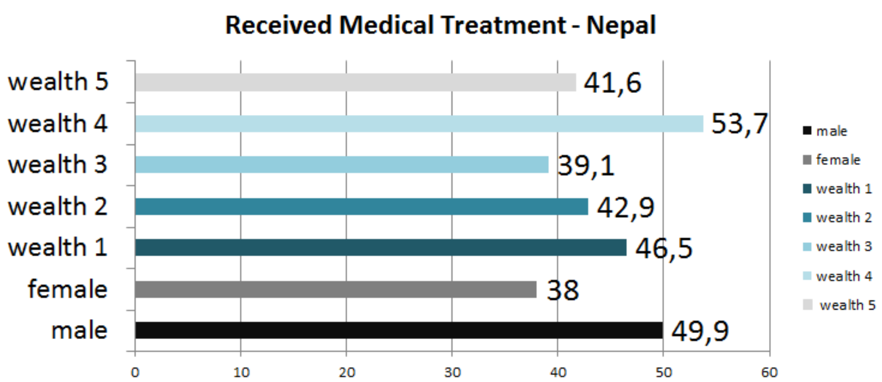
As mentioned, the previous studies considered wealth as important variable. These studies carried out greater gender differences and effects from sibling's composition among poorer households. The detail analyses in this research have not found a greater gender differences among the poor, quite the opposite, greater effect among richer household was found. The several reasons for these results were presented in the section First Hypothesis. On contrary during the examination of ratio of sisters, the previous studies were confirmed and greater effect occur among a poorer households. However, if we look at the variable *Wealth Index* with 5 different wealth levels, which one was included in the primary overall analyses, for explained variable *Stunting* the occurred effect, was as expected. The base group was the lowest wealth level and the others wealth levels were compared with it. The probability of child being stunting is diminished by higher wealth index. Precisely, in Bangladesh the second lower wealth group has shown reduced of probability comparing with the lowest group by 7.7% and the highest wealth group has shown reduced by 3.3% and these results are significant at 1% significance level. In Nepal the effect is a smaller, but still considerable. The child from the highest wealth group has lower probability of being stunting by 26.4%. In India the effect is similar as in Nepal, the highest income group has the probability diminished by 24%. The effect of the others wealth groups is possible to find in the Tables A1-A9 in Appendix. However, for explained variable *Diarrhoea* wealth has not shown a large effect, the significance occur just for a second highest and highest wealth group. Where the difference of diminished probability between the poorest and the richest is just 1,8%. The similar effect occur in India, where just the highest wealth group has shown significance, at the probability of the child having this disease is reduced by 2.8%. The *Wealth Index* has not shown the significance in Bangladesh and Nepal for last one examined variable *Received Medical Treatment*. In India the situation is different, the child from the middle wealth household has a probability of receiving medical treatment higher than child from the lowest wealth households by 8.2%. This effect has shown be even bigger for the highest wealth group, where probability of receiving medical treatment increase by 19.6%.

5.5 Differences among Countries

The empirical results were slightly different among the countries, especially Nepal has shown different trends compare to Bangladesh and India. This sections will analysed these occurred differences. As mentioned in Chapter 3, the size of the examined countries is not the same, but the health financing system shows to be comparable within countries.

The primary analyses has shown the sign of discriminatory behaviour in India and Bangladesh. However, Nepal has shown a huge effect just after much detail analyses, and these effects occur among the rich population. The question, why the results have occurred among the richer households and why the effect was greater than in the other observed countries, come up. The explained variable *Received Medical Treatment* did not found sign of better or worse child treatment in Bangladesh and India. If the significance has occurred the effect was small. However, results from Nepal among rich population observed 33.6% lower probability of receiving medical treatment for a girl and on contrary 33.2% higher probability of receiving medical treatment if the child has a higher ratio of sister. This is in contrary with the presented gender-specific model in Chapter 2, and also with empirical results from Pakistan [H. Alderman and P. Gertler, 1997], where the effect among poor population was expected. Therefore I look at the variable used for this analysis. The following Figure 5.1 contains the data for *Received Medical Treatment* separately for each of the wealth group, where the *Wealth 1* is the lowest income group and the *Wealth 5* the highest income group.

Figure 5.1: Received Medical Treatment - Nepal



Source: DHS, 2011

The *Wealth Index* has shown an interesting results. According to descriptive statistic, the results are as following: the lowest and the second lowest wealth group has higher percentage of receiving medical treatment comparing with the highest wealth group. This results are surprising, because the opposite trend would be logical. The explanation could be financial or other kind support for household among *poor population* and receiving medical treatment for free. In this case, the results from econometric analysis showing significance among the *rich population* are justified. Therefore, the discriminatory behaviour has occurred among richer households more widely, in Nepal.

Chapter 6

Summary

The goal of the work was to determined the effects of the sibling's composition on child health quality in Bangladesh, India and Nepal. In the second chapter, the theoretical models were introduced and three main hypotheses were stated. How the gender, ratio of sisters and birth order - first born child in particular, affect *Stunting*, acute morbidity -*Diarrhoea*, and in case child has this disease if he or she *Received Medical Treatment*. After closer studies, huge amount of data for a variable *Received Medical Treatment* have shown to be incorrect or missing. Nevertheless, the analyses were still provided. To sum up the results from the econometric models, one paragraph contains the main effects for each of the explained variables.

The results from examining *Stunting* have shown *Gender* as a significant variable for Bangladesh and India, where a positive effect has occurred. In this two countries, being a girl is connected with higher probability of being stunting. The effect is between 2-6%. The interesting observation was that this effect was stronger among the rich population. Some of the possible explanations were mentioned in the previous Chapter. The variable *Sisters* has shown the significance. Where a child with a higher ratio of sisters has a lower probability of being stunting. This negative effect is between 5-10% and is more widely among the poor population as mentioned in the previous studies. Ratio of sisters has shown the same results as the ones found by Garge and Morduch [1998]. However, results for Nepal has not shown discriminatory behaviour, neither in gender nor in the ratio. The last variable *First Born*, has not shown to be significant for Bangladesh. There was found significance in India, where first born child has a lower probability of being stunting by 2,1%. On contrary, in Nepal regression among "rich girls" has shown strong positive effect, where first born girl has 18,6% higher probability of being stunting.

The results from examining acute morbidity - *Diarrhoea* has shown *Girl* to be significant for India and Nepal, where the negative effect were found. Probability, that a girl will be sick is diminished by 1-7%. In the other words, boys are more susceptible to have this disease. Again, this effect has shown to be greater among rich population. The variable *Sisters* has shown to be significant only for Bangladesh, where the positive effect has occurred between 2-8%. The biggest influence has shown to be among poor girls, where the probability of having diarrhoea is reduced almost by 8%. On contrary, it can mean that girls with higher ratio of brothers in poorer households, has higher probability of being sick. The variable *First Born* is significant just for a Nepal, where first born child has a higher probability of having a diarrhoea.

The sign of better or worse treatment has been captured by the last examined variable, *Received Medical Treatment*. The results from primary analysis for this variable have not shown a big influence. The significance of the variable *Girl* occur in India, where the positive effect was between 3-4%. On contrary, in Nepal after closer studies for a richer households, the girl has a probability of receiving medical treatment diminished by 33,2%. The variable *Sisters* has not shown significance, except for Nepal. As before, a huge effect for rich population was observed, where the probability of receiving medical treatment increases with a higher ratio of sisters by 33,3%. The possible explanation was mentioned in the last section in the previous Chapter 5. The variable *First Born* has shown to be insignificant for all three examined countries.

Chapter 7

Conclusion

The aim of the presented thesis was to determine the effects of the sibling's composition on child health in developing countries, namely Bangladesh, India and Nepal. The first part of the thesis introduced the fundamentals of the Becker's model of human capital investment, the basic assumptions that needed to be fulfilled and the basic implications of this model. Different option of the measurement of health ware introduced and the health system of examined countries were presented.

In the second part, the empirical studies were provided. After closer examination, the analyses found a sibling's composition as an influential factor, in particular the variables *Gender* and *Sisters*. Results for Bangladesh and India have shown similarities. On average girls have an increased probability of *Stunting* by 2-6%. This effect has shown to be slightly greater in richer households. Although the explanation of this effect is not clear, some of the reasons are indicated in the chapter Empirical results. With a higher ratio of sisters this probability is diminished by 5-10%, as was expected according to the theory. By studying morbidity, the ratio of sisters among girls from poorer households in Bangladesh has shown negative effect. This means that girls with higher ratio of sisters have lower probability of being sick - having a diarrhoea. If the child was already sick, a sign of different treatment between siblings was not found. However, it does not mean that some differences do not occur. This variable was problematic because of insufficiency of observations. For a close study of *Received Medical Treatment* more precisely, a greater amount of variables would be needed.

Different results were obtained for Nepal, where a significance within variables occurs among richer households and the effect was more wisely compare to other two countries. The *Birth Order* has shown to be considerable variable, but only among rich girls, where being first born girl means higher probability of being stunting by more than 18%. The *Diarrhoea* has not shown prominently results, nevertheless *Received Medical Treatment* in *richer population* has shown some absorbing results. Being a girl in richer household means receiving medical treatment with lower probability by 33.6%, and the probability increased for a child with higher ratio of sisters by 33.2%.

The question, why the differences among the examined countries occurred, comes out. Similar results were obtained for Bangladesh and India, where the sibling's differences have shown to affect mainly stunting. On contrary, in Nepal, a huge difference was found among richer households in providing health care. The findings of last section of Chapter 5 lead us to a possible conclusion, that health policy in Nepal aimed on support among the poor population is prosperous. Therefore, discriminatory sign occurs only within richer households, where this support is not provided compare to other two countries, where this effect was not found.

The topic is more than interesting and further issues could be discussed. It would be interesting to capture effect of the *Dowry* as expected higher expenses for daughters and also future wealth of children and their wealth transfer to parents. The effect of sibling's composition not only by ratio of sisters, but ratio of younger or older siblings. However, investigating impact of these further variables is beyond the scope of this thesis and obtaining required data has shown to be problematic.

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Appendix A

Empirical Results Summary

This last section contains complete results in detail from econometric analyses provided in this thesis. For better interpretation marginal effects are stated in all following tables.

Table A1 Model 1 for Bangladesh

Table A2 Model 2 for *poor population* in Bangladesh

Table A3 Model 2 for *rich population* in Bangladesh

Table A4 Model 1 for India

Table A5 Model 2 for *poor population* in India

Table A6 Model 2 for *rich population* in India

Table A7 Model 1 for Nepal

Table A8 Model 2 for *poor population* in Nepal

Table A9 Model 2 for *rich population* in Nepal

Table A.1: Bangladesh - Probit Model 1

	Stunting			Diarrhoea			Received Medical Treatment		
variables	Overall Effect	Poor	Rich	Overall	Poor	Rich	Overall	Poor	Rich
girl	0.020**	0.019	0.019	-0.006	-0.003	-0.008	0.003	-0.010	0.019
	(0.010)	(0.016)	(0.013)	(0.004)	(0.007)	(0.006)	(0.045)	(0.061)	(0.063)
6-11 months	0.229***	0.266***	0.188***	0.049***	0.065***	0.035**	-0.072	0.127	-0.159
	(0.028)	(0.043)	(0.037)	(0.011)	(0.020)	(0.014)	(0.095)	(0.145)	(0.132)
12-23 months	0.496***	0.535***	0.462***	0.042***	0.057***	0.031**	-0.145	0.064	-0.241**
	(0.024)	(0.037)	(0.031)	(0.010)	(0.017)	(0.013)	(0.091)	(0.145)	(0.121)
24-35 months	0.391***	0.432***	0.349***	0.016	0.016	0.022*	-0.194**	-0.006	-0.315**
	(0.025)	(0.038)	(0.032)	(0.011)	(0.018)	(0.013)	(0.096)	(0.160)	(0.124)
36-47 months	0.426***	0.487***	0.370***	0.008	0.014	0.004	-0.317***	-0.190	-0.371***
	(0.024)	(0.036)	(0.031)	(0.011)	(0.017)	(0.013)	(0.100)	(0.165)	(0.131)
48-59 months	0.435***	0.495***	0.389**	0.014	0.014	0.014	-0.187*	0.030	-0.315**
	(0.024)	(0.036)	(0.031)	(0.010)	(0.017)	(0.013)	(0.102)	(0.157)	(0.140)
Chittago	0.013	0.052*	0.029	0.007	0.015	0.003	-0.130*	-0.162	-0.139
	(0.019)	(0.030)	(0.025)	(0.009)	(0.013)	(0.011)	(0.076)	(0.099)	(0.110)
Dhaka	0.023	0.000	0.065**	-0.008	-0.005	-0.011	-0.051	-0.127	0.005
	(0.020)	(0.305)	(0.026)	(0.010)	(0.014)	(0.012)	(0.085)	(0.112)	(0.126)
Khulna	-0.060***	-0.070**	-0.012	-0.031***	-0.050**	-0.023*	-0.086	-0.136	-0.113
	(0.022)	(0.036)	(0.027)	(0.011)	(0.021)	(0.014)	(0.110)	(0.191)	(0.144)
Rajshahi	-0.067***	-0.061*	-0.054*	-0.007	-0.009	-0.004	-0.130	-0.109	-0.167
	(0.021)	(0.032)	(0.028)	(0.010)	(0.015)	(0.013)	(0.092)	(0.124)	(0.130)
Rangpur	0.040*	0.017	0.036	-0.013	-0.013	-0.014	-0.016	-0.066	0.099
	(0.021)	(0.021)	(0.029)	(0.010)	(0.014)	(0.015)	(0.090)	(0.106)	(0.147)
Sylhet	0.065***	0.125***	0.051*	0.011	0.008	0.012	0.018	0.048	-0.021
	(0.020)	(0.030)	(0.026)	(0.009)	(0.014)	(0.012)	(0.077)	(0.098)	(0.112)
N	8343	3448	4895	8343	3448	4895	395	175	220

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses

Table A.2: Bangladesh - Probit Model 2 - Poor Population

	Stunting				Diarrhoea				Received Medical Treatment	
		Poor Population				Poor Population				
variables	Overall Effect		Girls	Boys	Overall Effect		Girls	Boys	Overall Effect	Poor
girl	0.048***	0.053*			0.009	0.008			-0.075	-0.093
	(0.017)	(0.029)			(0.008)	(0.014)			(0.077)	(0.102)
6-11 months	0.227***	0.270***	0.266***	0.274***	0.045***	0.065***	0.076**	0.062**	0.001	0.105
	(0.030)	(0.052)	(0.075)	(0.072)	(0.012)	(0.022)	(0.036)	(0.027)	(0.102)	(0.183)
12-23 months	0.494***	0.551***	0.561***	0.537***	0.038***	0.050**	0.068**	0.041	-0.070	0.046
	(0.026)	(0.045)	(0.066)	(0.061)	(0.011)	(0.021)	(0.035)	(0.026)	(0.099)	(0.183)
24-35 months	0.388***	0.449***	0.432***	0.455***	0.015	-0.002	0.021	-0.019	-0.177	-0.006
	(0.027)	(0.046)	(0.068)	(0.063)	(0.012)	(0.022)	(0.036)	(0.029)	(0.105)	(0.198)
36-47 months	0.408***	0.479***	0.508***	0.451***	0.007	0.016	0.042	-0.004	-0.283**	-0.206
	(0.026)	(0.045)	(0.067)	(0.062)	(0.012)	(0.021)	(0.035)	(0.028)	(0.111)	(0.206)
48-59 months	0.412***	0.500***	0.546***	0.450***	0.011	0.003	0.029	-0.022	-0.180	-0.206
	(0.026)	(0.045)	(0.067)	(0.062)	(0.012)	(0.022)	(0.036)	(0.029)	(0.115)	(0.210)
Chittago	0.039*	0.063*	0.067	0.061	0.006	0.019	0.013	0.028	-0.106	-0.060
	(0.020)	(0.036)	(0.051)	(0.050)	(0.009)	(0.016)	(0.023)	(0.022)	(0.082)	(0.123)
Dhaka	0.062***	0.014	0.029	0.000	-0.001	0.010	0.011	0.011	-0.018	0.025
	(0.021)	(0.036)	(0.052)	(0.051)	(0.010)	(0.017)	(0.024)	(0.024)	(0.0093)	(0.125)
Khulna	-0.016	-0.047	-0.049	-0.043	-0.024**	-0.042*	-0.037	-0.039	-0.141	-0.325
	(0.022)	(0.039)	(0.054)	(0.056)	(0.012)	(0.022)	(0.029)	(0.035)	(0.111)	(0.252)
Rajshahi	-0.043*	-0.040	-0.109**	0.056	-0.010	-0.018	-0.015	0.015	-0.118	-0.101
	(0.022)	(0.038)	(0.055)	(0.051)	(0.011)	(0.018)	(0.027)	(0.024)	(0.105)	(0.145)
Rangpur	0.033	0.028	0.032	0.025	-0.008	-0.005	-0.009	-0.000	0.058	0.075
	(0.022)	(0.034)	(0.050)	(0.046)	(0.011)	(0.017)	(0.024)	(0.021)	(0.096)	(0.114)
Sylhet	0.062***	0.107**	0.098*	0.115**	0.014	0.011	0.010	0.014	0.033	0.165
	(0.022)	(0.039)	(0.054)	(0.054)	(0.010)	(0.018)	(0.025)	(0.025)	(0.087)	(0.126)
sisters	-0.051**	-0.070*	-0.052	-0.005	-0.022**	-0.018	-0.078**	-0.011	0.084	-0.019
	(0.022)	(0.040)	(0.067)	(0.068)	(0.011)	(0.019)	(0.032)	(0.032)	(0.094)	(0.151)
total number of siblings	0.012**	0.022**	0.025	0.029*	-0.000	-0.000	-0.011	0.006	-0.032	0.043

	(0.006)	(0.010)	(0.033)	(0.015)	(0.003)	(0.001)	(0.007)	(0.007)	(0.030)	(0.043)
first born	0.008	0.030	-0.123	0.036	-0.000	-0.020	-0.004	-0.023	-0.007	-0.088
	(0.015)	(0.028)	(0.083)	(0.040)	(0.007)	(0.013)	(0.020)	(0.020)	(0.072)	(0.115)
number of household members	0.006***	-0.004	0.009	-0.008	0.012	-0.002	-0.007	0.001	-0.011	-0.095
	(0.002)	(0.006)	(0.010)	(0.008)	(0.001)	(0.003)	(0.004)	(0.004)	(0.008)	(0.030)
mother head	-0.022	-0.046	-0.134	-0.007	-0.003	0.036	0.030	0.039	0.057	0.085
	(0.021)	(0.046)	(0.098)	(0.060)	(0.010)	(0.018)	(0.028)	(0.025)	(0.095)	(0.118)
age of household head	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000	0.001	-0.001	0.002	0.010
	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.003)
highest year of education	-0.010***	-0.005***	-0.058***	-0.000	0.002	-0.000	0.001	-0.001	0.008	-0.022
	(0.004)	(0.006)	(0.020)	(0.009)	(0.002)	(0.003)	(0.004)	(0.004)	(0.016)	(0.023)
urban	0.044***	-0.082***	-0.090	0.117	-0.001	0.005	-0.011	0.017	0.139**	-0.013
	(0.013)	(0.029)	(0.061)	(0.041)	(0.007)	(0.014)	(0.021)	(0.019)	(0.061)	(0.099)
wealth 2	-0.077***				-0.005				-0.135	
	(0.018)				(0.009)				(0.083)	
wealth 3	-0.119***				0.000				0.004	
	(0.018)				(0.009)				(0.078)	
wealth 4	-0.193***				-0.019**				-0.064	
	(0.018)				(0.009)				(0.088)	
welath 5	-0.313***				-0.018*				0.081	
	(0.019)				(0.010)				(0.087)	
N	6756	4463	2176	2287	6756	4463	2176	2287	320	197

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses

Table A.3: Bangladesh - Probit Model 2 - Rich Population

	Stunting				Diarrhoea				Received Medical Treatment	
		Rich Population				Rich Population				
variables	Overall Effect		Girls	Boys	Overall Effect		Girls	Boys	Overall Effect	Rich
girl	0.048***	0.050**			0.009	0.012			-0.075	-0.099
	(0.017)	(0.021)			(0.008)	(0.010)			(0.077)	(0.109)
6-11 months	0.227***	0.202***	0.221***	0.187***	0.045***	0.031**	0.049**	0.018	-0.001	-0.113
	(0.030)	(0.038)	(0.057)	(0.050)	(0.012)	(0.014)	(0.022)	(0.019)	(0.102)	(0.130)
12-23 months	0.494***	0.461***	0.483***	0.446***	0.038***	0.029**	0.042**	0.021	-0.070	-0.165
	(0.026)	(0.032)	(0.049)	(0.042)	(0.011)	(0.013)	(0.020)	(0.017)	(0.099)	(0.121)
24-35 months	0.388***	0.347***	0.414***	0.290***	0.015	0.021	0.027	0.019	-0.176*	-0.306**
	(0.027)	(0.033)	(0.050)	(0.045)	(0.012)	(0.013)	(0.020)	(0.018)	(0.105)	(0.125)
36-47 months	0.408***	0.364***	0.420***	0.319***	0.007	0.001	0.006	-0.001	-0.283**	-0.389***
	(0.026)	(0.033)	(0.049)	(0.044)	(0.012)	(0.013)	(0.021)	(0.018)	(0.112)	(0.136)
48-59 months	0.412***	0.364***	0.398***	0.340***	0.011	0.014	0.033	-0.002	-0.180	-0.294**
	(0.026)	(0.033)	(0.049)	(0.043)	(0.012)	(0.013)	(0.020)	(0.018)	(0.115)	(0.140)
Chittago	0.039*	0.012	0.004	0.018	0.006	0.000	0.000	0.000	-0.105	-0.069
	(0.020)	(0.025)	(0.035)	(0.034)	(0.009)	(0.012)	(0.018)	(0.012)	(0.082)	(0.110)
Dhaka	0.062***	0.057**	0.038	0.073**	-0.001	-0.008	-0.005	-0.011	-0.018	0.042
	(0.021)	(0.026)	(0.037)	(0.036)	(0.010)	(0.012)	(0.018)	(0.017)	(0.093)	(0.126)
Khulna	-0.016	-0.023	-0.081**	0.031	-0.024**	-0.020	-0.017	-0.023	-0.141	-0.077
	(0.022)	(0.028)	(0.039)	(0.038)	(0.012)	(0.013)	(0.020)	(0.019)	(0.111)	(0.141)
Rajshahi	-0.043*	-0.059**	-0.067	-0.048	-0.010	-0.014	0.008	-0.040*	-0.118	-0.090
	(0.022)	(0.029)	(0.041)	(0.040)	(0.011)	(0.013)	(0.018)	(0.020)	(0.105)	(0.139)
Rangpur	0.033	0.028	-0.070	0.108***	-0.008	-0.011	0.012	-0.034	0.058	0.228
	(0.022)	(0.030)	(0.044)	(0.040)	(0.011)	(0.014)	(0.020)	(0.021)	(0.095)	(0.142)
Sylhet	0.062***	0.007	0.019	0.000	0.014	0.012	0.032*	-0.007	0.032	0.093
	(0.022)	(0.027)	(0.038)	(0.037)	(0.010)	(0.012)	(0.017)	(0.017)	(0.086)	(0.111)
sisters	-0.051**	-0.048*	0.008	-0.094**	-0.022**	-0.025**	-0.041**	-0.025	0.084	0.157
	(0.022)	(0.026)	(0.043)	(0.045)	(0.011)	(0.012)	(0.020)	(0.023)	(0.098)	(0.128)
total number of siblings	0.012**	0.018**	0.008	0.032***	-0.000	-0.000	-0.004	0.002	-0.032	-0.104**

	(0.006)	(0.007)	(0.043)	(0.010)	(0.003)	(0.004)	(0.005)	(0.005)	(0.030)	(0.043)
first born	0.008	0.005	-0.040	0.028	-0.000	0.008	0.010	0.008	-0.007	-0.130
	(0.015)	(0.018)	(0.027)	(0.026)	(0.007)	(0.009)	(0.013)	(0.013)	(0.072)	(0.097)
number of household members	0.006***	0.006**	0.003	0.008	0.012	0.001	0.001	0.002	-0.003	-0.001
	(0.002)	(0.002)	(0.003)	(0.003)	(0.001)	(0.010)	(0.001)	(0.002)	(0.002)	(0.009)
mother head	-0.022	-0.038	-0.044	-0.034	-0.003	-0.020*	-0.019	-0.021	0.056	-0.139
	(0.021)	(0.023)	(0.032)	(0.033)	(0.010)	(0.012)	(0.017)	(0.018)	(0.095)	(0.141)
age of household head	-0.001	-0.001*	-0.000	-0.001*	-0.000	-0.000	-0.000	-0.000	0.002	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
highest year of education	-0.010***	-0.017***	-0.019***	-0.015**	0.002	0.002	0.004	0.015	0.008	0.022
	(0.004)	(0.004)	(0.006)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.016)	(0.023)
urban	0.044***	-0.033**	-0.030	-0.036*	-0.001	-0.008	-0.001	-0.012	0.139**	0.209***
	(0.013)	(0.014)	(0.019)	(0.019)	(0.007)	(0.007)	(0.009)	(0.009)	(0.061)	(0.068)
wealth 2	-0.077***				-0.005				-0.135	
	(0.018)				(0.009)				(0.083)	
wealth 3	-0.119***				0.000				0.004	
	(0.078)				(0.009)				(0.259)	
wealth 4	-0.064***				-0.019**				-0.212	
	(0.088)				(0.009)				(0.291)	
welath 5	-0.313***				-0.018*				0.081	
	(0.019)				(0.010)				(0.087)	
N	6756	4463	2176	2287	6756	4463	2176	2287	320	197

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses

Table A.4: India - Probit Model 1

variables	Stunting			Diarrhoea			Received Medical Treatment		
	Overall Effect	Poor	Rich	Overall	Poor	Rich	Overall	Poor	Rich
girl	0.006	-0.003	0.009*	-0.010***	-0.011**	-0.010***	-0.032**	-0.026	-0.037**
	(0.004)	(0.007)	(0.005)	(0.003)	(0.004)	(0.003)	(0.014)	(0.024)	(0.017)
6-11 months	0.047***	0.131***	-0.001	0.037***	0.039***	0.035***	0.047*	0.063	0.031
	(0.010)	(0.017)	(0.012)	(0.005)	(0.008)	(0.006)	(0.026)	(0.046)	(0.031)
12-23 months	0.283***	0.389***	0.218***	0.007*	0.024***	-0.001	0.081***	0.106**	0.074**
	(0.008)	(0.013)	(0.010)	(0.004)	(0.007)	(0.005)	(0.024)	(0.043)	(0.029)
24-35 months	0.217***	0.344***	0.140***	-0.034***	-0.027***	-0.040***	0.022	0.073	-0.003
	(0.009)	(0.014)	(0.010)	(0.004)	(0.009)	(0.006)	(0.026)	(0.046)	(0.031)
36-47 months	0.257***	0.363***	0.192***	-0.075***	-0.067***	-0.080***	0.015	0.030	0.008
	(0.008)	(0.014)	(0.010)	(0.005)	(0.008)	(0.007)	(0.029)	(0.051)	(0.035)
48-59 months	0.258***	0.367***	0.191***	-0.091***	-0.084***	-0.096***	-0.047	-0.022	-0.057
	(0.008)	(0.014)	(0.010)	(0.005)	(0.009)	(0.006)	(0.031)	(0.054)	(0.037)
N	48679	17300	31379	48679	17300	31379	4440	1569	2861

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses, regression was control by 28 regions

Table A.5: India - Probit Model 2 - Poor Population

	Stunting				Diarrhoea				Received Medical Treatment	
		Poor Population				Poor Population				
variables	Overall Effect		Girls	Boys	Overall Effect		Girls	Boys	Overall Effect	Poor
girl	0.030***	0.023			-0.011**	-0.016			-0.040	0.081
	(0.025)	(0.017)			(0.004)	(0.016)			(0.076)	(0.057)
6-11 months	-0.002	0.032	0.050	0.019	0.034***	0.035**	0.040*	0.031	0.022	0.012
	(0.012)	(0.030)	(0.042)	(0.042)	(0.006)	(0.016)	(0.021)	(0.023)	(0.031)	(0.077)
12-23 months	0.219***	0.313***	0.345***	0.283***	0.001	0.030**	0.020	0.039*	0.070**	0.033
	(0.010)	(0.024)	(0.033)	(0.034)	(0.006)	(0.014)	(0.019)	(0.020)	(0.029)	(0.071)
24-35 months	0.141***	0.272***	0.306***	0.232***	-0.040***	-0.025*	-0.026	-0.025	0.006	-0.030
	(0.010)	(0.024)	(0.034)	(0.035)	(0.006)	(0.014)	(0.020)	(0.021)	(0.032)	(0.075)
36-47 months	0.182***	0.282***	0.303***	0.257***	-0.083***	-0.087***	-0.076***	-0.020***	0.017	-0.087
	(0.010)	(0.024)	(0.034)	(0.035)	(0.007)	(0.016)	(0.022)	(0.023)	(0.036)	(0.091)
48-59 months	0.177***	0.302***	0.340***	0.261***	-0.097***	-0.093***	-0.099***	-0.092***	-0.069*	-0.136
	(0.010)	(0.025)	(0.035)	(0.036)	(0.007)	(0.017)	(0.023)	(0.024)	(0.038)	(0.093)
sisters	-0.050***	-0.065**	-0.125***	-0.030	0.001	-0.005	-0.012	0.013	0.026	-0.099
	(0.010)	(0.030)	(0.041)	(0.043)	(0.007)	(0.016)	(0.026)	(0.028)	(0.034)	(0.080)
total number of siblings	0.013***	0.011**	0.003	0.017**	-0.000	0.001	0.002	-0.000	-0.012	-0.022
	(0.003)	(0.005)	(0.008)	(0.008)	(0.017)	(0.004)	(0.005)	(0.005)	(0.009)	(0.018)
first born	-0.021***	-0.013	-0.017	0.006	-0.0050	-0.012	-0.013	-0.009	0.005	-0.015
	(0.006)	(0.017)	(0.025)	(0.025)	(0.004)	(0.011)	(0.016)	(0.017)	(0.023)	(0.059)
number of household members	0.003***	-0.002	-0.002	-0.003	0.002***	-0.002	-0.005*	-0.000	-0.002	-0.003
	(0.001)	(0.003)	(0.004)	(0.004)	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)	(0.009)
mother head	-0.001	-0.011	-0.003	-0.018	0.000	0.015	-0.016	0.040*	0.008	0.133*
	(0.008)	(0.024)	(0.033)	(0.034)	(0.006)	(0.014)	(0.021)	(0.021)	(0.029)	(0.072)
age of household head	-0.001***	0.001	0.000	0.001	-0.000**	-0.000	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.003)	(0.001)	(0.000)	(0.001)	(0.002)
highest year of education	-0.006***	-0.010**	-0.015**	-0.004	-0.001	0.003	-0.003	0.009*	-0.011*	-0.001

	(0.002)	(0.005)	(0.007)	(0.007)	(0.001)	(0.003)	(0.004)	(0.004)	(0.006)	(0.014)
urban	-0.000	0.025	0.010	0.040	0.008*	0.024*	0.020	0.020	-0.012	0.118
	(0.006)	(0.021)	(0.029)	(0.031)	(0.004)	(0.013)	(0.017)	(0.019)	(0.0212)	(0.179)
wealth 2	-0.019				-0.001				0.052	
	(0.013)				(0.008)				(0.041)	
wealth 3	-0.052***				-0.005				0.082**	
	(0.012)				(0.008)				(0.039)	
wealth 4	-0.115***				-0.009				0.128***	
	(0.012)				(0.008)				(0.039)	
wealth 5	-0.240***				-0.028***				0.196***	
	(0.012)				(0.009)				(0.042)	
N	29230	5302	2620	2682	29230	5302	2609	2664	2716	526

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses, regression was control by 28 regions

Table A.6: India - Probit Model 2 - Rich Population

	Stunting				Diarrhoea				Received Medical Treatment	
		Rich Population				Rich Population				
variables	Overall Effect		Girls	Boys	Overall Effect		Girls	Boys	Overall Effect	Rich
girl	0.031***	0.035***			-0.011**	-0.010*			-0.040	-0.073**
	(0.007)	(0.008)			(0.005)	(0.005)			(0.025)	(0.029)
6-11 months	-0.002	-0.012	-0.019	-0.002	0.034***	0.033***	0.030***	0.036***	0.022	0.021
	(0.012)	(0.016)	(0.020)	(0.019)	(0.006)	(0.007)	(0.009)	(0.010)	(0.031)	(0.034)
12-23 months	0.219***	0.195***	0.192***	0.200***	0.001	-0.006	-0.006	-0.006	0.070**	0.080**
	(0.010)	(0.011)	(0.016)	(0.016)	(0.001)	(0.006)	(0.009)	(0.009)	(0.029)	(0.033)
24-35 months	0.141***	0.109***	0.124***	0.098***	-0.040***	-0.044***	-0.055***	-0.034***	0.006	0.009
	(0.010)	(0.011)	(0.016)	(0.016)	(0.006)	(0.007)	(0.009)	(0.009)	(0.032)	(0.035)
36-47 months	0.182***	0.154***	0.155***	0.154***	-0.083***	-0.083***	-0.085***	-0.081***	0.017	0.036
	(0.010)	(0.011)	(0.016)	(0.016)	(0.007)	(0.007)	(0.010)	(0.010)	(0.036)	(0.040)
48-59 months	0.178***	0.141***	0.138***	0.144***	-0.097***	-0.100***	-0.111***	-0.091***	-0.069*	-0.058
	(0.010)	(0.011)	(0.017)	(0.016)	(0.007)	(0.007)	(0.010)	(0.010)	(0.038)	(0.042)
sisters	-0.050***	-0.051***	-0.079***	-0.040**	0.001	0.001	-0.011	0.019	0.026	0.057
	(0.010)	(0.011)	(0.018)	(0.018)	(0.007)	(0.007)	(0.012)	(0.012)	(0.034)	(0.038)
total number of siblings	0.013***	0.023***	0.015***	0.029***	-0.000	0.001	0.003	-0.003	-0.002	-0.012
	(0.003)	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.010)
first born	-0.021***	-0.016**	-0.023**	-0.006	-0.005	-0.003	0.003	-0.005	0.005	0.009
	(0.006)	(0.007)	(0.011)	(0.010)	(0.004)	(0.005)	(0.007)	(0.007)	(0.023)	(0.026)
number of household members	0.003***	0.003***	0.002	0.004***	0.002***	0.002***	0.003***	0.003*	-0.002	-0.000
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
mother head	-0.001	0.003	0.012	-0.006	0.000	-0.003	0.000	-0.007	0.008	-0.021
	(0.009)	(0.009)	(0.013)	(0.013)	(0.006)	(0.006)	(0.008)	(0.009)	(0.029)	(0.032)
age of household head	-0.001***	-0.002***	-0.002***	-0.002***	-0.000**	-0.000**	-0.000	-0.000	0.000	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
highest year of education	-0.006***	-0.012***	-0.011***	-0.012***	-0.001	-0.002*	-0.002	-0.001	-0.011*	-0.009

	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.006)	(0.006)
urban	-0.000	-0.063***	-0.077***	-0.050***	0.008*	-0.001	0.000	-0.004	-0.012	0.023
	(0.006)	(0.006)	(0.008)	(0.008)	(0.004)	(0.004)	(0.006)	(0.006)	(0.021)	(0.021)
wealth 2	-0.019				-0.001				0.052	
	(0.013)				(0.008)				(0.041)	
wealth 3	-0.052***				-0.005				0.082**	
	(0.012)				(0.008)				(0.039)	
wealth 4	-0.115***				-0.009				0.128***	
	(0.012)				(0.008)				(0.039)	
wealth 5	-0.239***				-0.027***				0.196***	
	(0.013)				(0.009)				(0.042)	
N	29230	23928	11347	12581	29230	23928	11347	12581	2716	2172

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses, regression was control by 28 regions

Table A.7: Nepal - Probit Model 1

	Stunting			Diarrhoea			Received Medical Treatment		
variables	Overall Effect	Poor	Rich	Overall	Poor	Rich	Overall	Poor	Rich
girl	0.015	0.012	0.025	-0.043***	-0.018	-0.067***	-0.066	-0.025	-0.082
	(0.019)	(0.028)	(0.026)	(0.014)	(0.019)	(0.020)	(0.053)	(0.074)	(0.074)
6-11 months	0.144***	0.195***	0.085	0.104***	0.106***	0.102**	0.139	0.083	0.168
	(0.052)	(0.070)	(0.075)	(0.029)	(0.040)	(0.041)	(0.107)	(0.155)	(0.148)
12-23 months	0.343***	0.391***	0.290***	0.083***	0.063*	0.101***	0.093	0.116	0.014
	(0.044)	(0.061)	(0.062)	(0.026)	(0.037)	(0.037)	(0.100)	(0.145)	(0.136)
24-35 months	0.381***	0.414***	0.337***	-0.005	-0.019	0.007	0.064	0.150	-0.065
	(0.043)	(0.059)	(0.062)	(0.027)	(0.038)	(0.038)	(0.107)	(0.151)	(0.147)
36-47 months	0.458***	0.488***	0.406***	-0.056**	-0.081**	-0.029	0.048	0.090	-0.041
	(0.042)	(0.057)	(0.061)	(0.028)	(0.040)	(0.040)	(0.115)	(0.167)	(0.155)
48-59 months	0.440***	0.495***	0.374***	-0.110***	-0.079**	-0.152***	0.184	0.311*	-0.020
	(0.043)	(0.059)	(0.061)	(0.030)	(0.040)	(0.046)	(0.129)	(0.164)	(0.209)
Mountain	0.091***	0.066**	0.065	0.001	-0.011	0.026	-0.034	-0.035	0.041
	(0.026)	(0.032)	(0.047)	(0.019)	(0.023)	(0.037)	(0.074)	(0.090)	(0.128)
Terai	-0.063***	0.005	0.006	0.012	0.009	0.013	-0.003	0.072	-0.115
	(0.021)	(0.035)	(0.028)	(0.015)	(0.024)	(0.022)	(0.058)	(0.072)	(0.081)
N	2392	1217	1175	2392	1217	1175	341	166	175

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses

Table A.8: Nepal - Probit Model 2 - Poor Population

	Stunting				Diarrhoea				Received Medical Treatment	
		Poor Population				Poor Population				
variables	Overall Effect		Girls	Boys	Overall Effect		Girls	Boys	Overall Effect	Poor
girl	0.065	0.092			-0.033	-0.023			-0.172	-0.127
	(0.135)	(0.076)			(0.032)	(0.052)			(0.365)	(0.219)
6-11 months	0.130**	0.300**	0.385*	0.255*	0.096***	0.089	0.167	0.145	0.055	0.101
	(0.064)	(0.116)	(0.199)	(0.147)	(0.037)	(0.058)	(0.115)	(0.087)	(0.151)	(0.249)
12-23 months	0.254***	0.394***	0.435**	0.394***	0.080**	0.044	0.061	0.059	-0.015	0.172
	(0.056)	(0.103)	(0.182)	(0.127)	(0.034)	(0.053)	(0.104)	(0.079)	(0.138)	(0.214)
24-35 months	0.358***	0.536***	0.652***	0.471***	0.010	0.009	0.089	-0.005	-0.025	0.199
	(0.054)	(0.099)	(0.177)	(0.122)	(0.035)	(0.054)	(0.107)	(0.081)	(0.149)	(0.228)
36-47 months	0.405***	0.543***	0.628***	0.527***	-0.040	-0.133**	omitted	-0.084	-0.140	omitted
	(0.054)	(0.100)	(0.180)	(0.122)	(0.037)	(0.068)		(0.089)	(0.167)	
48-59 months	0.383***	0.511***	0.548***	0.513***	-0.137***	-0.209**	-0.131	omitted	-0.081	omitted
	(0.055)	(0.104)	(0.184)	(0.130)	(0.044)	(0.087)	(0.138)		(0.223)	
Mountain	0.041	0.071	0.007	0.102	0.008	-0.012	-0.005	-0.006	-0.018	0.054
	(0.036)	(0.055)	(0.082)	(0.074)	(0.028)	(0.037)	(0.068)	(0.056)	(0.108)	(0.149)
Terai	0.017	0.022	-0.077	0.105	-0.000	-0.022	0.048	-0.078	-0.038	0.084
	(0.029)	(0.066)	(0.091)	(0.098)	(0.022)	(0.047)	(0.079)	(0.090)	(0.093)	(0.199)
sisters	-0.059	-0.095	-0.012	-0.005	-0.019	0.026	-0.170	-0.059	0.121	0.024
	(0.051)	(0.098)	(0.169)	(0.161)	(0.039)	(0.065)	(0.148)	(0.131)	(0.159)	(0.268)
total number of siblings	0.028**	0.021	0.051	-0.002	0.010	0.008	-0.051	0.022	-0.015	0.022
	(0.014)	(0.023)	(0.040)	(0.031)	(0.011)	(0.016)	(0.042)	(0.024)	(0.043)	(0.076)
first born	0.035	0.042	0.036	0.048	0.045*	0.058	0.069	0.035	-0.013	-0.223
	(0.033)	(0.061)	(0.102)	(0.081)	(0.026)	(0.042)	(0.088)	(0.066)	(0.107)	(0.175)
number of household members	0.002	0.002	-0.024	0.022	-0.004	0.002	-0.004	0.014	-0.006	0.003
	(0.005)	(0.012)	(0.018)	(0.017)	(0.004)	(0.008)	(0.013)	(0.013)	(0.020)	(0.039)
mother head	-0.048*	-0.023	-0.080	0.020	-0.013	-0.071*	-0.071	-0.128*	-0.156*	-0.654**
	(0.029)	(0.056)	(0.084)	(0.076)	(0.022)	(0.040)	(0.071)	(0.068)	(0.089)	(0.206)

age of household head	-0.001	0.000	0.000	0.000	0.000	-0.001	0.001	-0.002	-0.001	-0.006
	(0.001)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.006)
highest year of education	0.010	0.004	0.010	0.002	-0.003	-0.008	0.020	-0.035**	0.006	0.092**
	(0.008)	(0.016)	(0.023)	(0.021)	(0.006)	(0.010)	(0.019)	(0.017)	(0.024)	(0.037)
urban	-0.027	-0.052	0.004	-0.106	-0.014	-0.052	omitted	0.022	0.151	omitted
	(0.033)	(0.104)	(0.197)	(0.125)	(0.025)	(0.080)		(0.105)	(0.103)	
wealth 2	-0.089**				-0.000				0.110	
	(0.042)				(0.034)				(0.144)	
wealth 3	-0.123***				0.051				0.118	
	(0.042)				(0.033)				(0.131)	
wealth 4	-0.187***				0.027				0.100	
	(0.043)				(0.039)				(0.139)	
wealth 5	-0.264***				0.020				-0.028	
	(0.045)				(0.036)				(0.161)	
N	1288	421	186	235	1288	421	149	201	177	47

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses

Table A.9: Nepal - Probit Model 2 - Rich Population

	Stunting				Diarrhoea				Received Medical Treatment	
		Rich Population				Rich Population				
variables	Overall Effect		Girls	Boys	Overall Effect		Girls	Boys	Overall Effect	Rich
girl	0.065	0.040			-0.033	-0.041			-0.172	-0.336*
	(0.135)	(0.049)			(0.032)	(0.041)			(0.365)	(0.168)
6-11 months	0.130**	0.028	-0.002	0.025	0.096***	0.102**	-0.003	0.225***	0.055	0.116
	(0.064)	(0.077)	(0.098)	(0.125)	(0.037)	(0.047)	(0.060)	(0.070)	(0.151)	(0.184)
12-23 months	0.254***	0.179***	0.068	0.282***	0.079**	0.095**	0.047	0.134**	-0.015	-0.058
	(0.056)	(0.066)	(0.090)	(0.092)	(0.034)	(0.043)	(0.055)	(0.063)	(0.138)	(0.171)
24-35 months	0.358***	0.259***	0.264***	0.234**	0.010	0.010	-0.023	0.049	-0.025	-0.093
	(0.054)	(0.064)	(0.085)	(0.094)	(0.035)	(0.045)	(0.060)	(0.066)	(0.149)	(0.187)
36-47 months	0.405***	0.319***	0.239***	0.381***	-0.040	-0.004	-0.009	-0.007	-0.140	-0.087
	(0.054)	(0.063)	(0.086)	(0.090)	(0.038)	(0.046)	(0.058)	(0.069)	(0.167)	(0.194)
48-59 months	0.383***	0.306***	0.179**	0.420***	-0.137***	-0.114**	-0.122*	-0.102	-0.081	-0.167
	(0.055)	(0.064)	(0.088)	(0.092)	(0.044)	(0.053)	(0.068)	(0.079)	(0.223)	(0.245)
Mountain	0.041	0.023	-0.054	0.122*	0.008	0.024	0.038	0.005	-0.018	0.080
	(0.036)	(0.051)	(0.076)	(0.067)	(0.028)	(0.040)	(0.052)	(0.058)	(0.108)	(0.144)
Terai	0.017	-0.019	-0.068	0.035	-0.000	0.004	0.035	-0.007	-0.038	-0.029
	(0.029)	(0.032)	(0.045)	(0.044)	(0.022)	(0.025)	(0.033)	(0.037)	(0.093)	(0.102)
sisters	-0.059	-0.029	-0.018	-0.070	-0.019	-0.029	-0.094	-0.057	0.121	0.332*
	(0.051)	(0.061)	(0.104)	(0.098)	(0.039)	(0.049)	(0.086)	(0.090)	(0.159)	(0.195)
total number of siblings	0.028**	0.042**	0.107***	-0.001	0.010	0.008	-0.008	0.019	-0.015	-0.029
	(0.014)	(0.018)	(0.030)	(0.024)	(0.004)	(0.016)	(0.027)	(0.020)	(0.043)	(0.060)
first born	0.035	0.043	0.186***	-0.087	0.045*	0.035	0.046	0.041	-0.013	0.053
	(0.033)	(0.040)	(0.062)	(0.056)	(0.026)	(0.034)	(0.052)	(0.051)	(0.107)	(0.137)
number of household members	0.003	0.005	0.008	0.001	-0.000	-0.007	-0.022**	0.005	-0.006	-0.004
	(0.005)	(0.006)	(0.007)	(0.009)	(0.004)	(0.005)	(0.009)	(0.007)	(0.020)	(0.025)
mother head	-0.048*	-0.057*	-0.072	-0.043	-0.013	0.008	0.010	0.016	-0.156*	-0.053
	(0.029)	(0.034)	(0.051)	(0.045)	(0.022)	(0.027)	(0.035)	(0.039)	(0.089)	(0.102)

age of household head	-0.001	-0.001	-0.001	-0.002	0.000	0.001	0.001	0.000	-0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
highest year of education	0.009	0.009	-0.010	0.026**	-0.003	-0.000	-0.009	0.006	0.006	0.001
	(0.008)	(0.009)	(0.014)	(0.012)	(0.006)	(0.007)	(0.010)	(0.010)	(0.024)	(0.030)
urban	-0.027	-0.072**	-0.105**	-0.065	-0.014	-0.020	0.005	-0.031	0.151	0.064
	(0.033)	(0.031)	(0.044)	(0.041)	(0.025)	(0.024)	(0.032)	(0.036)	(0.103)	(0.092)
wealth 2	-0.089**				-0.000				0.110	
	(0.042)				(0.034)				(0.144)	
wealth 3	-0.123***				0.051				0.117	
	(0.042)				(0.033)				(0.131)	
wealth 4	-0.187***				0.027				0.100	
	(0.043)				(0.034)				(0.139)	
wealth 5	-0.264***				0.020				-0.028	
	(0.045)				(0.036)				(0.161)	
N	1288	867	424	443	1288	867	424	443	177	124

Note: *** significant at the 1% level, ** significant at 5% level, * significant at 10% level, standard errors are in the parentheses