Household health care expenditure and health services utilization decisions in Honduras

HOUSEHOLD HEALTH CARE EXPENDITURE AND HEALTH SERVICES UTILIZATION DECISIONS IN HONDURAS

by

Linda Lee Scheu

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SIGNED: Linda Scheer

APPROVAL OF THESIS DIRECTOR

This thesis has been approved on the date shown below:

Dr. Mark Langworthy
Assistant Research Scientist
Agricultural and Resource Economics

5/2/03
Date

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ABSTRACT

This study utilizes national household income and expenditure data from Honduras, collected by the Honduran Central Bank in 1998-99, to examine two distinct health issues. First a tobit censored regression model is estimated to identify the variables that affect monthly household expenditures on health. This analysis is then used to examine income elasticities for health goods. Secondly, a nested bivariate probit model is used to study the socio-economic and demographic variables that influence a Honduran household's decision to seek health services attention when a household member is acutely ill and, consequently, how they then choose between public and private health services.

CHAPTER 1

INTRODUCTION

Health care is widely believed to be a basic human right thus making the provision of health care one of the most important social issues throughout the world. Historically, developing countries have relied heavily on their governments to provide health services and typically these governments at least nominally take partial or full responsibility for ensuring health care for their citizens (Bitran and McInnes 1993; Russell 1996). Therefore governments are closely scrutinized for their overall public expenditure on health care (Russell 1996; Jowett 1999).

Many developing countries' expenditures on health have fluctuated dramatically since the economic recession in the early 1980's (Jowett 1999). Structural readjustment policies in response to large foreign debt have forced many countries to reformat their health care systems (Bitran and McInnes 1993; Jowett 1999). These changes in health care provision have made the affordability of health services a critical policy issue in developing countries as people are expected to contribute more from their own pockets (Russell 1996).

Honduras, one of the poorest countries in the western hemisphere, exhibits the common pattern of irregularities in yearly public health care expenditures. Health expenditures as a proportion of total public spending, has fluctuated: from 8.1% in 1990 to 6% in 1993 and to 9.2% in 1995 (Pan American Health Organization 1999). The Ministry of Public Health, which is both a service provider and a regulatory agency, and

the Honduran Social Security Institute provide the majority of public health services. The public health care system has a fee for service system, although a governmental stipulation exists guaranteeing treatment even for those unable to pay. Overall, however the ability to pay for a good or service is a major determinant in health care consumption patterns; as a result income is regarded as a highly significant factor in determining health care expenditures as well as how families decide to seek health care. However, other variables including environmental, socio-cultural, and belief-oriented factors are also known to influence health care expenditures and health care decisions (Bitran and McInnes 1993; Tesler 2001).

The objective of this study is to understand the influence of different socioeconomic and demographic variables on the consumption of health resources in Honduras. Three relationships will be addressed in this thesis; specifically the influence of income and household characteristics on health services expenditure, on health services use, and on choice of public versus private practitioner. Empirical analysis will be conducted using the Honduran national survey of household income and expenditures (*Encuesta Nacional de Ingresos y Gastos de los Hogares 1998/99* (ENIGH)) evaluating the factors that have an impact on health expenditures and how these factors influence heath service utilization decisions for acute illnesses.

There are multiple motivations behind looking at these relationships. Examining household health expenditures at a national level allows for a better understanding of expenditures on health care across income strata. If health care expenditures increase and then level off, similar to expenditure patterns for calories, with increasing income,

observed overall health spending can help answer the question of whether there is a minimum monetary amount needed by a household to assure adequate health care coverage. Income elasticities for overall health can further explain how changes in income, holding health prices constant, will affect health expenditures. Does health expenditure show a pattern of being more like a necessity good or a luxury good? How does the income elasticity for health goods change with varying incomes? Analyzing socio-economic and demographic factors as they relate to health spending can elucidate critical variables that may affect how households spend on health care.

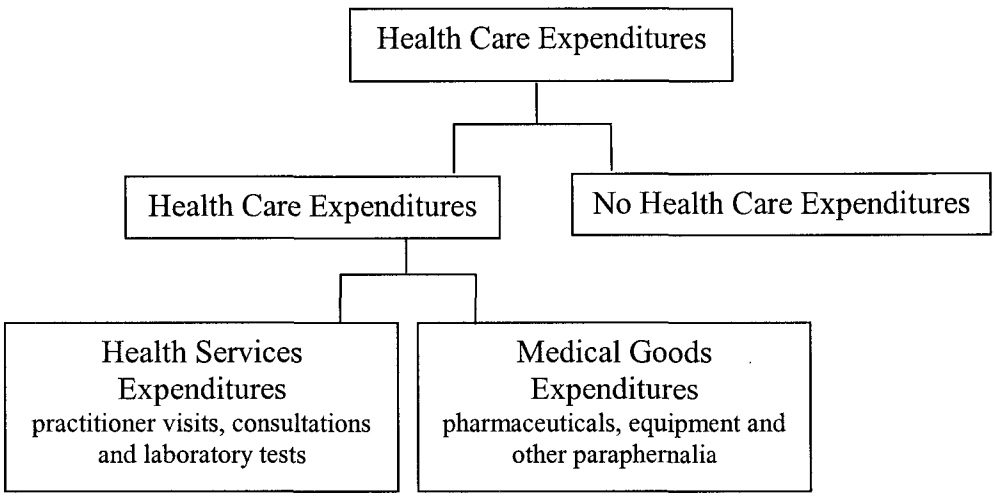
The decision making process to seek treatment for an ill household member can be broken down into a two-step process. The first decision a household faces when a member presents illness symptoms is whether to seek care from a service provider or use self-care. The second level of the decision making process relates to the choice of service provider. Analysis of these decisions using socio-economic and demographic variables will show which factors are significant for households in choosing to seek attention as well as selecting a type of provider. Understanding how these factors affect people's choices to use health services could provide the impetus for better targeting of public health care.

1.1 Household Out of Pocket Health Expenditures

Analysis of an explanatory model predicting household health expenditures from socioeconomic and demographic factors would contribute to our understanding of household resource allocation, and provide a foundation for better targeting of health

policy. The ENIGH health expenditure data permits a breakdown into two distinct health expenditures categories: health services (i.e. practitioner visits, consultations and laboratory tests) and medical goods (i.e. all pharmaceuticals, equipment and other paraphernalia). See Figure 1.1. This breakdown of healthcare expenses also allows for finer assessment of household consumption of two very different components of healthcare and can also reveal differences in income elasticities for health services and medical goods. In this thesis a single predictability equation will be used to expose the influences of socioeconomic and demographic factors on overall healthcare expenditures.

Figure 1.1 Categorization of Health Care Expenditure



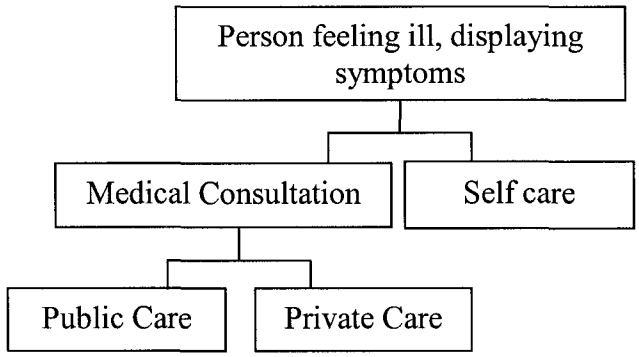
1.2 Household Choices in Health Care Seeking

Evaluation of consumption and utilization of a good can be done in a multitude of ways including studying expenditures, use patterns, etc. Health care expenditures may imply how a household is addressing health needs however; a more complete picture of

health services utilization can be attained if household choices of health care use are also considered.

When a family member is ill a decision is typically made whether or not to seek medical attention and if so, a choice must be then made to utilize a certain type of health service. The sequential nature of these two decisions/choices is illustrated in Figure 1.2.

Figure 1.2 Health Service Decisions/Choices When Ill



Many of the same socioeconomic and demographic household factors that affect health expenditures are believed to also influence health service seeking behavior. The ENIGH data recorded household characteristics and all household expenditures, and in addition surveyed health status and health services use over a one-month period. The health survey data included, specifics on which household member was ill, their age and gender, type of acute illness (if professionally diagnosed), whether or not health services were sought, and what kind of services were obtained. These data allow for another model that forecasts the decision to seek or not to seek heath services attention and predicts the choice to use a public or private practitioner. This model will allow

household socioeconomic and demographic factors to be examined as they pertain to and influence health services seeking behavior.

1.3 Hypothesis Summary

There are numerous potential factors that have been identified as possible influences on health care expenditure and health care choice. Previous research allows us to identify variables, which will be important in terms of their impact on health care consumption. For this investigation influences from the following factors will be addressed:

1. Income Level

Increases in income are likely to coincide with increases in health care expenditure. As income rises it is anticipated that households will spend more on overall health care expenditure. The higher a household's income the less hindered the household may be in actually seeking health services and are more likely to visit private doctors or clinics.

An alternative hypothesis is that health expenditures will increase at an increasing rate with higher levels of income, so the share of total expenditures on health increases. Thus indicating that health care is a luxury good.

2. Characteristics of the Head of Household

Age, gender, and education level of the head of household will be examined. Young heads of households are not well established and are not likely to have as much savings or assets as older ones do. Older households may also have more wage earners,

increasing the amount of overall household income. It is expected therefore that increasing age has a positive effect on health expenditure. This positive affect of age is apt to carry over into health seeking behavior.

As a trend commonly seen in the developing world, female-headed households in Honduras are likely to spend a greater proportion of income on health care than male-headed households, although, female-headed households tend to be poorer and may not have the time necessary to seek health services. This lack of time may cause a negative effect on the tendency for female-headed households to seek health consultations.

It is expected that with increasing education comes an increase in health care expenditure; there is a two-fold reason for this: individuals with more education tend to have higher paying jobs and better bio-medical health knowledge. Higher salary levels and increased understanding of health will lead to increased health service usage, especially private care.

3. Household Size and Composition

Households must spread the available resources amongst their members and needs. Thus, the higher number of members the less money available for health care. This is expressly so for families with many children as older family members tend to have more wage earners, which provide household income. In general large households are also not likely to have time or money available to seek attention and if they must it is more likely public practitioners will be sought.

4. Rural vs. Urban

Households in urban areas have, on average, higher incomes than rural ones as well as increased access to health services. Urban households will therefore spend more on health care and due to their proximity to health clinics and are thus more likely to seek health services when ill. Furthermore, higher income and better accessibility to private care result in urban households not using public services.

5. Type of Illness

The perception of an illness will have a large effect on the type of health care sought. It is however, not clear how a particular illness will affect practitioner choice. The illnesses included in the evaluation are: malaria/dengue, acute respiratory infections (ARI), gastrointestinal illnesses (GI), fever, and skin infections. These were selected based on their higher rates among the population in the ENIGH survey. The types of illnesses were recorded in the ENIGH only in the cases where health services were sought and a practitioner diagnosed the illness.

The first four factors (income, head of household characteristics, household size and composition, and geographic location) will be included in the prediction of health care expenditure and health service seeking behavior. The fifth factor (type of illness) will only be used in the analysis of health services choice, to seek care from a public or private practitioner.

In order to test these hypotheses and examine the impact of these socioeconomic and demographic characteristics it is necessary to perform two estimations. First a tobit (censored regression) will be utilized for modeling the health expenditure model and a

nested probit (binary regression modeling) will be implemented to examine the health service seeking models.

CHAPTER 2

LITERATURE REVIEW

There is much anthropological and some empirical literature analyzing personal health care expenditure and utilization in developing countries. The literature reveals that anthropologists have profoundly studied and analyzed health and health care utilization, through the socio-economic, demographic, environmental, socio-cultural, and belief-oriented perspectives and that empirical studies also base much of their examination on these factors. Therefore anthropological research and economic studies on the health care utilization were explored to understand and form a credible hypothesis for this analysis on health care expenditures and utilization in a Honduras. Linking different academic disciplines enables the association of how economic, socio-cultural, environmental and belief-oriented factors affect health spending and use.

2.1 Anthropological Research on Health Care in Developing Countries

The New Household Economic (NHE) theory provides an instrumental basis for understanding the household production of health (Berman, Kendall, and Bhattacharyya 1994). Households, not individuals produce health; and therefore household characteristics are important in determining health expenditures. Households, not just individuals, also suffer from illnesses in several ways as costs of illnesses are borne by healthy family members in terms of monetary and time loss (Oths 1994). Households have limited resources, and must weigh the choice of treating an illness and obtaining

other necessary goods and services. Therefore, with respect to financial costs the comparison of health care expenditure with respect to total household expenditure may not truly reflect the burden of health care, especially in terms of time loss, on that household. Household characteristics, as well as belief systems, are of great importance in health care seeking decisions. A decision must be made first on whether or not an illness is severe enough to warrant medical intervention and if so, a choice made on the type of practitioner sought.

Illness occurs within social contexts and so numerous people may be involved in health care seeking processes and decision-making regarding illness diagnosis, treatment strategies, and resource allocations (Tesler 2001). Additionally, health and medicinal care decision-making and strategies may vary according to the type of acute illness as well as over the course of its duration.

The household and its activities are not constant. The roles and social status of members change over the course of their lifecycle and in response to changes in both employment status and individuals' relationships with other household members (Wilk and McCarthy 1984). During the lifespan of a household the consumer to producer ratio of a family shifts. Typically the ratio grows and per capita income decreases as children (consumers) are added to the household. As children age and leave or become producers this ratio once again approaches one and income per capita rises (Sauerborn, Adams and Hein 1996). This implies that households with many dependents must stretch their resources to provide basic necessities to all. Coreil (1983) found evidence of this in Haiti, where families that have a small number of children and a large number of adults

are more able to obtain care than households with a greater proportion of children and that single parent households spent less money on illness' than other families indicating that monetary investment decreased with more children. Intra-household resource allocation has also been found to vary according to gender, generational relations, birth order, true and perceived contributions to the household through employment and generation of income, and future potential (Levine 1987; Messer 1997; Miller 1997). For example, David (1993), Kennedy and Cogill (1987), and Dwyer (1989) found evidence that nutrition in female-headed households is better because women spend more, proportionally, on food and health care than other types of households. There has also been extensive documentation of selective gender care in developing countries, typically expressing a disproportionate allocation of food and medical care to male children (Coreil 1983).

Perceived severity of an illness will affect household decisions in regard to maintaining labor output of the household unit and to spending income on a combination of goods, which maximizes satisfaction (Oths 1994; Maclachlan 1987). It has been found that people with little expectation of receiving care are less likely to interpret a symptom as an illness (Gao et al. 2001; Duggal and Amin 1989). In order to minimize time and monetary loss a wide variety of home remedies may be used before the perceived severity of the illness is great enough to warrant expenditure on pharmaceuticals or practitioner consultations. People are often willing to gamble with time, in hopes of a recovery, in order to avoid the costs of seeking and obtaining medical care. Families may also allocate more money toward illness that have a poor prognosis

and fewer resources to illness's that have a better recovery rate (Coreil 1983). Those with higher incomes however are more likely to spend more on illnesses; increasing household income has been shown to have a positive relationship with expenditure per day of illness (Bhatia and Celland 2001).

Consumer demand for medical goods, including pharmaceuticals, is determined by established patterns of medical consumption and by popular health concerns (Nichter and Vuckovic 1994). Consumer demand for any good, including medicine and health service is also determined by time and money costs. Busy workers and the poor often have little time for sickness and will often define high thresholds for illness care, and will also likely forego any preventative care. Self-medication has been described as coping with health problems at the most primary level (Van Der Geest 1988). First lines of defense may be medications that provide a state of minimal functional health required to complete work tasks. These medicines are often recommended by friends, relatives, and pharmacists or have been prescribed for a similar ailment during a prior illness episode (Nichter and Vuckovic 1994).

How households actually allocate limited resources to health and other essential needs can have serious consequences for the household and those within it. The literature suggests a plethora of factors, including economic, social and behavioral influencing health care expenditure. Factors most often expressed as influential on health expenditures are household income, family size, gender, age and education of the head of household, gender and age of the person needing care, seasonality and location.

2.2 Empirically Based Studies on Health Expenditures and Health Care Utilization

Many ethnographic studies describe factors of importance in determining for whom, how and when health services are sought. Large data sets are also being used to help understand and reiterate on a large scale what ethnographies have described. Discrete or censored models like the probit or logit and tobit are ideal for investigating the determinants of health care utilization on a household level. More and more household level studies of this type are appearing in health economic literature.

The statistical techniques used in many of these studies are similar, but their overall design and point of examination are quite different. The unifying theme between these empirically-based studies is that each looks at household characteristics and health care decisions and attempts to predict how much households spend on health care and/or how health related decisions are made. While statistical models have been used to explore health care, the choice of the model depends on the nature of the hypothesis and data available making it difficult to group them all into one neat category. The following are examples of how other researches have used the tobit, logit, or probit predictive models in their research in varying countries around the world. No literature specific to Honduras was found.

2.2.1 Tobit Models

Tobit models or limited dependent variable models are used when the data examined is censored or truncated. Household health care expenditure data is typically censored as not every household spends money on health care hence making their

expenditure level zero. The examination of just the expending households, using a simple linear regression, would bias the analysis and provide inconsistent estimators (Gujarati 1995). The tobit model, using the maximum likelihood method, provides the means to take into account the censored observations. The tobit model will be discussed in more detail in Chapter 5.

An example of the tobit model in estimating out of pocket health care expenditures is found in Burkina Faso, where understanding the nature of spending has serious consequences for health policy concerning malaria control. Due to structural readjustment Burkina Faso implemented user fees to off set the financial burden of governmental public health care financing. This user fee on what was once free health care system has become a deterrent for people, especially the poor and children, from using health care services. Furthermore it is also worsening the burden of illnesses by causing people to delay treatment, resulting in complications, or by inducing inappropriate self-diagnosis and treatment (Mugisha et al. 2002).

To assess the impact of malaria on the likelihood of treatment delay and possible drug resistance Mugisha et al. (2002) investigated household out-of-pocket expenditures on malaria using a tobit model. Overall the tobit model revealed that less out-of pocket money is spent on malaria than any other illness, either in or outside a health facility. This is likely because of the high out of pocket expenditure incurred when seeking attention from a health care worker and the belief that malaria can be self-treated. Although binary predictive models are discussed in more detail in the following subchapter it is pertinent to include the fact that Mugisha et al. (2002) also used, as a

compliment to the tobit model, a probit model to identify the role malaria plays in treatment choice. These results showed that malaria does not determine treatment choice but that those in urban areas and with higher incomes are more likely to seek care from health facilities, elucidating the ease of monetary and geographical access.

2.2.2 Probit and Logit Models

Probit or logit models are predictive models and are typically applied when the response variable is binary. This variable typically takes a value of 0 or 1, where these values represent exhaustive and mutually exclusive outcomes. The methodology used in the probit and logit however do not limit their predictive nature to dichotomous models; ordered and nested probits and logits are also common. In the ordered case the response variable may take on numerous values, where each value represents a different and distinct choice outcome. Whereas in the nested method two distinct models, representing two separate decision outcomes, are joined into a single estimation due the sequential nature of the decision making process.

In the literature probit and logit models have, for example, been used to determine which socioeconomic and demographic variables affect: an individual's choice of private vs. public health services in Vietnam (Ha, Berman and Larsen 2002), health care seeking behaviors for ill children in Bangladesh (Levin et al. 2001), sickness reporting and health services seeking behavior in Egypt (Nandakumar, Chawla and Khan 2000), and how these variables, particularly price of care, affect demand for health care in Nigeria (Akin, Guilkey and Denton 1995).

Ha, Berman and Larsen (2002) were interested in the health care utilization and expenditure patterns on private and public health services in Vietnam. The study questioned how the legalization of private health care has impacted the health care system in hopes of garnering some information to help the government plan, organize and finance its health care system. Logistic regression was used to determine which socioeconomic and demographic variables affect an individual's choice of private vs. public health services.

In Bangladesh, Levin et al. (2001) used nested multinomial logit models to investigate the determinants of child health care seeking behaviors. While demographic, socioeconomic, prices and time variables were all evaluated, particularly the effects of income, women's access to income and the prices of obtaining child health care were scrutinized. The multinomial nested logit models were used to determine the use of child curative care in households where both parents were present and in households where fathers were absent. The nested logit became a necessity due to the study design structure of decision-making, where some of the practitioner choices had more in common with each other than with the other choices. The decision making process was modeled as a two step progression; the first is the choice to use or not to use child curative care and the second is that occurring between four types of service providers.

In Egypt, the government provides health care at little or no charge, yet Nandakumar, Chawla and Khan (2000) found that the delivery of health care inequitable. Evidence from the study showed that almost all segments of the population prefer fee-for-service private consultations indicating that the poor are paying proportionally much

more than the rich. Nandakumar, Chawla, and Khan (2000) used two probit models to analyze the probabilities of reporting an illness and the probability of seeking health care when sick in order to understand what segment of the population is likely to be receiving care.

In Nigeria, like Burkina Faso, user fees are collected at public health care facilities. Governments would like to collect as much as possible from consultation fees in order to off set their own expenditures. However, increasing user fees are likely to act as a deterrent to health care use. In order to evaluate the effect of price (fee) increases on the use of health care facilities Akin, Guilkey, and Denton (1995) utilized a multinomial probit model to analyze and predict a given persons choice of medical service type: self, public facility, or private facility treatment.

Binary prediction models, like the probit and logit, are powerful yet, flexible statistical tools. They are especially potent when used as a device to understand health services seeking behavior. From the studies presented it is also clear that these models must be adapted to the study at hand or the available data in order to provide a relevant analyses. This thesis will utilize this flexibility to model how households spend on health care and how health service seeking decisions are made.

2.3 Household Income Elasticity for Health Care

Income elasticity for health care is a means of describing a household's behavior in the health care market. By definition income elasticity for health care is the percent change in the amount of health care spent divided by the percent change in income.

Income elasticities are not static and are determined by consumer preference as well as many demographic, geographic and social forces.

Goods are defined by their consumption pattern as either normal or inferior. Normal goods are classified as those whose consumption increases/decreases with similar changes in disposable income. Within the normal good-classification lie two sub-types of goods, necessities and luxuries. Necessities have income elasticities between zero and one, indicating that the quantity demanded is not very sensitive to changes in income. Luxury goods are defined as having income elasticities of greater than or equal to one, meaning that the quantity demanded of that good is very sensitive to changes in income. Inferior goods have income elasticities of less than zero and are unique in that as income increases consumption of that good decreases. Health care is universally considered a normal good, being either a necessity or a luxury.

The literature is full of macro-level expenditure studies from developed countries that focus on income (Govindaraj, Murrary, and Chellaraj 1995). While analysis of national expenditures on health care and national income may provide insights on elasticities at the national level, it may be argued that these results have relied upon the application of microeconomic analysis to macroeconomic data (Liu 1999). In developing countries, the studies available using aggregate national level data show that health care is a luxury good yet, studies at the household level show income elasticities for health care to be less than one (Govindaraj, Murrary, and Chellaraj 1995).

Changes in household income can be interpreted as changes in purchasing power; the poor hence adjust their spending patterns proportionally more than do the rich when

income changes. Therefore understanding the income elasticity of demand, on the household level, provides important policy information about the demand responses of different income groups (Bitran and McInnes 1993). The government may then focus its policy towards ensuring that changes in income, price and/or quality of health care, do not adversely affect the amount of health care demanded, but rather improve health care utilization and hopefully improve health.

CHAPTER 3

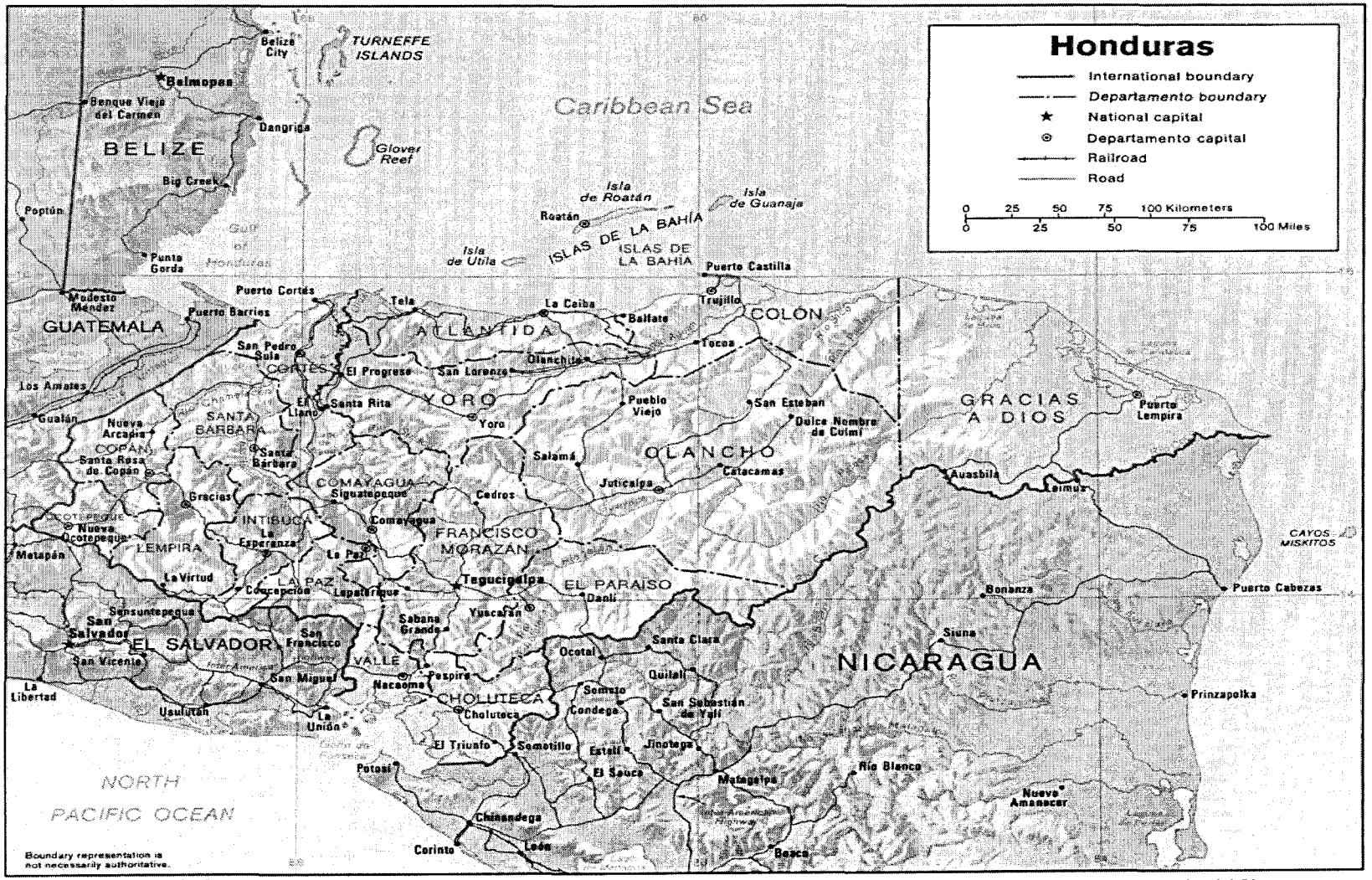
CURRENT DEMOGRAPHIC AND HEALTH CONDITIONS IN HONDURAS

Honduras is one of the poorest countries in the Western hemisphere. The 1999 GDP was estimated at 5.4 billion (Central Intelligence Agency 2001). The export economy is primarily based on agricultural products: coffee, bananas, lobster, shrimp and timber, although minerals, such as zinc, and textiles are also important (Central Intelligence Agency 2001). There are also extensive forest, marine and mineral resources which have become increasingly important to the Honduran economy. In 2000 the unemployment rate was estimated at 28% and the inflation rate at 11% (Central Intelligence Agency 2001). In 1999 the Pan American Health Organization reported that 50% of the population living in poverty.

3.1 Geography of Honduras

Honduras is located in Central America and is bordered by El Salvador, Guatemala, and Belize to the west and Nicaragua to the East. The country is divided into 18 departments and 297 municipalities. Honduras is 112,492 square kilometers in size, approximately the size of Ohio. It is a relatively mountainous country with 11% of the land classified as valley or agricultural land, the majority of which lies on the Northern coast (See Figure 3.1). Two seasons are generally classified; the rainy (cool) season from May through January and the dry (hot) season from February to May.

Figure 3.1 Map of Honduras



Courtesy of The General Libraries, The University of Texas at Austin www.lib.utexas.edu/maps (Acccessed 2002)

3.2 Social and Demographic Conditions

In 2001 the estimated population of Honduras was 6,406,052 (Central Intelligence Agency 2001). The population is unevenly distributed by age: children 0-14 years of age constitute 42.22% of the population, those 15-64 years of age compose 54.21% and the remaining 3.57% are 65 years and older. According to the Honduran National Survey of Household Income and Costs (NSHIC) the distorted population stratification appears to actually be reducing due to the diminishing birth rate, which is currently 31.94 births/1,000 population (ENIGH 1999); the estimated population growth rate for 2001 was 2.43% (Central Intelligence Agency 2001). Life expectancy is increasing; in 1989 the life expectancy was estimated at 67 years for females and 63 years for males (Altipedia 2002) while currently it is estimated at 71 years for females and 67 years for males (Central Intelligence Agency 2001).

The population is almost equally distributed between urban and rural sectors. The ENIGH reported in 1999 that 43.7% of the population lived in urban areas and the remaining 56.3% in rural regions and that the gender ratio is almost equal with males constituting 48.9% of the population and females 51.1%. The NSHIC in 1998 reported a population density of 56 people/square kilometer which is 41.1% over the National Population and Housing Census (NPHC) findings of 39.6 people /square kilometer in 1988 (ENIGH 1999). The ENIGH (1999) also found the average household size to be 5.5 people with an average size in rural and urban areas of 5.8 and 5.1 people, respectively. On the national level, in 1998, 27.1% of all households were headed by women where 60.6% of these female-headed households were in urban areas.

According to the ENIGH (1999), on average 76.8% of all households had access to potable water. There is some discrepancy however, as urban areas have over 90% accessibility whereas rural areas are only 63% covered. Only 58% of all households had electricity in 1998, 76% of these households were in urban areas leaving only 24% of the households in rural areas with electric power. Seventy-eight percent of all households used some type of sanitary service or latrine.

The literacy rate in Honduras is relatively high and was estimated at 80% for those over 15 years of age for both genders (Pan American Health Organization 2001).

3.3 Income Levels

The ENIGH found in 1999 that the average household monthly income was 1,082 lempiras or $75 U.S. 1999 dollars (1999 conversion rate US$=14.5039 Lempiras). Across the country the income distribution is unequal. See Table for geographic comparisons of income. In contrast however, the GDP per capita was estimated at US$ 660 or approximately US$ 55 monthly in 1999 by other sources (Pan American Health Organization 2001).

Table 3.1: Monthly Income by Geographic Zone

Geographic Zone	Monthly Income Per Capita in Lempiras ($US 1999)
All Urban Areas	1,614 (111)
Central District (Tegucigalpa)	1,887 (134)
San Pedro Sula	2,079 (143)
Other Urban Areas	1,215 (84)
All Rural Areas	607 (42)
National Total	1,082 (75)

Source: ENIGH (1999)

3.4 Health in Honduras

Typically, health status of a developing country's population is reflected in its economic characteristics. Honduras' high population growth rate and skewed age distribution have direct health consequences. These may include: higher incidence of communicable diseases as a result of poor housing and overcrowding, high maternal mortality and morbidity and poor nutrition.

Morbidity in Honduras is largely caused by vector borne diseases, acute respiratory illnesses, nutritional diseases and diarrhea. Malaria is endemic and most typically caused by *Plasmodium vivax* (98.9% of all cases), while *Plasmodium falciparum* accounts for only 1.1% (World Health Organization 1998). Dengue and Chagas disease, although also endemic, cause far less illness than malaria. Acute respiratory infections were more common in urban areas than rural areas and that children under 1 year of age were most often affected according to a study done in 1991-1992; overall the most common illnesses reported were malaria and acute respiratory illness (World Health Organization 1998). Chronic protein-energy malnutrition (stunting) is far more common in Honduras than malnutrition (wasting). In children under 5 years of age in 1996, 36.7% displayed some form of stunting indicating prolonged periods of inadequate feeding and/or mild morbidity (World Health Organization 1998). In 1999 it was estimated that the national population consumes, on average, only 77% of the required daily caloric intake (Pan American Health Organization 2001). AIDS rates in Honduras are the highest in Central America with the majority of cases found in San

Pedro Sula. Approximately 63,000 people were living with HIV/AIDS in 1999 equating to a 1.92% prevalence rate in adults (Central Intelligence Agency 2001).

3.5 Health Care Structure in Honduras

Although Honduras has one of the lowest per captia incomes in Central America, it has a health care system that guarantees coverage for all Hondurans. There are three categories of health care in Honduras: public (Ministry of Health,), social security and private sector. (Omaha et al 1998). It is estimated that about 80% of the population has access to health care of which 60% is provided by the Ministry of Health (MOH). The Honduran Social Security Institute (IHSS) covers 11% of the people and the private sectors reach approximately 5% (World Health Organization 1998).

Public institutions are categorized into five levels of service: 1) CESAR (centro de salud rural) where only auxiliary nurses provide services; 2) CESAMO (centro de salud con médico) a health center with a doctor that provides outpatient care and laboratory services; 3) Area Hospital (approximately 50 beds); 4) Regional Hospital (approximately 100-150 beds); 5) National Hospital (highly specialized referral hospitals) (Omaha et al 1998). The public health sub-system also oversees the National Autonomous Water Supply and Sewerage Service (SANAA) (World Health Organization 1998). The private system contains 15 hospitals, numerable clinics and an unknown number of private physicians, many of which are run by religious groups (World Health Organization 1998).

Patients are expected to follow this hierarchy of health services, demonstrated by the preferential treatment referral patients receive in outpatient wards over those without referrals and over those patients in emergency services (Omaha et al. 1998). However, there is no difference in cost for those referred and those non-referred. However, fees do not differ according to the complexity of the service center. That is costs at a hospital are almost no different than those at a health center (Omaha et al. 1998).

Honduras places much emphasis on preventative medicine and education. Promoters from the CESARs and CESAMOs visit communities to monitor and ameliorate basic health problems, like malaria outbreaks and water and sanitation practices.

3.6 Health Sector Regulations

The lack of regulation of the health sector has important implications for the quality of health service delivery in Honduras (World Bank 2000). The accreditation of providers and certification of professionals is not well developed or non-existent, leaving the private sector to grow without appropriate regulation. This puts the public at risk in the hands of services that do not follow minimum quality standards (World Bank 2000). There is also no regulation on the price of domestically made pharmaceuticals however; the Ministry of Finance does control the price and markup of imported drugs (World Health Organization 1998).

In 1998 the government of Honduras (the Flores administration 1997-2001) released a New Agenda for Health 1998-2002 (U.S. Agency for International

Development 1999). The objectives of the agenda include: reform of the structure and operations of the MOH, improvement in access to care – especially for the poorest of the nation, an improvement in efficiency and quality of health service delivery, promotion of community-level care, and a basic package of maternal and child health care services. Honduras hopes to implement the most important regulation within the next four years (World Bank 2000).

3.7 Efficiency and Quality of Health Care

According to World Bank studies (2000) Honduras made considerable progress towards improving access to health services. In the 1990's maternal and child health care received a high degree of expenditure which made access to basic health care more accessible, especially for the poor (World Bank 1998). These strides may also be due to low fees in public hospitals and clinics, which are sometimes waived for the extremely poor. Select prescription drugs are also dispensed at hospitals and clinics free of charge. It should be noted, however, that prices for basic public services are only approximately 5% under what the private sector charges (World Bank 2000).

Health indicators show however, that Honduras is still lagging behind many countries in the region (World Bank 2000). There have been improvements in life expectancy on average, 69.35 years (Central Intelligence Agency 2001), infant mortality 30.88 deaths per 1,000 live births (Pan American Health Organization 2001) but maternal mortality is very high (World Bank 2000) at 110 per 1,000 live births (Pan American Health Organization 2001). The Honduran population is not static and the MOH must

also deal with an increasing population migration to urban centers and a growing HIV/AIDS incidence. Although, Honduras' improvements are undeniable, the poor still demand better health care in terms of availability and quality, the middle class demands more high tech services yet wants cheap public provision of these services (World Bank 1998). These factors will make the goals New Agenda for Health a challenge to achieve.

3.8 Health Sector Inputs

In 1998, the World Bank reported the total health care expenditure in Honduras was 7.2% of the GDP, where private expenditure accounted for over half of that (World Bank 1998). This is up dramatically from the estimates of 2.7% (1990) and 3.0% (1995) (World Health Organization 1998).

When health expenditure is viewed as a proportion of total public expenditure in Honduras, volatile patterns can be seen: from 8.1% in 1990, to 6% in 1993 and to 9.2% in 1995 (World Health Organization 1998). Despite of this, health care expenditure per capita increased from US $18.9 in 1990 to US$ 21.5 in 1995 (World Health Organization 1998). During this time period there was also a decrease in current spending impacting the supply, availability and quality of public health care services (World Health Organization 1998). In addition during the early to mid 1990's inflation outstripped increases in spending and devaluated the Lempira with respect to the dollar causing a negative impact on the procurement and hence availability of supplies, drugs and medical materials. This lack of medical goods exacerbated the supply and quality of health services (World Health Organization 1998). Therefore, although basic pharmaceuticals

are free in public facilities, typically these pharmaceuticals and medical supplies are out of stock. This is not only attributed to pricing and expenditure cuts on pharmaceuticals procurement and distribution but also problems in the supply chain management (World Bank 2000). This deficiency in supplies in the public health sector augments people's perceptions that private hospitals and health services are superior to public offerings (World Bank 2000). In addition, the use of private services may also be preferred due to the probable acceptance of payment in-kind or more lenient of payment types, whereas public services may require full payment.

CHAPTER 4

HONDURAN NATIONAL SURVEY OF HOUSEHOLD INCOME AND EXPENDITURE 1998/99

Encuesta Nacional De Ingresos Y Gastos De Los Hogares 1998/99

In 1999 the Central Bank of Honduras (*Banco Central de Honduras* (BCH)) completed the national survey of household income and expenditures (*Encuesta Nacional de Ingresos y Gastos de los Hogares 1998/99* (ENIGH)). "The purpose of this massive survey was to obtain more information about income, expenditures, household characteristics, household composition and other economic and social variables in the household, buying streams for goods and services, consumption structure, and per capita consumption and nutrition levels, among other things" (ENIGH, principal page). The survey reached sixteen of the eighteen Honduran departments excluding the departments of Thanks to God (*Gracias a Dios)* and the Bay Islands (*Islas de la Bahia)* due to their isolated nature.

4.1 Survey Design

Honduras was geographically divided into four categories for the survey; 1) the Central District, the Tegucigalpa metropolitan area 2) the metropolitan area of San Pedro Sula, 3) all other urban areas, and 4) all rural areas. In total the exact number of homes interviewed was 3,746 where 983 homes were from Central District, 880 homes from the San Pedro Sula area, 1219 from other urban areas and 664 homes from rural areas.

In order to capture seasonality in household consumption the sample from each geographic category was uniformly distributed in four trimester groups such that households in each geographic area were interviewed throughout the year. The survey took place in 1998 and 1999. It should be noted, however that the survey was interrupted due to internal country problems from Hurricane Mitch, which occurred in late October, 1998.

To attain all the information necessary nine different survey formulas were generated and were given to each household over a period of nine days. These nine formulas contain a numerous variables and categories that attempt to account for all the economic transactions within a household. Due to the collection of this tremendous amount of information the periodicity of income generation and expenditures was analyzed in order to create a valid period of reference. Also taken into account was recall ability of different economic transactions in relation to income and expenditures.

4.2 Health Care Expenditures and Health Service Data

The ENIGH survey split health care expenditure questions into different survey formulas according to their period of reference analysis and investigation into expenditure recall ability. All expenditure data used in this thesis has been converted to and assessed on a monthly basis. To do so the expenditures were converted to monthly costs by multiplying weekly expenditures by 4.33, monthly expenditures by 1, trimester expenditure by 0.33, and annual expenditures by 0.08.

In the health care module, the survey asked if any member of the household was sick in the last thirty days, was it an acute illness, did you seek health services for the illness, where did receive attention, and if so, what illness was diagnosed? The ENIGH also recoded the 'where did you receive attention' from multiple categories into hospitals and clinics in the public and private domain, see Table 4.1. Therefore the overall distinction between public or private attention was determined by the ENIGH. Questions such as: how much did you spend on consultations and did you have any preventative treatments or consultations, were also asked. Also, the majority, 87%, of the preventative care sought was for vaccines, which are given out free by the government. Thus preventative care was not considered in this analysis.

4.3 Description of the Variables

It is necessary at this point to note that this thesis uses the ENIGH definition of "household." The ENIGH defines a household as a place where one or more people share or depend on a common income for expenditures and who have resided in the same place for the majority of the last six months. Each variable used is described below.

Total Health Expenditures: The sum of all health service and medical good expenditures for each household, as a monthly average.

Income: The total monthly income calculated by ENIGH for each household.

Gender of the Head of Household: The self identified sex of the head of household.

TABLE 4.1 Select Variables from the ENIGH Health Survey

Question/ Data Collected HH = household	**Additional Information**
Total number of HH members	total in survey: 19,117
Sickness in the last 30 days	total saying yes: 3,704
Was it an acute illness?	total saying yes: 2,664
Did you receive any attention?	total saying yes: 1,531
What was the acute illness?	Recorded only if attention was received (n =1,529) • Respiratory problems (n= 539) • Diarrhea/Vomiting (GI) (n=86) • Other GI problem (n= 76) • No description given (n= 41) • Hepatic Disease (n= 7) • Dental problems (n= 27) • Cardiovascular problems (n= 15) • Skin problems (n= 70) • Articulation problems (n= 18) • Urinary problem (n= 16) • Gynecological problem (n= 25) • Genital Problem (n= 4) • Malaria/Dengue (n= 192) • Accident/Trauma (n= 24) • Wounds (n= 9) • Intoxication (n= 1) • Headache (n= 31) • Fever/Chills (n= 109) • Tuberculosis (n= 0) • Diabetes (n= 1) • Hypertension (n= 4) • Cancer (n= 0) • Ear ache (n= 17) • ETS (n= 0) • AIDS (n= 0) • Asthma (n= 20) • Allergies (n= 21) • Nerves (n= 23) • Other (n= 146) • Don't Know (n= 7)
Where did you receive attention? (ENIGH coding)	• Public Hospitals (n= 232) • Private Hospitals (n= 77) • Public Clinics (n= 477) • Private Clinics (n= 744)

Source: ENIGH (1999)

Age of the Head of Household

Education Level of the Head of Household: Four levels of education were defined by the ENIGH, these were: 1) no education, 2) primary school education, 3) secondary school education, and 4) university level education.

Number of Household Members

Urban vs. Rural: The locale of the household may be either urban or rural.

Attention: A binary variable explaining whether a household member that was sick with an acute illness in the last thirty days actually sought medical attention for the illness.

Private or Public: A binary variable defining those, who were sick in the last thirty days and sought attention that choose to consult either a private or public practitioner.

Gender of the Sick: the sex of the person who was sick in the last thirty days.

Age of the Sick: the age of the person who was sick in the last thirty days.

Malaria/Dengue: A variable defining those who were sick in the last thirty days, who sought attention and were diagnosed with either malaria or dengue.

Acute Respiratory Infection (ARI): A variable defining those who were sick in the last thirty days, who sought attention and were diagnosed with an acute respiratory infection.

Stomach or intestinal illness: A variable defining those who were sick in the last thirty days, who sought attention and were diagnosed with a stomach or intestinal illness.

Skin infection or disease: A variable defining those who were sick in the last thirty days, who sought attention and were diagnosed with a skin infection or disease.

Fever: A variable defining those who were sick in the last thirty days, who sought attention and were diagnosed with a fever.

CHAPTER 5

HEALTH EXPENDITURE AND HEALTH SERVICE CHOICE MODELS

This chapter presents the empirical specifications of the model for health expenditure estimation and health service choice of use. Two models will be estimated, 1) a tobit model examining health expenditures and 2) a nested -probit model assessing health services seeking behavior, i.e. the choice to seek medical attention and factors involved in choosing public or private health care for acute illnesses.

5.1 The Tobit Health Expenditures Model

Overall health care expenditures, including health services and medicinal goods, can be estimated using a censored regression model. Unlike food expenditure models, where practically all households spend money on foodstuffs, many households actually report zero expenditures on health care in a given survey time frame. However, among the households that report any spending, there will be likely a wide variation in the quantity spent. The tobit model of regression allows analysis of this kind of data. This censored regression model to describe overall health expenditures is defined as follows:

$$(5.1) \quad \text{HealthTot}_i^* = \mathbf{x}_i\beta + u_i \qquad HealthTot_i = \begin{cases} HealthTot_i^* \geq 0 \\ 0 \end{cases}$$

where HealthTot_i^* is an unobserved latent variable, which may also be denoted as y_i^*.

$HealthTot_i$ is the observed total monthly health care expenditure by an i^{th} household per month and which may also be referred to in this thesis as y_i. $\boldsymbol{x}$ is a vector of exogenous variables, β is the vector of parameters to be estimated, and u_i are residuals that are independently and normally distributed.

5.1.1 Choice of Variables

Each variable included in the overall health expenditures was chosen in response to the anthropological and health economics literature. These variables represent economic, household and geographical influences on health expenditures. The expenditure on health is specified as a function of head of household and general household factors.

The exogenous variables are defined as follows:

$\boldsymbol{x}$ = (MaleHH, AgeHH, NoEducation, PrimaryEducation, SecondaryEducation, No. Members, Income, IncomeSquare, IncomeCube, Urban)

MaleHH	= The gender of the head of household, a dummy variable where male=1.
AgeHH	= The age of the head of household
No Education	= Dummy variable for no education of the head of household, no education = 1
Primary Education	= Dummy variable for primary education level of the head of household, primary education = 1

Secondary Education = Dummy variable for secondary education level of the head of household, secondary education = 1

No. Members = Number of household members

Income = Total monthly household income in 100 Lempiras

Income Square = Total monthly household income in 100 Lempiras, squared

Income Cube = Total monthly household income in 100 Lempiras, cubed

Urban = Dummy variable for location of the household, urban =1

IncomeSquare and IncomeCube are included in the analysis to test the hypothesis that health expenditures will increase at an increasing rate with higher levels of income.

5.1.2 Testing for Heteroscedasticity

The tobit model is sensitive to misspecification and may impose a structure on censored or truncated data that is not well fitted, thereby causing inconsistent estimates. One "eyeball" test to judge whether a tobit is misspecified is to compare the maximum likelihood estimates from the tobit model with the estimates from a probit model from the same data, where nonzero values are treated as one and zero values as zeros. If scaled parameter estimates from both models are very different, it suggests that the probit is misspecified (Johnston and DiNardo 1997).

Once there is some assurance that the tobit model is not misspecified, testing for heteroscedasticity is essential; the tobit model is sensitive to non-spherical disturbances. To assure that the parameter estimates are consistent and not related to the error variance

(σ^2) heteroscedasticity may be tested for by the likelihood ratio (LR) test. Whereby the log likelihood ratio of a full model (L_f) is compared to that of a reduced model (L_r) as seen below:

(5.2) $$LR = 2 \bullet \left(L_f - L_R \right) \sim \chi^2_{\text{df}}$$

The LR test has a chi-square distribution, where the degrees of freedom (df) correspond to the number of restrictions.[1]

5.1.3 Calculating Marginal Effects

To calculate the marginal effects the continuous variable means and dummy variables set to 0 or 1 are used in order to calculate the parameter estimates ($\mathbf{x\beta}$). For continuous explanatory variables not contributing to heteroscedasticity, marginal effects are calculated using y_i, y_i* as described earlier and the standard deviation (σ) as follows:

(5.3) $$E\left(y_i \mid x \right) = E\left(y_i^* \mid y_i^* \geq 0 \right) \bullet \Phi\left(\frac{\mathbf{x\beta}}{\sigma} \right)$$

such that

(5.4) $$\frac{\partial E\left(y_i \mid \boldsymbol{x} \right)}{\partial x_j} = \beta_j \bullet \Phi\left(\frac{\mathbf{x\beta}}{\sigma} \right)$$

These marginal effects may need to be modified in the presence of heteroscedasticity and if the explanatory variable of interest x_j influences the variance of the error term. In particular suppose that the error term is specified as $\sigma_i^2\left(\gamma, x\right)$. Then the marginal effects would be given by (Aradhyula 2003):

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[1] For further discussion see Maddala 1983, p. 179-182.

$$(5.5)\quad \frac{\partial E(y \mid x)}{\partial x_j} = \beta_j \bullet \Phi\left(\frac{\mathbf{x}\beta}{\sigma}\right) + \phi\left(\frac{\mathbf{x}\beta}{\sigma}\right) \bullet \left(\frac{\partial \sigma_i}{\partial x_j}\right)$$

5.1.4 Calculating Income Elasticities

The income elasticity can then be estimated using the following equation:

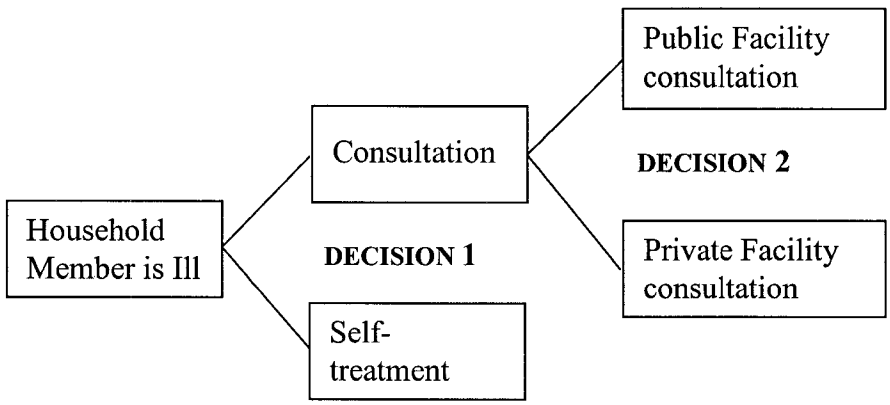
$$(5.6)\quad Income\ elasticity = \frac{\partial E(y|x)}{income} \bullet \frac{income}{E(y \mid x)}$$

To calculate the income elasticities the continuous variable means were held constant and the dummy variables set to either 0 or 1. Income is varied in order to evaluate the income elasticities over the entire range of income.

5.2 Health Service Choice Models

The statistical method is a nested probit, where a sequence of decisions can be modeled. The first decision considers the choice of the individual whether to seek or not to seek health services, when sick with an acute illness. The second choice is dependent on the first and examines those who sought a consultation and considers their choice of public or private care. This model is visually described in Figure 5.1.

Figure 5.1 Sequence of Health Service Decision-Making



The sequence of health services decision-making is modeled as follows:

(5.7) Health service attention Model

$$\text{Attention}^* = \mathbf{x}_1\beta_1 + u_1 \qquad Attention = \begin{cases} 1 \text{ if } Attention^* \geq 0 \\ 0 \end{cases}$$

(5.8) Health service choice Model

$$\text{Public}^* = \mathbf{x}_2\beta_2 + u_2 \qquad Public = \begin{cases} 1 \text{ if } Public^* \geq 0 \\ 0 \end{cases}$$

where $\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \sim N\left[0, \begin{pmatrix} \sigma_{11} & \sigma_{12} \\ \sigma_{21} & \sigma_{22} \end{pmatrix}\right]$

Attention* and Public* are the unobserved latent variables, which may be referred to as y_1 and y_2; $\mathbf{x}_1$ and $\mathbf{x}_2$ are vectors of exogenous variables; and β_1 and β_2 are vectors of

unknown parameters. The disturbances $\begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$ are assumed to be distributed normally with a mean of zero and a symmetric variance covariance matrix. Both σ_{11} and σ_{22} are normalized to be 1. Attention and Public are the observed health actions representing whether or not health service attention was sought and whether public health services were chosen, respectively. The parameters are estimated using maximum likelihood methodology, which barring any misspecification, provide consistent estimators.

5.2.1 Choice of Variables

Like in the Tobit model each variable included was chosen in response to the anthropological and health economics literature, and the variables used are thus similar. Again, they represent economic, household and geographical influences on health services use and choice. In addition, characteristics of the sick family member have been included in this analysis.

There are, however, five additional variables in the type of health service choice model. These represent five major illness categories that were commonly diagnosed among the patients seeking care. These were not available for use in the health service attention model because those who did not seek care were not clinically diagnosed.

Overall the exogenous variables in $\mathbf{x}_1$ and $\mathbf{x}_2$ are defined as follows:

$\mathbf{x}_1$ =(MaleHH, AgeHH, NoEducation, PrimaryEducation, SecondaryEducation, GenderSick, AgeSick, No.Members, Income, Urban)

$\mathbf{x}_2$ =(MaleHH, AgeHH, NoEducation, PrimaryEducation, SecondaryEducation, GenderSick, AgeSick, No.Members, Income, Urban, Malar/Deng, ARI, Gastro, Fever, Skin)

The additional variables used in the nested probit, that were not described in section 5.1.1 are:

MaleSick	= A dummy variable for the gender of the sick family member, where 1=male
AgeSick	= Age of the sick family member
Malar/Deng	= A dummy variable for malaria or dengue Fever, where 1= malaria or dengue
ARI	= A dummy variable for Acute Respiratory Infection where 1= ARI
Gastro	= A dummy variable for gastro-intestinal illness where 1= gastro
Fever	= A dummy variable for fever, where 1= fever
Skin	= A dummy variable for skin infection or disease, where 1 = skin infection

5.2.2 Testing for Heteroscedasticity

The ENIGH data is cross-sectional in nature and such data are commonly wrought with heteroscedasticity problems, which when not accounted for lead to inconsistent estimators. In Probit models it is impossible to estimate the parameters (β) and the error variance (σ^2) separately, but is easily resolved by restricting the error variance to a known constant, i.e. Var (u) = σ^2 = 1 (Godfrey 1988). It is the assumption of a constant variance that allows for consistent estimation of β. Heteroscedasticity will be checked using the langrange multiplier (LM_2) test.[2] The LM_2 test has a chi square distribution with k + q degrees of freedom where k is the number of parameters and q is the number of restrictions. If heteroscedasticity is found the log-likelihood will be re-written appropriately.

5.2.3 Calculating Marginal Effects

The marginal effects in the attention portion (y_1) of the model (univariate case), where no heteroscedasticity is present, for continuous explanatory variables are calculated by:

$$(5.9) \quad \frac{\partial E(y_1 \mid \boldsymbol{x})}{\partial x_j} = \beta_j \bullet \phi_1(\boldsymbol{x}_1\boldsymbol{\beta}_1)$$

where ϕ_1 is the probability density function for the attention model. However, to calculate the marginal effect for a dummy explanatory variable, the expected value of y given that the variable takes on the value of zero is subtracted from the expected value of y given

[2] For more information see Godfrey 1988, p. 217.

that the dummy variable takes on the value of one. The marginal effect of x_j is calculated by:

$$(5.10)\quad E\left(y_1 \mid x_j = 1\right) - E\left(y_1 \mid x_j = 0\right) = \Phi\left(\boldsymbol{x}_1\boldsymbol{\beta}_1 \mid x_j = 1\right) - \Phi\left(\boldsymbol{x}_1\boldsymbol{\beta}_1 \mid x_j = 0\right)$$

where Φ is the cumulative density function from the attention model.

The calculation of the marginal effects of the health service portion of the model however becomes more complicated, because of the bivariate nature of the case. The expected value of the health service choice portion of the model (y_2) given that attention (y_1) is sought, is:

$$(5.11)\quad E\left(y_2 \mid y_1 = 1\right) = prob\left(y_2 = 1 \mid y_1 = 1\right) = \frac{\Phi_2\left(\frac{\boldsymbol{x}_1\boldsymbol{\beta}_1}{\sigma_1}, \frac{\boldsymbol{x}_2\boldsymbol{\beta}_2}{\sigma_2}, \rho\right)}{\Phi_1\left(\frac{\boldsymbol{x}_1\boldsymbol{\beta}_1}{\sigma_1}\right)}$$

The marginal effects for continuous variable x_j is obtained by differentiating the above expression with respect to x_j. Through algebraic manipulation we get:

$$(5.12)\quad \frac{\partial prob\left(y_2 = 1 \mid y_1 = 1\right)}{\partial x_j} = \frac{1}{\Phi}\left[\frac{-\phi\left(\frac{\boldsymbol{x}_1\boldsymbol{\beta}_1}{\sigma_1}\right)\beta_{1j}\Phi_2}{\Phi\left(\frac{\boldsymbol{x}_1\boldsymbol{\beta}_1}{\sigma_1}\right)} + \frac{\partial\Phi_2}{\partial x_j}\right]$$

where:

(5.13)

$$\frac{\partial \Phi_2}{\partial x_j} = \left(\frac{\beta_{2j}}{\sigma_2}\right)\phi\left(\frac{x_2\beta_2}{\sigma_2}\right) \bullet \overbrace{\int^{\frac{x_1\beta_1}{\sigma_1}} \frac{\phi_2\left(t, \frac{x_2\beta_2}{\sigma_2}, \rho\right)}{\phi\left(\frac{x_2\beta_2}{\sigma_2}\right)} dt}^{prob\left(z_1 \le \frac{x_1\beta_1}{\sigma_{11}} \,\middle|\, z_2 = \frac{x_2\beta_2}{\sigma_{22}}\right)} + \left(\frac{\beta_{1j}}{\sigma_1}\right)\phi\left(\frac{x_1\beta_1}{\sigma_1}\right) \bullet \overbrace{\int^{\frac{x_2\beta_2}{\sigma_2}} \frac{\phi_2\left(t, \frac{x_1\beta_1}{\sigma_1}, s, \rho\right)}{\phi\left(\frac{x_1\beta_1}{\sigma_1}\right)} ds}^{prob\left(z_2 \le \frac{x_2\beta_2}{\sigma_{22}} \,\middle|\, z_1 = \frac{x_1\beta_1}{\sigma_{11}}\right)}$$

and ϕ_2 and Φ_2 are the probability density functions and the cumulative density function for the bivariate normal respectively, ρ is the covariance, and s is the standard deviation.

The above is for the continuous variables only. In order to calculate the marginal effects of the dummy explanatory variables, the expected value of y_2 when the binary variable is equal to zero is subtracted from the expected value of y_2 when the binary variable is equal to one; this is similar to the univariate case. The calculation of the marginal effect of a dummy explanatory variable, x_j, can be seen in the following equation:

(5.14) Marginal effect of x_j =

$$\left(\frac{\Phi_2\left(\frac{x_1\beta_1}{\sigma_1}, \frac{x_2\beta_2}{\sigma_2}, \rho\right)}{\Phi\left(\frac{x_1\beta_1}{\sigma_1}\right)} \middle| x_j = 1\right) - \left(\frac{\Phi_2\left(\frac{x_1\beta_1}{\sigma_1}, \frac{x_2\beta_2}{\sigma_2}, \rho\right)}{\Phi\left(\frac{x_1\beta_1}{\sigma_1}\right)} \middle| x_j = 0\right)$$

The previous calculations examined the marginal effects of explanatory variable common to both the attention and health services models. However, the health services portion of the model contains the illness variables that are not found in the attention segment of the model. The formula to calculate the marginal effects of such unique dichotomous explanatory variables can be seen below:

$$(5.15)\quad \frac{\partial E(y_2 \mid y_1 = 1)}{\partial x_j} = \frac{1}{\Phi} \bullet \left(\frac{\partial \Phi_2}{\partial x_j} \right)$$

where $\left(\frac{\partial \Phi_2}{\partial x_j} \right)$ is as defined above and x_j in this case represents an illness variable.

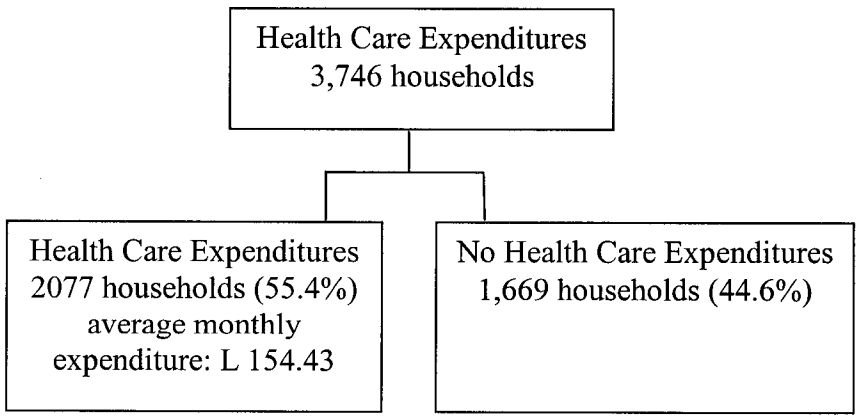
CHAPTER 6

ESTIMATION AND RESULTS OF THE HEALTH EXPENDITURES TOBIT MODEL

6.1 Data Overview

The overall summary for household health care expenditures can be seen in Figure 6.1. Of the 3,746 households in the ENIGH survey, approximately 55% or 2,077 of them reported some amount of spending on health. These households spent, on average, 154.43 L in a month on health care expenditures. This descriptive data is the basis of the Tobit regression analysis for predicting household health care expenditures and ultimately household income elasticities.

Figure 6.1 Households and Health Care Expenditures



6.2 Estimation of the Model

Previously stated in chapter 5, the health expenditures tobit model is defined as:

$$(6.1) \quad HealthTot_i^* = \mathbf{x}_i\beta + u_i \qquad HealthTot_i = \begin{cases} HealthTot_i^* \geq 0 \\ 0 \end{cases}$$

The dependent variable, $HealthTot_t$ is the total monthly health care expenditure by a given household *i*, per month. The term ***x*** is a vector of exogenous variables and β is the vector of parameters to be estimated and u_i are residuals that are independently and normally distributed. The exogenous variables in ***x***, were explained in Chapter 5, but again are:

x = (MaleHH, AgeHH, NoEducation, PrimaryEducation, Secondary Education, No. Members, Income, IncomeSquare, IncomeCube, Urban)

Heteroscedasticity is an important consideration in cross sectional data. In the case of the tobit, a limited dependent variable model, if heteroscedasticity is ignored the resulting estimated may not only be biased but also inconsistent (Maddala 1983). A Likelihood Ratio (LR) test showed that heteroscedasticity is present in the model (χ^2=1113, df=4).

Accordingly the standard deviation of the disturbance term is specified as:

$$(6.2) \quad SE(u_i) = \sigma_i = abs(\gamma_0 + d_1\text{*NoEdu} + d_2\text{*Primary} + d_3\text{*Income} + d_4\text{*Urban})$$

The health expenditures tobit model in (6.1) and (6.2) was estimated using TSP 4.5 software. TSP uses analytic first and second derivatives to obtain the maximum likelihood estimates via the Newton-Raphson algorithm[2]. The log-likelihood with heteroscedasticity correction is:

$$(6.3) \quad \sum_0 \log\left[1-\Phi\left(\frac{\mathbf{x}_i\boldsymbol{\beta}}{\sigma_i}\right)\right]+\sum_1 \log\left[\frac{1}{\sigma_i}\phi\left(\frac{y_i-\mathbf{x}_i\boldsymbol{\beta}}{\sigma_i}\right)\right]$$

where the first summation refers to the set of observations where HealthTot = 0 and the second summation to where HealthTot > 0; Φ is the cumulative density function, and ϕ is the probability density function for standard normal random variable.[3]

6.3 Results

6.3.1 The Health Expenditures Model

The results of the tobit regression on monthly health expenditures are shown in Table 6.1. There is a highly significant positive relationship ($p < 0.01$) between the age of the head of household, income and locality on monthly household expenditures. The number of household members also positively exerts influence on household expenditures ($p < 0.10$).

The results of the regression and sign of the coefficient implies that as heads of households get older more money is spent on health care (p=0.002), which supports the

[2] See Greene 2000, p. 191, for more information.
[3] See Maddala 1983, p. 180, for more information.

initial hypothesis for this variable, as stated in Chapter 1. This may be due to the decrease in the number of children (consumers) and the corresponding increase in the number of wage earners (producers) as the household itself ages. Older heads of households may also be able to earn more than their younger counterparts. The calculated marginal effect of the age of the head of household variable indicates that for each additional year of age 0.61L more was spent on health care.

The regression analysis supports the initial theory that as income rises more money is spent on health care ($p=0.022$). Poorer households may choose to delay seeking health solutions or attempt to solve them with minimal expenditures due to financial constraints, while more affluent households do not feel the same pecuniary limitations and can afford to seek medicinal and/or health care. Due to the nature of the regression and relationship between the income variables, a single marginal effect was calculated using all three income variables, which revealed that as income changes by 100 L unit, monthly health care expenditures increase by 0.98 L. It also appears that as income rises health care expenditures also increase- indicating that these two variables have linear relationship, rather than eventually leveling off.

Increasing numbers of household members also impacts monthly health care expenditures ($p=0.078$), for each additional household member approximately 2 additional Lempiras was spent per month. This outcome is also corresponds with the hypothesis summary for household size, as described in Chapter 1.

The regression analysis revealed a significant relationship between geographic location and health care expenditure ($p=0.018$). However, in contrast to the initial

hypothesis, the sign on the urban coefficient indicates that rural households spend more money on health care than urban ones. Yet, the sign of the marginal effect is positive. This reversal in signs from the coefficient to marginal effect indicates something is amiss. Further investigation determined that while the sign of the coefficients and marginal effects of variables not causing heteroscedasticity are the same in Tobit models, this is not necessarily the case in heteroscedasticity causing variables; meaning signs of coefficients and marginal effects do not necessarily correspond.[3] It is the sign of the marginal effect and not the sign of the coefficient that determines the overall effect of a heteroscedasticity-causing variable.

TABLE 6.1 Parameter Estimates, P-values and Marginal Effects of the Health Expenditures Tobit Model

Variable	Coefficient	p-value	Marginal effects	p-value
Intercept	-33.9674	.635		
MaleHH	-12.9451	0.326	-7.19498	.328
AgeHH	1.10028	0.002**	0.60621	0.003
No Education	-40.0504	0.526	82.8767	0.000
Primary Education	-13.5016	0.843	25.9693	0.000
Secondary Education	3.08329	0.966	9.24058	0.649
No. Members	3.73753	0.078*	2.05924	0.077
Income	1.29495	0.022**		
Income Square	0.00421	0.224	.980410	0.000
Income Cube	-0.0000048938	0.202		
Urban	-44.4610	0.018**	69.4291	0.000
Heteroscedasticity Equation				
Intercept	350.511	0.00		
No Education	-306.559	0.00		
Primary Education	-277.373	0.00		
Income	3.20126	0.00		
Urban	247.532	0.00		
n = 3,746				

*Significant at the 0.1 level ** Significant at the 0.05 level

[3] For more information see Aradhyula, 2003.

Overall, the analysis shows that urban households will on average spend 69L more a month on health care than their rural counterpart. This result supports the supposition that urban households spend more money on health care than rural households do. This may be because urban households have better access to and greater selection of medical goods and health services than rural households do and they may have better information about benefits of health services.

6.3.2 Income Elasticities

Income elasticities can vary according to demographic, geographic and social characteristics. Therefore in order to view income elasticities for health care, it is necessary to keep certain variables used in the tobit regression constant thereby providing a snapshot of what income elasticities may look like. For the income elasticities calculated the age of head of household and number of household members are held constant at their mean values of 39.32 years and 5.12 people respectively. The calculated standard deviation (needed to correct for heteroscedasticity) is based, however, on the median monthly income rather than the mean due to the highly skewed income distribution. Income elasticities were then evaluated by varying the remaining dichotomous variables; gender of head of household, geographic location, and education level of the head of household.

We can see in Figure 6.2 that income elasticities according to gender of head of household and geographic location, while holding primary education level constant, male and female heads of household have similar income elasticities. In contrast urban

households have much lower income elasticities than do rural households, indicating that urban households are less responsive to health care spending as income changes.

To provide a better picture of the income elasticities according to the ENIGH income distribution, income percentiles are included on the Figures 6.2 and 6.3, which show that income elasticities for health expenditures increase as income level increases. The graphic shows that fifty percent of the households surveyed have elasticities of less than 0.35 in rural areas and less than 0.18 in urban areas. At the 89^{th} and 93^{rd} income percentiles, for rural and urban households respectively, that health care changes from being a normal good, with an elasticity less than one, to a luxury good, with an elasticity greater than one.

Figure 6.3 provides a comparison of geographic location and education level of the head of household, while keeping male headed of households constant. The figure demonstrates a dramatic variation in household sensitivity to health care expenditure.

Rural areas have the large differences in income elasticities according to education level. Heads of household with no education level have a much more rapid increase in income elasticity, with an elasticity of 0.42 at the 50^{th} percentile of income, compared to 0.35 for heads of households educated at the primary level, and 0.15 for heads of household with a secondary level education. Figure 6.3 shows that the greater the education the more elastic health care expenditure is and that a small change in income for those with higher levels of education, results in a larger expenditure on health care. This analysis also reveals that health care becomes a luxury good at high income

levels; at the 83rd, the 89th, and 97th income percentiles for households with heads that have no education, primary and secondary education respectively.

As in Figure 6.2, Figure 6.3 shows that urban households have lower income elasticities than do their rural counterparts. Income elasticities in urban areas do not vary as greatly among different head of household education level as do rural households. The graph shows little difference between income elasticities of households with no education or primary education. Heads of household with no education level have an income elasticity of 0.19 at the 50th percentile of income, compared to 0.17 for heads of households educated at the primary level, and 0.10 for heads of household with a secondary level education. Urban households are income elastic and are therefore much less reactive in health care spending as income increases.

This investigation also shows that in urban areas, health care becomes a luxury good, in the 95th income percentile for households with heads that have no education or a primary education. However, health care does not become a luxury good for households headed by people with a secondary education.

These findings do not support the initial hypothesis that the households reach a point where income no longer constrains health care expenditures. Elasticities increase in a linear fashion from highly inelastic for low-income levels to elastic at very high-income levels. Overall health care has been shown to be a normal good for the majority households. It is clear that at even very low incomes, households choose to spend on health care. As income rises, households spend an even larger proportion of their total

expenditures on health. It is also possible that high-income households have insurance for health care that was not accounted for in the ENIGH survey.

Figure 6.2 Income Elasticities for Health Care According to Gender of the Head of Household and Geographic Location

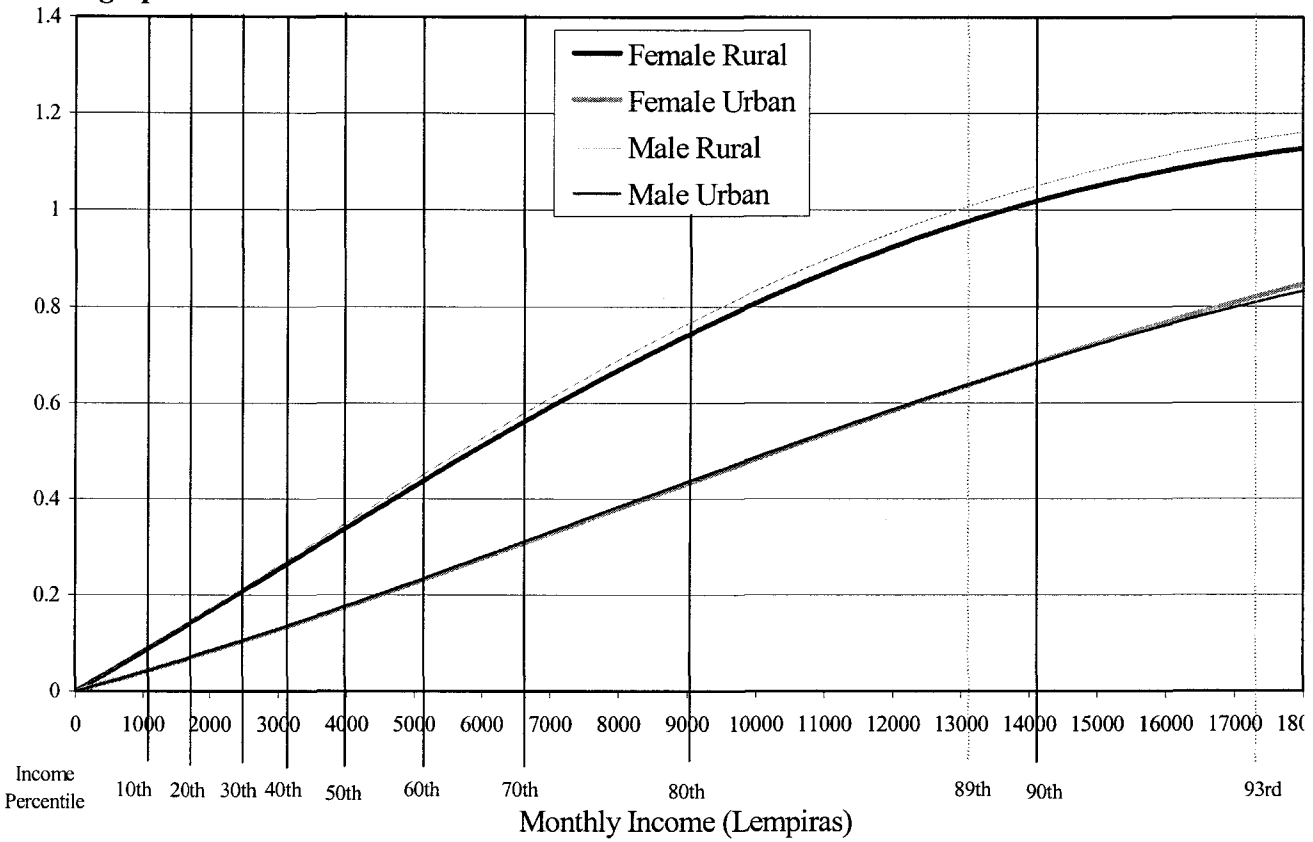
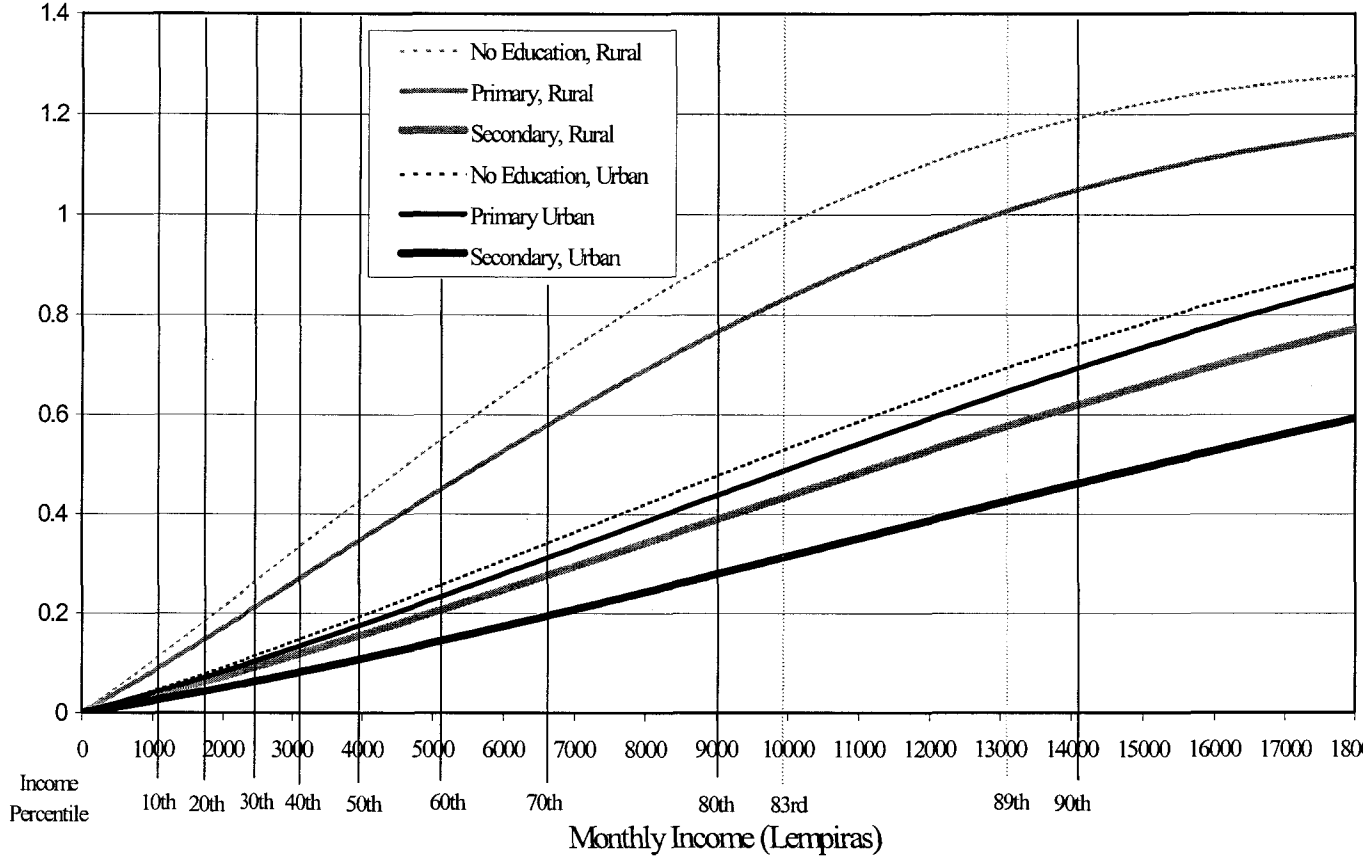


Figure 6.3 Income Elasticities for Health Care by Education Level of the Head of Household and Geographic Location



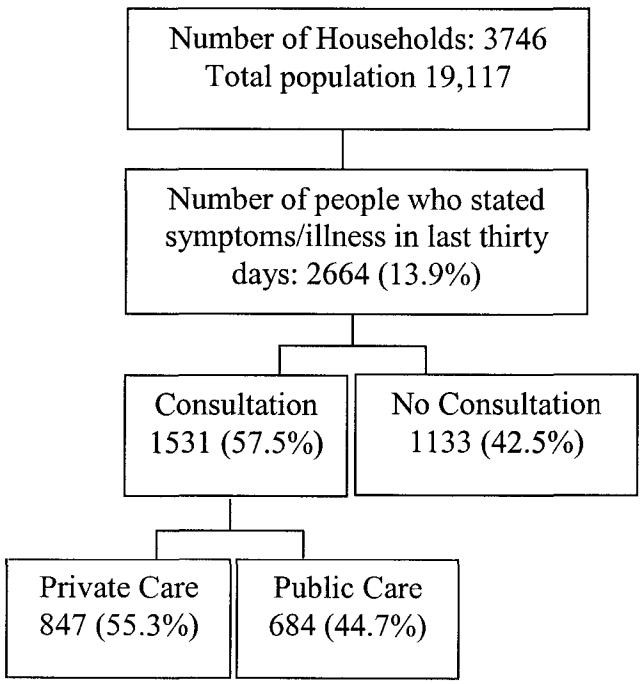
CHAPTER 7:

ESTIMATION AND RESULTS OF THE PROBIT HEALTH SERVICE MODELS

7.1 Data Overview

The utilization of health services is assessed by the patterns of health services use and trends in the type of care sought (Figure 7.1). Of the 19,117 people in the ENIGH survey, approximately 14% or 2,664 people reported an acute illness in the last thirty days. Almost 58% or 1531 people sought a consultation for the illness and of these approximately 45% or 684 people reported visiting a public health care facility. Note

FIGURE 7.1 Population in the Study, Those Reporting Illnesses and Treatment Type



that each observation corresponds to an individual not a household. The nested probit analysis of health services utilization is based on this data taken from the ENIGH survey and attempts to explain the households' decisions to seek and use health services when a member is ill.

7.2 Estimation of the Model

As stated in chapter 5 the health services nested probit model is defined as:

$$(7.1)\quad \text{Attention}^* = \mathbf{x}_1\beta_1 + u_1 \qquad Attention = \begin{cases} 1 \text{ if } Attention^* \geq 0 \\ 0 \end{cases}$$

If *Attention* = 1, then:

$$(7.2)\quad \text{Public}^* = \mathbf{x}_2\beta_2 + u_2 \qquad Public = \begin{cases} 1 \text{ if } Public^* \geq 0 \\ 0 \end{cases}$$

The endogenous variable Attention_i is binary representation of whether or not a family member sought medical attention while sick with an acute illness and the endogenous variable Public_i is binary representation of whether or not a sick family member sought medical attention from a public or private practitioner. The vector $\mathbf{x}_i$ represents the exogenous variables, β are the coefficients to be estimated, and u_i the error term. The exogenous variables, which were explained in chapter 5, that are represented by $\mathbf{x}_1$ and $\mathbf{x}_2$ are:

$\mathbf{x}_1$ =(MaleHH, AgeHH, NoEducation, PrimaryEducation, SecondaryEducation, GenderSick, AgeSick, No. Members, Income, Urban)

$\mathbf{x}_2$ =(MaleHH, AgeHH, NoEducation, PrimaryEducation, SecondaryEducation, GenderSick, AgeSick, No. Members, Income, Urban, Malar/Deng, ARI, Gastro, Fever, Skin)

As explained in chapter 5 due to the nature of cross sectional data it is necessary to check for heteroscedasticity caused by inconsistent estimators. The LM_2 test, on the health services attention model (individual, un-nested, probit model), showed that no heteroscedasticity is present at the 95% confidence level. However, the LM_2 test for heteroscedasticity in the health service choice portion of the model showed evidence that the variable 'income' caused the heteroscedasticity in the health service choice model (χ^2 = 78.71, df 18).

In order to correct for the presence of heteroscedasticity, the variance of the error term in (7.2) is specified as:

(7.3) $\quad \text{var}(u_i) = \sigma_i^2 = e^{di*ingre100i}$

Parameters in the nested probit model in (7.1), (7.2), and (7.3) were estimated using TSP 4.5 software by maximizing the following likelihood function:

$$(7.4) \quad \sum_{0} \ln \Phi(\mathbf{x}_{1i}\boldsymbol{\beta}) + \sum_{1,0} \ln \Phi_2\left(\mathbf{x}_{1i}\boldsymbol{\beta}, \frac{\mathbf{x}_{2i}\boldsymbol{\beta}_2}{\sigma_{2i}}, -\rho\right) + \sum_{1,1} \ln \Phi_2\left(\mathbf{x}_{1i}\boldsymbol{\beta}, \frac{\mathbf{x}_{2i}\boldsymbol{\beta}_2}{\sigma_{2i}}, \rho\right)$$

where, $\sum_{0} \ln \Phi(\mathbf{x}_{1i}\beta)$ represents Attention$_i$ = 0

$$\sum_{1,0} \ln \Phi_2 \left(\mathbf{x}_{1i}\beta, \frac{\mathbf{x}_{2i}\beta_2}{\sigma_{2i}}, -\rho \right)$$ represents Attention$_i$ = 1 and Public$_i$ = 0

and $$\sum_{1,1} \ln \Phi_2 \left(\mathbf{x}_{1i}\beta, \frac{\mathbf{x}_{2i}\beta_2}{\sigma_{2i}}, \rho \right)$$ represents Attention$_i$ = 1 and Public$_i$ = 1

The Newton-Raphson method is used for searching for optimal parameter estimates. R-square measurement is calculated in terms of the proportion of correct predictions (count R^2).

$$R^2_{count} = \frac{1}{N} \sum n$$

Where, N is the number of observations and *n* the number of correct predictions for outcome.[4]

7.3 Results

7.3.1 Health Service Attention

The results, the parameter estimates, p-values and marginal effects of the health service attention model are presented in Table 7.1. The variables with a significant effect (p value < .01) on the probability of seeking health services include age, gender and no education level of the head of household; age of the sick household member; and geographic locality. The signs of these significant coefficients, as explained in chapter 1, are all as expected.

[4] See Long 1997, p. 107, for more information.

The older the head of household the more likely the sick household member is to seek practitioner attention. This may be due to links between age and higher income levels and/or experience. Older heads of households are more likely to receive better pay and likely have more income earners within the home than younger head of household counterparts. Furthermore older heads of household may have more experience with signs and symptoms of illnesses and disease that warrant medical attention.

Male-headed households have a negative effect on the probability of seeking medical attention when a member is sick. In other words sick household members are more likely to be taken for a medical evaluation if the head of household is female. This was not an expected out come; although female-headed households spend more on illnesses and health care they also typically have less time to travel and wait for health services.

TABLE 7.1 Parameter Estimates, P-values and Marginal Effects of the Health Service Attention Probit Model

Variable	Coefficient	p-value	Marginal effects	p-value
Intercept	0.104667	.465		
MaleHH	-0.145035	.011**	-0.07727	.004
AgeHH	0.00597	.003***	0.00234	.003
No Education	-0.344116	.004***	-.159264	.000
Primary Education	0.057826	.549	.136840	.000
Secondary Education	0.112873	.254	.021704	.618
MaleSick	-0.057197	.255	-0.02229	.255
AgeSick	-0.006418	.000***	-0.00251	.000
No. Members	-0.002182	.823	-0.00085	.823
Income	0.000231	.522	0.00009	.552
Urban	0. 128951	.063*	.028294	.395

$R^2 = 0.60$, n = 2,656

* Significant at the 0.1 **Significant at the 0.05 level *** Significant at the 0.01 level

Heads of households with no education also have negative effects on the probability of seeking medical attention when a member is sick. Although no other education variable had a significant effect on seeking health service attention. Heads of households with no education may not have been exposed to any modern health education and may not recognize the need for medical attention. Low education levels are also associated with low income, which may lead to treatment delay or negation due to lack of funds or lack of free time. Those with lower levels of education may also be forced to live in marginalized areas far from medical facilities.

The only characteristic of a sick individual that had a significant effect was age; the younger sick household member, the higher the probability of having sought medical attention. Children and young tend to suffer more from illness than do older community members who may have already had the illness or have herd immunity. Older members may also be better able or need to withstand illness symptoms in order to carry on with their daily lives.

Finally, urban dwellers also are more likely to seek care over rural residents. Urban residents have better access to and more choice in deciding to seek medical attention. In addition, rural residents often must travel in order to seek health care, making the health service seeking process more difficult.

7.3.2 Health Service Choice

Table 7.2 presents the estimated coefficients, p-value and marginal effects of the corrected health service choice portion of the model. The signs of all the significant

coefficients are as expected as explained in chapter 1. The variables with a significant effect (p value < 0.01) on choosing public health services include: the age and education level of the head of household, number of household members; income; and whether the illness was an ARI. The variables secondary education level malaria/dengue were also significant at the p-value < 0.1.

TABLE 7.2: Parameter Estimates, P-values and Marginal Effects of the Health Service Choice Probit Model

Variable	Coefficient	p-value	Marginal effects	p-value
Intercept	0.414067	.376		
MaleHH	-0.015191	.904	-0.025586	.372
AgeHH	-0.016545	.000***	-0.0040725	.000
No Education	1.10983	.000***	0.094843	.081
Primary	0.880086	.007***	0.094438	.002
Secondary	0.506431	.102*	0.131996	.011
MaleSick	-0.111892	.275	-0.040645	.107
AgeSick	-0.001862	.618	-0.000216	.752
Members	0.092197	.000***	0.026345	.000
Income	-0.016980	.016**	-0.004707	.099
Urban	-0.060200	.640	0.002817	.937
Malaria/Dengue	0.291236	.059*	0.222956	.000
ARI	0.372954	.005***	0.133946	.020
GI	-0.132783	.388	-0.167093	.012
Fever	0.144688	.398	-0.064581	.163
Skin	-0.114857	.608	-0.110554	.084
Heteroscedasticity Equation				
Income	.013309	.000**		

$R^2 = 0.68$, n = 1523

* Significant at the 0.1 **Significant at the 0.05 level *** Significant at the 0.01 level

The older the head of household and the higher the income of the household the less likely the sick individual is to seek a public consultation. Older heads of household may want to show a certain status by utilizing private health services when someone in

their household is sick. Older heads of households may also have more experience with illnesses and may recognize the need for specialized care. Established households may also have the resource base or social network support to be able to utilize private health services.

Sick households members are more likely to seek private services at all head of household education levels. It is a logical extension that if public facilities are thought to provide more generalized and lower quality services, that more utility will be attained from seeking private practitioner evaluations.

Increasing numbers of household members and the illness being malaria/dengue fever or ARI all increase the likelihood that public medical attention will be chosen. Household resources must extend over all household members, therefore the larger the household more the resources, including time and money must stretch. It is not surprising that the Malaria/Dengue and ARI variables increase the probability that public health services are sought. Honduras has a public malaria/dengue epidemiological surveillance system that attempts to track and assist its containment by providing malaria drugs to those who may have the disease. It is through personal observation that the majority of cases of ARI occur in the dry/pre-harvest season, which is also the period of lowest cash reserves in rural areas and thus cash flow into urban areas. This may create a preference for public facilities.

7.4 Model Predictability

While the significance of each parameter is important, the overall accuracy of the predictions tells of how the model performs. Individually, the attention portion of the nested model correctly predicts 60% of the cases, and the health service choice part of the nested model correctly predicts 68% of the cases (See Tables 7.3 And 7.4).

TABLE 7.3 Prediction Table for the Health Service Attention Portion of the Nested Probit Model

	Actual	
Predicted	**0**	**1**
0	10.2%	7.2%
1	32.5%	50.1%

TABLE 7.4 Prediction Table for the Health Service Choice Portion of the Nested Probit Model

	Actual	
Predicted	**0**	**1**
0	28.8%	7.2%
1	24.8%	39.2%

The overall nested model correctly predicts 43% of the cases, giving the model a R^2_{count} of 0.43. While this appears low, a naïve model would calculate 25% as the overall correct prediction percentage; where the predicted probability would be 0.5 for each of the two regressions that comprise the nested model.

CHAPTER 8

CONCLUSIONS AND SUMMARY

The ability to pay for and access health care is an important social issue and is a topic of concern for many households not covered by insurance. When a household member is sick or hurt, households must analyze the injury/illness itself and their current resource and social situation to determine what kind of health remedies are not only necessary but also feasible. In Honduras, if seeking health services is the chosen strategy, households must then choose between utilizing publicly or privately funded clinics or hospitals. Patterns and differences in how households spend on health care and use health services are reflected in demographic and socio-economic variables, as well as in beliefs and preferences.

This study has analyzed demographic and socio-economic variables from the ENIGH Honduran health expenditure data from 1998/99 in order to examine health care spending and health services utilization. To do so, two distinct methods of analysis were used. First a tobit explanatory model was used in order to understand health expenditures and income elasticities for health care across all income levels. A tobit model was used instead of a simple linear regression because a large proportion of households had no health expenditures during the time period covered by the study.

Second, the decision to seek health services was viewed as a two-step process: i) deciding to seek health services and ii) then choosing between public and private providers. To model this sequence of decisions, a nested probit model was

implemented to study the influence of household level socioeconomic and demographic factors on this process.

8.1 Conclusions

8.1.1 Household Health Expenditures

The tobit analysis reveals that rural, young, and larger households are statistically important in determining household health expenditures. Honduran households with these characteristics spend less on health care than the corresponding counterparts. These variables may be of importance in directing health policy such that young, rural, and larger households may benefit more from public health care. Findings also show a linear relationship between health care spending and income levels, thus contradicting the theory that at a certain income level spending on health care would level off in a fashion similar to that of the Engel curve for food. There appears to be no point at which households do not spend some proportion of additional income on health. There is no point at which household expenditures on health are not constrained by income level. Households continue to increase spending as income rises, indicating more and more expensive and possibly luxury goods and services, like name-brand pharmaceuticals or plastic surgery, are demanded.

The model also shows that income elasticities are not the same across income levels. Households become gradually more responsive to change in health costs as household income level increases. The overall outcome of this analysis did concur with the prevailing literature in that income elasticities calculated on the household level in

developing countries are typically less than one. However, this study reveals that health care becomes a luxury good at high-income levels in Honduras. When comparing the income elasticities for health care between urban and rural areas, it is evident that rural households have income elasticities close to twice that of urban areas across all income levels; meaning that health care is more of a luxury good for rural households. This may be due to the added cost of travel that many rural people must incur when seeking health services or medicine.

8.1.2 Health Service Choice Models

8.1.2.1 Seeking Health Service Attention

In the initial decision to seek health services, income was expected to play a significant role in predicting whether or not a sick household member would receive medical attention or not. Yet, it was found to be insignificant in this decision, thus not presenting itself as a limiting factor for seeking medical treatment. Rather the influential factors were all demographic. As anticipated, the older the head of household the more likely a sick member would receive health services. Older households may have greater wealth and more experience and may therefore have the means to pay for and/or the ability to identify illnesses that require medical attention. The sick are less likely to seek medical attention if the head of household is male. This was as expected, since throughout the world female headed households are more likely to spend and seek treatment for ill household members (David 1993, Kennedy and Cogill 1987; Dwyer 1989). The less education a head of household has the less likely the sick household

member is to seek medical services. The lack of education may negatively affect a household's resource base and thereby reduce a families' ability to take the time to travel to and wait for care. Households in rural areas are less apt to seek medical care when sick than households in urban areas. There are fewer clinics in rural areas and medical office visits take time and money. Furthermore, those in rural areas are probably involved in an agrarian and subsistence lifestyle, making travel difficult during planting and harvest times and income cyclical.

Overall, the results of the attention portion of the model indicate that the decision to seek health care in Honduras is one based on perceptions. In this study health services are sought based on the experience of age, gender-based outlook on health, lack of formal education and time and travel consequences of distance from health facilities.

8.1.2.2 Type of Health Service

Overall , the age and education level of the head of household, the number of household members, income and the Malaria/Dengue and ARI disease variables were all found to be significant in determining the type of health services sought by sick Hondurans.

Sick members from older households are more likely to use private services. As heads of household age they gain life experience and are able to establish deeper social networks. These factors may allow older heads of household to recognize illness quickly and expedite the need for specialty (private) care and to tap into their social web for help in attaining private care. Furthermore, heads of household with any level of education

will more likely utilize private health care. This is a testament to the observed preference for private services. The findings show that households with more family members are more likely to use public services. Large households tend to have a scarce resource base and must carefully allocate those finite resource among all household members this may make public care a more feasible option. In contrast to the health service seeking attention portion of the model, income is important variable in determining type of health service. The more money a household has the more likely a sick member is to use private care. This supports the observation that many Hondurans believe private health care is better (World Bank 2000), and if possible will pay for it.

Finally, illnesses diagnosed as Malaria/Dengue or ARI are more likely to been treated in public clinics. These are the two most common illnesses reported in Honduras, which is a positive finding in terms of good use of the Honduran public health and the malaria surveillance and control system. Overall, Hondurans may perceive that these are common illnesses, ones that public health services can treat, without problems.

8.2 Policy Implications

The tobit analysis reveals that rural, young, and larger households are statistically important in determining household health expenditures. Households with these characteristics spend less on health care, other things being equal, than their corresponding counterparts. There is considerable evidence that overall health care in Honduras is inequitable, with the poor and rural spending disproportionately larger

amounts on health compared to the more affluent. There appears to be a drastic difference in spending and income elasticities between urban and rural households. In the event of an economic down turn, it is the rural and lower-educated households that will be most reactive in reducing their overall health spending. In such a situation the Honduran government may want to implement health policy directives that take these findings into account so that a maximum number of households receive necessary health care and goods.

It is clear from the health service choice model that Hondurans prefer to utilize private health services. The Honduran government may want this inclination, so that those who cannot afford (either by time or money) private care are captured by the public system. Or it may be that this preference for private services indicates the defeat of the publicly funded health care rationale. This nested probit model allows for the prediction of health services use and may therefore help the government tailor and target the public health care system. Overall, this study provides empirical support for future governmental analysis of what can be done to improve services with the ultimate objective of improving health care and services for all Honduran citizens.

8.3 Suggestions for Future Research

This thesis analyzed overall health care spending. However health care can easily be categorized into health services and medical goods. A more specific examination into how households spend on health services and medical goods, in a simultaneous fashion, may provide a more in depth look into how households are treating acute illnesses. In a

society, like Honduras, where health expenditures are typically out of pocket and pharmaceuticals do not require a prescription, such an analyses may provide information and details never seen before.

Each household has its own requisites for determining if health services are sought when a member is ill. The sequence of decisions a household makes when a household member is ill presented in this thesis surmises that this is a nested decision. Better predictions on household behavior may however be elucidated by examining and even comparing different predictive models. Single equation models where health services seeking decisions, the decision to seek health care and the choice to seek a public or private practitioner, may provide a different picture of which variables and factors are influencing households decisions. Perhaps a multinomial logit where a single decision is made between self, public and private care at once, like Levin et al. (2001) and Akin, Guilkey and Denton (1995) performed in their analysis of health care facilities use could expose other facets of this decision making process.

8.4 Limitations of the Study

The decision to use medicine and/or seek health services is a complex one. Factors including perceived quality, availability of other providers, previous experience, perceived severity, and socio-cultural beliefs can all play a role in health care choice. This econometric analysis of health expenditures and health service utilization cannot account for these important factors. Furthermore, the ENIGH survey was a massive survey that was not specifically targeted toward data collection on health care; it was

simply just one component. Therefore some important explanatory variables, like distance to health care facilities, time costs, workload etc. that could help provide a more through analysis were not available. More in-depth surveys and, more importantly, ethnographic studies are needed to tease this unquantifiable information from a population.

This analysis looked only at health services sought for acute illnesses; the demand for preventive care requires a complex set of assumptions about an individual's behavior that were not collected in the ENIGH survey. To further complicate matters, approximately 85% of the preventive care sought in the survey was for vaccines, which are highly promoted and provided free by the government.

In analyzing the health related data set some important explanatory variables, namely, type of illness, were omitted due to a lack of an official diagnosis, from all but those who actually sought health care. The type of illness variable was therefore not included in that part of the analysis.

Finally, opportunity costs of health care seeking are not readily quantified. While location may provide a decent proxy variable for distance, knowledge about foregone work (of the person ill and the caretaker), time costs, and available transport to seek care are vitally important to understanding health-seeking behavior. These important factors were also not collected in the survey.

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