# Socio-economic Status and Health Expenditure of Households in Benin

By

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# Abstract

This paper studies the determinants of household health expenditure. It focuses on catastrophic health expenditure using the recent year 2009 household survey for Benin, and uses the Heckman approach to control for potential selectivity bias. We find that household income, level of education and household size have positive and significant effects on the magnitude of health expenditure. Furthermore, health care is a necessary good for households in Benin. Households comprising both children and elderly persons, the size of the household and living in a rural area are major risk factors for catastrophic health expenditure. In addition, catastrophic health expenditure has a significant and negative effect on the budget allocated to education and food. These results have some policy implications in terms of ensuring better access to health care. For instance, as health care is a necessary good in Benin, the Ministry of Health could subsidize public health facilities to enable access for the poor.

**Key words:** Health care, health expenditure, catastrophic health expenditure, selection bias, Benin

# 1. Introduction

Africa's health-care finance system is characterized by a heavy reliance on out-of-pocket expenditure and the lack of an effective social security net. The impact of such a health-care finance system on the welfare of households, particularly poor and vulnerable households, is a challenge faced by policy makers in developing a health care system (Xu et al., 2003). In such a health system, health expenditure by the household is a key variable in economic policy, especially when considering the poor and vulnerable groups of the population. Indeed, health expenditure not only affects the health of the population in the long term, but also their ability to earn income due to the decrease in productivity and labour supply (Grossman, 1972; Cai and Kalb, 2006). Health-care spending has also been credited with prolonging life expectancy; reducing morbidity and infant mortality rates. Therefore, it partially explains the inequalities in the prevalence of disease among different socio-economic groups.

However, when people have to pay fees for health care, the amount can be so high related to income that it results in a "financial catastrophe'' for the household. Medical care expenses become financially catastrophic when they endanger the family's ability to maintain its customary standard of living. Such high expenditure can mean that people have to cut down on necessities such as food, water, sanitation and clothing, or are unable to pay for their children's education (Russell, 1996). These necessities, however, are also inputs for the health production function. Catastrophic health expenditure is defined as out-of-pocket spending for health care that exceeds a certain proportion of a household's capacity[1] to pay for health care, with the consequence that households suffer the burden of disease.

According to Wyszewianski (1986), high health expenditure is not always catastrophic in terms of imposing a severe financial burden on a household, since even small amounts spent on health care can be financially devastating for poor households without health insurance. The threshold level from which health spending is deemed to be catastrophic is subjective, and there is no final consensus on the choice of thresholds (Knaul et al., 2009). Thus, thresholds used by previous studies to estimate catastrophic health expenditure varied from 5% to 60% of total household expenditure, total non-food expenditure or non-subsistence expenditure (Su et al., 2006b; Russell, 2004; Wagstaff and Van Doorslaer, 2003; Xu et al., 2003). All these measures suggest that when households spend a large proportion of their budget on health care, they often forego other goods and services, which can have negative implications for living

standards (O'Donnell et al., 2005). In this paper, we used three alternative catastrophic thresholds for comparison: equal or greater than 10% of non-food expenditure, 20% of non-food expenditure and 30% of non-food expenditure. Setting only one cut-off value may result in an inaccurate estimation, leading to a misinterpretation of the importance of some variables.

Considering the lack of financial risk protection again the cost of illness and the generally high level of poverty in Africa, and particularly in Benin, the poor may not seek health care when they need it and rich households may utilize health care and end up with catastrophic spending. This situation underlines the importance of understanding the determinants of households' decisions on whether to utilize health care or not and, to some extent, how much to pay for health care in Benin. Furthermore, it highlights the interest in studying how catastrophic health expenditure is distributed across households. However, despite extensive investigation into demand for health care in Africa, there are only a few detailed analyses on the socio-economic determinants of household health expenditure with a particular focus on catastrophic health expenditure in general in Africa, and Benin in particular. For instance, according to Chuma and Maina (2012), few studies have highlighted the levels of catastrophic health expenditure in Africa. To the best of our knowledge, except for the work by Bolduc et al. (1996) on choice of health care provider, we found very few research papers on how household socio-economic characteristics affect households' health expenditure in Benin. The research that has been done on health care expenditure in Benin entail descriptive analyses of government expenditure and household surveys (Council of Economic Analysis, 2010).

This study provides important contextual information for policy discussion and health financing reforms by identifying appropriate policy responses (for health policy) to protect families against the negative effects of financial catastrophe that may result from the use of health services. As argued by Xu et al. (2003), determining the extent of catastrophic health expenditure and the distribution thereof across households is an important step in the process of developing social protection mechanisms. Therefore, the results may provide input into the policy of improving the performance of the health system in Benin through improved access to health services. From a methodological point of view, we used the Heckman (1979) framework to control for potential selectivity bias that may arise when restricting health spending data analysis to a sample of households with positive health expenditure. Indeed, some households may choose not to seek health care and households can only incur catastrophic health expenditure if they actually seek and purchase health care. This measurement problem, which is accepted as a limitation of existing studies on catastrophic health expenditure (Russell, 2004; Xu et al., 2003), is addressed in this work.

To fill this gap in health services research, this paper aims to answer the following questions: How does a household's socioeconomic status influence health expenditure in a health system in which out-of-pocket payments is the dominant mode of financing? What is the magnitude of catastrophic health expenditure, and how are these costs distributed across households? What is the main impact of such expenditure on the structure of household expenditure?

The rest of the paper is organized as follows: Section 2 presents the objectives of this study. Section 3 looks at the health-care sector in Benin. Section 4 presents an overview of the determinants of household health expenditure, catastrophic expenditure and its impact on household expenditure. Section 5 discusses data, variables and model specification. Section 6 presents and discusses the descriptive and econometric results. Section 7 offers concluding remarks.

# 2. Objectives

The main objective of this study is to investigate the determinants of household health expenditure, with a particular focus on catastrophic health expenditure using recent household survey information for Benin (2009).

Specifically we:

- present a detailed analysis of the determinants of health-care expenditure, with particular attention to household income;
- explore risk factors associated with experiencing catastrophic health expenditure at the household level; and
- assess the impact of catastrophic health expenditure on the household spending pattern, notably food and education.

# 3. The Health Care System in Benin

The health-care system in Benin is characterized by the co-existence of the private and public sector. On the public side of Benin's health-care system, the government sets policies for, regulates, and provides health-care delivery, among other things. Hospitalization and treatment fees in public health facilities are subsidized, but are under severe strain to cope with the demand for health care. Private health-care providers have a profit motive. Treatment fees in private health centres are expensive and overpriced (Ministry of Health, 2011). In 2009, the shortage of health workers was estimated at 53.2% of the available workforce (Council of Economic Analysis, 2010). People's access to health services appears to be determined by the degree of urbanization of the community in which the household lives, the availability of health services in the community and whether the household has health insurance. According to INSAE (2012), the proportion of poor households increased over the last ten years, from 28.9% in 1995 to 35.2% in 2009.

Only about 10% of the country's population is covered by some health insurance, mainly through schemes for selected employees in the formal sector. Benin allocated about 4.43% of its GDP to health in the period 2009–2013. It does not have a national health insurance programme that offers universal coverage for the whole population. Table 1 shows that over the period 2009–2013, social security expenses related to health accounted for 0.4% of total public health expenditure, against 7.90% for the rest of Africa. The out-of-pocket spending on health care as a percentage of private expenditure on health remains high (91.2% against 56.96% for Africa). Moreover, the proportion of public expenditure was 53.8% of total health expenditure in 2009, but has decreased to 46.16% in 2013. Private health insurance plays a relatively minor role in health financing in Benin. For example, private insurance expenditure as a percentage of total private expenditure on health is, on average, 7.3% against 31.10% for Africa over the period 2009–2013. All this suggests excessive out-of-pocket payments in Benin, which expose households to a high risk of catastrophic health expenditure occurring, thereby forcing households to reallocate their resources and develop strategies to offset the economic costs of poor health, which results in damaging the short and long-term welfare effects on families.

**Table 1: Health expenditure ratio, 2009–2013**

| | Benin | | | | | | Africa region |
|---|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2009-2013 | 2009-2013 |
| Total health expenditure as % of GDP | 4.3 | 4.3 | 4.5 | 4.49 | 4.58 | 4.43 | 6.2 |
| Government spending as % of total health expenditure | 53.8 | 51.2 | 52.1 | 51.46 | 46.16 | 51.65 | 47.75 |
| Private expenditure on health as % of total health expenditure | 46.2 | 48.8 | 47.9 | 49.0 | 48.1 | 48.35 | 52.7 |
| Public expenditure on health as % of total public expenditure | 9.2 | 10.5 | 10.8 | 10.29 | 10.48 | 10.65 | 9.65 |
| External funding as% of total health expenditure | 9.26 | 32.8 | 35.3 | 34.67 | 33.4 | 34.05 | 8.63 |
| Social security expenditure on health as % of total public health expenditure | 0.5 | 0.4 | 0.4 | 0.5 | 0.6 | 0.4 | 7.90 |
| Out-of-pocket expenditure as % of private expenditure on health | 92.7 | 91.2 | 91.2 | 91.5 | 91.7 | 91.2 | 56.96 |
| Private health insurance as % of private healthcare expenditure | 7.3 | 7.2 | 7.2 | 8.0 | 7.6 | 7.4 | 31.70 |

Source: WHO (2014); WDI (2014).

# 4. Literature Review on Health Expenditure: An Overview of Theory and Empirical Studies

Conceptual frameworks for analyzing health-care demand include those by Grossman (1972) and more recently Rosenzweig and Schultz (1983). According to these works, the demand for health care is a derived demand. However, Rosenzweig and Schultz's model incorporates key insights from the models of demand for health and health care by Grossman and further illustrates procedures for consistent estimation of parameters of any economic model when the behaviour of agents is conditional on unobserved variables (Mwabu, 2007). Thus, health expenditure by households is directed toward particular goods and services in order to satisfy the desire for good health. Consequently, empirical studies have often adapted this theoretical framework to analyze health expenditure. In what follows, we firstly reviewed a set of recent studies related to the determinants of household health expenditure. Secondly we looked at the risk factors of catastrophic health-care expenditure, and thirdly we considered the impact of such spending on a household's spending on other items.

On the empirical front, studies on health expenditure in developing countries including African countries have been developed more from a macroeconomic[2] than a microeconomic perspective due to the lack of microeconomic data on households (Okunade, 2005). At the macro level, most of these studies have found that income is a major explaining factor in health-care expenditure, and per capita income elasticity of health expenditure is less than one, implying that health care is a necessity (Sahn, 1992; Gerdtham and Gbesemete, 1992; Okunade, 2005; Okunade and Murthy, 2009). Using panel data analysis, Sen (2005) and Farag et al. (2012) found similar results. However, health-care spending is least responsive to changes in income in low-income countries and most responsive in middle-income countries, with high-income countries falling in the middle (Farag et al., 2012). Some authors have focused on the health effect of health expenditure. For example, Anyanwu and Erhijakpor (2009) found that health expenditure has a statistically significant effect on infant mortality and under-five mortality in African countries. In the same vein, Bokhari et al. (2007) estimated the elasticity of under-five mortality and maternal mortality with respect to government health expenditure and income and concluded that while economic growth is certainly an important contributor to health outcomes in developing countries, government spending on health is just as important a factor. Tandon and Cashin (2010) provide a conceptual framework for assessing the fiscal space for health with an illustrative roadmap for guiding such assessments.

At the micro level, as far as the determinants of households' health expenditure are concerned, Okunade (1985) constructed Engel's expenditure models using the International Labour Organization's data covering the period 1960–1972 based on the budget surveys for selected African countries to estimate the income elasticity of household expenditure categories (clothing, health care, housing, and education). He found that the income elasticity of health expenditure varied across budget survey areas, within each country and across countries. For example, the income elasticity of medical expenditure was 0.24 (Ghana-urban), 0.25 (Ghana-rural), 1.58 (Kenya-Nairobi), 1.33 (Kenya-Mombasa), 1.25 (Kenya-Kisumu), 0.61 (Malawi-urban), 0.51 (Malawi-rural), 0.83 (Sudan-urban), 0.72 (Sudan-semi-urban), 0.85 (Sudan-rural), 1.70 (Tanzania-urban) and 0.34 (Tanzania-mainland). These elasticities seem to confirm the assumption that spending on health care rises faster with income in urban than rural areas, and that the income elasticities of health expenditure vary by the level of analysis. This is because national data elasticities, in general, exceed regional or budget area elasticities. Using Heckman's sample selection model, Parker and Wong (1997) found that the total monetary income for Mexico has a positive and significant effect on health expenditure for the insured low-income group, insured upper-income group and uninsured upper income group. However, total in-kind income only has a significant negative effect on health expenditure for the insured low-income group. In addition, the authors found that, in general, urban residency was negatively related to the probability of incurring a health-care expense, whereas the presence of children was positively related to the probability of incurring a health expense.

On the other hand, Makinen et al. (2000) reviewed household survey data from eight[3] developing countries and countries in transition and found no clear pattern of distribution of household health expenditure as a proportion of income by quintiles within developing countries. In Burkina Faso, Paraguay and Thailand, the wealthier quintiles spent a lower percentage of their total consumption on health care than the poorer quintiles, while in Guatemala and South Africa this finding is reversed. In these countries, health care would appear to be a luxury good, especially for the richest quintile. Recently, Hjortsberg (2003) has examined coefficients of household health expenditure for Zambia by controlling for endogeneity bias arising due to the selection of providers using the method developed by Lee (1983). As the magnitude of health expenditure depends on the choice of provider, the author generated a selection term for different providers from a multinomial logit regression model and used each selection term as a regressor in an ordinary least squares estimation of health expenditure for the respective providers. He found that the magnitude of the health expenditure is influenced by income, insurance status of the household, and the type of disease. Moreover, this author concluded that income elasticity of health care spending is 0.646. In the same vein, Su et al. (2006a) used a similar approach and found that, for Burkina Faso, factors such as "being an adult", "married", "illness occurred in rainy season" and "being seriously ill" significantly increase the magnitude of health expenditure. In addition, the characteristics of the household head such as "the household head of the patient is female", "the household head is literate" and higher total expenditure are

positively correlated with the magnitude of health expenditure. Furthermore, economic status and literacy of the household head were identified as key determinants of health expenditure.

Relating to catastrophic health spending risk factors, Wyszewianski (1986) and Merlis (2002) found that, for the United States, households headed by older people, people with disabilities, the unemployed or poor people and those with reduced access to health insurance were more likely to be affected than other households. Similarly, Berki (1986) concluded that American families that incurred medical expenditure that exceeded 5%, 10% or 20% of their family income were poverty households and those without any health insurance coverage. In the same vein, Xu et al. (2006) showed by logistic regression that, for Uganda, risk factor of catastrophic health expenditure is not the same for poor and non-poor households. For instance, for the non-poor, the use of public and private inpatient services was the most important risk factor, while for the poor the use of private outpatient facilities was the most risky choice.

However, these authors found that having household members aged over 65 and a household head with little education increased the risk of catastrophic health expenditure for poor and non-poor households alike. Likewise, for Georgia, Gotsadze et al. (2009) used logistic regression and suggested that the hospitalization of a household member and the presence of a chronically ill person in the household could explain catastrophic health expenditure. Conversely, Garg and Karan (2009) found that, for India, the household's location in a rural area increases the probability of incurring catastrophic health expenditure.

This finding is in line with Li et al. (2012) and Li et al. (2014) who found that for China, urban households were more likely to escape catastrophic health expenditure than rural households. In addition, these authors concluded that the lowest socio-economic quintile of households had the similar level of risk to incur catastrophic health expenditure as their richest counterparts. However, the households in the middle range of consumption expenditure experienced a significantly lower prevalence of catastrophic expenditure than the richest. Using a probit model O'Donnell et al. (2005) explained the source of variation in the prevalence of catastrophic health-care expenditure across six countries, namely Bangladesh, Hong Kong, India Sri Lanka, Thailand and Vietnam, using a household survey. Contrary to Xu et al. (2006), they found that the occurrence of catastrophic health-care expenditure increases with total household expenditure. In addition, O'Donnell et al. (2005) suggested that except in India and Sri Lanka, bigger households are more likely to incur catastrophic health spending, and the prevalence of catastrophic spending is high in rural areas and low among households with restricted access to toilets and drinking water. Finally, they concluded that having a highly educated household head was inversely associated with the probability of incurring catastrophic health expenditure. By using a logistic regression method, Su et al. (2006b) concluded that income has a positive and significant effect on the probability of catastrophic health care expenses in the Nuna district of Burkina Faso. Moreover, they found that illness episodes among household adults significantly increased the probability of catastrophic expenses, and the prevalence of catastrophic health-care expenditure is high for low

income quintile households at various thresholds (20%, 30%, 40% and 60%) despite the fact that richer households have reported more illness than households in lower income quartiles and received treatment more than poor households.

Regarding the impact of catastrophic health spending on households' consumption of other goods, Wouter et al. (1993) argued that if poor people are required to pay for health care, they may be forced to make a trade-off in the consumption of other essentials such as food or education. Furthermore, households may attempt to compensate for the economic costs of illness by dissaving, selling assets, or borrowing from relatives or financial institutions. However, these strategies are not always available to a household in a health crisis (Kim and Yang, 2010). Therefore, for some households it may be necessary to reduce non-health expenditure to pay for higher out-of-pocket health expenditure to maintain their money available to them for expenses (Wagstaff, 2008). This is true for rural China where Wang and Hsiao (2006) indicated that most households were not able to increase their income sufficiently to offset health spending, which led them to reduce spending in other consumption categories, including food. Similar results were recorded by Wagstaff (2007) for rural Vietnam, but expenditure on items related to the health care of sick household members, such as heating and housing, increased. According to the World Health Organization (2005), exposure to such catastrophic medical expenditure risk is a major disadvantage of heavy reliance on out-of-pocket expenditure and an important motivation for the movement to some type of pre-payment mechanism. It follows that catastrophic health expenditure typically forces a family to reallocate its resources and threatens the household standard of living, which can have short and long-term impacts on the wellbeing of the household. Likewise, Kim and Yang (2010) showed for Korea that the income from property, business and wages are significantly lower for households with catastrophic health expenditure and income transfers and loans are significantly higher for the latter. In addition, all categories of consumption outside of health expenditure are significantly lower for households with catastrophic health expenditure. These results reveal that the impact of ill health expenditure within categories varies between categories.

To sum up, studies on determinants of health-care expenditure, with particular focus on catastrophic health expenditure, are scarce in Africa, especially on Benin. Most evidence comes from case studies. In addition, the widely used approach is to set a different threshold of catastrophic health expenditure. Furthermore, simple probit/logit models were used, neglecting selectivity bias issues.

# 5. Data and Methodology

## 5.1 Data and variables

We used a national representative Household Integrated Modular Survey on the Living Conditions of Households, conducted in 2009 by the National Institute of Statistics and Economic Analysis of Benin. The survey collected data about the expenditure pattern of households (such as food, health expenditure, education expenditure and electricity expenditure), the demographic characteristics of household members, and the socio-economic characteristics of the household. As decisions about seeking health care are taken by household members and the costs are supported by a household budget, the household is the research unit. The sample is restricted to 15,411 households made up of 75,850 individuals for which complete information on variables is available. To obtain health-care expenditure data, the household heads were asked to report health expenditure in the six months preceding the survey. Health-care expenditure includes the cost of medical consultation, hospital services, medical services, medical tests, drugs, various therapeutic appliances and equipment. For each household, the dataset provided aggregated health expenditure for the entire household. Health expenditure did not include in-kind payments for health care, informal payments to health workers, payments to traditional healers and loss of income due to illness. The health status of household members was not available in the dataset used. The dataset contains 17.76% of households with zero health expenditure.

The dependent variables are: The logarithm of total health expenditure ($h\exp_i$), the budget share of a good ($W_{ji}$) $j = 1, 2, 3, 4$ (health care, education, food and other goods); the propensity of a household to spend on health care ($prop$), which is an indicator of health care-seeking behaviour that is approximated by a dummy variable taking the value 1 if the household has positive health expenditure and 0 otherwise. This binary variable is an indicator of whether a household reports positive health expenditure or not, and provides information about medical visits of the household and serves as a proxy for health care-seeking behaviour; catastrophic health expenditure ($cath\exp_i$) is measured by a binary variable taking the value 1 if household health expenditure equals or is greater than 10%, 20% and 30% of the household's capacity to pay captured by total household non-food expenditure, and 0 otherwise. Non-food expenditure is equal to total household expenditure minus food expenditure, and is an appropriate proxy of household effective income (Wagstaff and Van Doorslaer, 2003).

The presence of catastrophic health expenditure is hypothesized to be negatively associated with the budget share allocated to education and the budget share for food.

We followed empirical literature (i.e. Hjortsberg, 2003; Li et al., 2014) and data availability to select explanatory variables. For major explanatory variables, we briefly show how they were measured and their expected sign. Household income ($\ln \exp_i$) was measured by the level of total household expenditure, which gives a clearer idea of permanent income and is recorded more accurately than income in developing countries (Hjortsberg, 2003). We assumed that higher income may lead to greater ability to afford better medical attention, and thus higher health-care expenditure.

Educational qualification of the household head ($educ$) was divided into four binary variables (0/1): without any qualification; primary qualification; secondary qualification; and higher qualification. We expect that higher educated household heads could probably better perceive the benefit of health investment expenditure. Therefore, they are more likely to make use of health-care services and allocate resources to health.

The occupation status of the household head ($staocp$) was coded based on the National Institute of Statistics and Economic Analysis's classification of occupations, that was divided into three binary variables (0/1): private sector, public sector and household sector. This variable may affect the perception of the relationship between investment in human health capital and the benefits of these investments. We expect the status of occupation may have a positive coefficient with respect to utilization and a positive coefficient on health expenditure.

Household size ($hsize$) is expected to have a positive effect on health expenditure and on the risk of incurring catastrophic health expenditure. Indeed, large households experience more illness and are likely to have higher health expenditure and incur catastrophic expenditure.

The gender of the household head ($sex$) as well as the age composition of households are also important in health care-seeking behaviour, because they may directly affect a household's health-care expenditure (Chaze, 2005). For instance, females are more careful about the health of the members of their family and are more likely to take them for medical care than males. We expect that the sex variable (male) should have a negative coefficient in both health care demand and health expenditure equation. Children and old people are more vulnerable to disease due to premature or to a deterioration of the immune system. Like Pradhan and Prescott (2002), we used the age of household members to define four dummies as a proxy of health status of the household: $grage5 = 1$ if at least one member of the household is younger than five years (children) and 0 otherwise; $grage60 = 1$ if at least one member of the household is older than 60 years (elderly) and 0 otherwise; $grage560 = 1$ if the household has a member younger than five years and a member older than 60 years and 0 otherwise; $grage = 1$ if the household has neither children nor elderly members and 0 otherwise. We assumed that the older an individual, the more health care she/he would seek with more health expenditure and will incur catastrophic health expenditure. Following Deaton (1997), we used the region of residence as an indicator of regional variation in

prices to control the price differences of health care.

Location ( *urban* ) is a binary variable taking a value of 1 if the household is in an urban area and 0 otherwise. We expect that the proximity to health-care services may raise the utilization of health care in urban areas, while time and travel costs will raise expenditure in rural areas. We also expect that living in urban areas protects households against catastrophic health expenditure.

We also used as control variable the ratio of dependence ( *ratiodep* ), which is measured as the proportion of non-active members in the household; the percentage of female members between 15 and 49 years old ( *pfem*1549 ) to capture the fertility effect on health care-seeking behaviour of the households (Miller, 1994); the percentage of men in the household ( *pmale* ) and the marital status and religion of the household head because marriage and religion can bring about happiness and this may lead to reduced health problems and medical costs. (Zimmermann and Easterlin, 2006).

## 5.2 Model specification: Motivation and estimation issues

Restricting health-care expenditure data analysis on the sample of households to positive health expenditure makes this subset a non-random sample of the entire population and this may lead to sample selection bias. For instance, some households may choose not to seek health care, and if there are unobserved factors that are correlated with the perception of illness and the amount households spent on health care, the coefficients on the expenditure equation will be biased. Sample selection bias may also arise because households can only incur catastrophic health expenditure if they actually seek out and purchase health care.

We used Heckman's (1979) sample selection model to analyze health-care expenditure determinants, and extend this framework to where the outcome equation (i.e., presence of catastrophic health expenditure) involved is a binary variable to investigate risk factors of catastrophic health expenditure to control for potential selection bias that may arise when restricting data analysis to the sample of households with positive health expenditure. To check the robustness of the Heckman approach, we also use Olsen's (1980) approach to correct for selectivity bias.

Due to issues with identification, we need a variable that affects selection in the sample, but not the outcome variable. Therefore, to estimate the parameters of the health-care expenditure function and catastrophic health-care spending function, we used as identifying variable the level of socio-economic development of the community measured as the number of health and educational infrastructures available in the community. This variable is assumed to affect the type and density of health-care services, but not the relative price of health-care services (Parker and Wong, 1997). Therefore, it is supposed to affect the occurrence of investing in health care, but not the amount or the share of household budget allocated to health. By following Heckman's two-step procedure for selectivity correction bias, we first used a probit model to describe the distinction between households with health expenditure and

households without health expenditure, and then predict $\hat{\lambda}_i(\cdot)$, the inverse Mills ratio, which will be used as new regressor in outcome equations – health expenditure and risk of catastrophic health expenditure. The health investment decision of a household can be formally represented as:

$$\mathbf{P}\boldsymbol{b}\left(prop_i = 1\right) = \beta_0 + \sum_j \beta_{1j} SES_j + \sum_m \beta_{4m} D_{im} + \varepsilon_i \quad (1)$$

where $prop_i = 1$ means health expenditure of household $i$ is observed, $SES_{ji}$ vector of socioeconomic status of the household $i$, $D_{im}$ vector of demographic characteristics of the household $i$, $\varepsilon_i$ the error term and $\beta$ the vector of parameters to be estimated. Second, ordinary least squares (OLS) techniques are used to assess the effect of socio-economic status on household health-care expenditure. The aggregate health expenditure function is as follows:

$$\log(h\exp)_i = \alpha_0 + \sum_j \alpha_{1j} SES_j + \sum_m \alpha_{4m} D_{im} + \alpha_s \hat{\lambda}_i + \vartheta_i \quad (2)$$

where $\log(h\exp)$ is the logarithm of health-care expenditure, $\hat{\lambda}_i(\cdot)$ the inverse Mills ratio, $\vartheta_i$. the error term and $\alpha$ the vector of parameter to be estimated.

A similar estimation strategy was used to estimate the parameters of catastrophic health expenditure. The probability of incurring catastrophic health expenditure is written as

$$\mathbf{P}\boldsymbol{b}\left(cath\exp_i = 1\right) = \xi_0 + \sum_j \xi_{1j} SES_j + \sum_m \xi_{4m} D_{im} + \xi_5 \hat{\lambda}_i + u_i \quad (3)$$

where $\mathrm{cathexp_i} = 1$ means household $i$ incurred catastrophic health expenditure and $\xi$ the vector of parameters to be estimated.

Finally, to estimate the impact of catastrophic health expenditure on the various categories of household expenditure, namely education expenditure, food expenditure and other expenditure of the households, we used the following equation:

$$W_{ji} = \theta_{j0} + \sum_j \theta_{1j} SES_j + \sum_m \theta_{4m} D_{im} + \theta_{5j} cath\exp + \theta_{6j} \dot{\lambda}_i + \varepsilon_{j_i} \quad (4)$$

where $W_{ji}\ j = 1, 2, 3, 4$ are, respectively, health care expenditure as a share of total expenditure, education expenditure as a share of total expenditure, food expenditure as a share of total expenditure, and other goods and services expenditure. The independent variable of interest is the presence of catastrophic health expenditure. There could be endogeneity between the share of budget that goes to health spending and the budget share going to other expenditures because household have to redistribute expenditure between different components. Then, the error terms in Equation 4 are correlated and equation-by-equation estimation might lead to an inefficient estimate result in the covariate effect. Therefore, a seemingly unrelated regression estimator is used to obtain more efficient parameter estimates (Zellner, 1962). While Equation 1 is estimated over the whole sample, equations 2 to 4 are estimated using only the sample of households with positive health spending.

# 6. Results and Discussion

## 6.1 Descriptive results

Descriptive statistics for all the variables used in our analysis are provided in appendix Table A1. From this table, we notice that the average per capita total household expenditure was 274,451.7 FCFA with a standard deviation higher than the mean. The average per capita household health-care expenditure ranged from 0 to 500,000 FCFA with the mean around 19,935.41 CFA, which represents about 1.94% of total household expenditure. The households allocate a high budget share to food (50.4%), and a low budget share to health and education (see Table A1 in the appendix). The mean values of household size and household head age were 4.92 members and 44.68 years, respectively. The proportion of household heads with no formal education was 68.70% against 16.60% for household heads with a primary school qualification. A higher percentage of households live in the rural area (61%), and the majority of household heads worked in the private sector (93.40%). The proportion of households with females between 15 and 49 years old was 21.6%.

Tables 2 and 3, respectively, present the distribution of health expenditure and various expenditure shares by selected household characteristics, and the prevalence of catastrophic health expenditure by threshold levels and budget share. From Table 2, we see that food budget share decreases with the household income quintile, while the education budget share increases with income quintile. The higher the level of qualification of the household head, the higher the budget share for education and the lower the budget share for food.

**Table 2: Distribution of budget share by selected household characteristics**

| Characteristic | Households with positive health expenditure, n=12673 | | | | |
|---|---|---|---|---|---|
| | Mean health expenditure (per capita) | Health expenditure as share of total expenditure (%) | Education expenditure as share of total expenditure (%) | Food expenditure as share of total expenditure (%) | Other expenditure as share of total expenditure (%) |
| **Total consumption expenditure quintile** | | | | | |
| Q1 | 6,817.96 | 2.17 | 0.68 | 53.84 | 43.31 |
| Q2 | 10,530.50 | 1.95 | 1.13 | 53.36 | 43.56 |
| Q3 | 13,903.29 | 1.80 | 1.33 | 50.10 | 46.77 |
| Q4 | 19,791.16 | 1.76 | 1.51 | 48.41 | 48.32 |
| Q5 | 48,634.16 | 2.03 | 3.57 | 42.56 | 51.85 |
| ***Education (educ)*** | | | | | |
| No qualification | 17,376.28 | 1.95 | 1.25 | 52.70 | 44.10 |
| Primary qualification | 23,532.94 | 1.96 | 2.74 | 44.03 | 51.27 |
| Secondary qualification | 28,546.44 | 1.90 | 4.19 | 36.89 | 57.02 |
| Further qualification | 47,186.61 | 1.79 | 6.10 | 29.27 | 62.84 |
| ***Occupational sector*** | | | | | |
| Public sector | 32,686.90 | 1.72 | 5.00 | 35.25 | 58.03 |
| Private sector | 20,037.83 | 1.94 | 2.16 | 47.54 | 48.37 |
| Household sector | 22,073.24 | 2.68 | 2.53 | 53.31 | 41.48 |
| Rural | 18,378.44 | 2.08 | 1.24 | 52.56 | 44.11 |
| Urban | 24,145.01 | 1.79 | 3.53 | 40.74 | 53.94 |

Table 3 shows that the percentage of households suffering from catastrophic health-care expenditure were 9.6% at a threshold of equal to or greater than 10% of non-food expenditure, 2.9% at a threshold equal to or greater than 20% of non-food expenditure, and 1.1% at a threshold equal to or greater than 30% of non-food expenditure. These percentages mean, for example, at cut-off levels of 10%, that 9.6% of total households spent 10% of their effective income on health care. Table 3 also shows that at all threshold levels, households with catastrophic health-care expenditure had a lower average budget share for education than households without catastrophic health expenditure. According to the budget share for food, however, it is only at a threshold of 30% that households with catastrophic health expenditure had a lower budget share devoted to food than households without catastrophic expenditure.

**Table 3: Prevalence of catastrophic health expenditure by threshold levels and budget share**

| Share of expenditure | Catastrophic health expenditure threshold | | | | | |
|---|---|---|---|---|---|---|
| | 10% | | 20% | | 30% | |
| | Yes (9.6%) | No | Yes (2.9%) | No | Yes (1.1%) | No |
| **Health expenditure as share of total expenditure (%)** | 9.99 | 1.15 | 17.39 | 1.46 | 26.75 | 1.65 |
| **Education expenditure as share of total expenditure (%)** | 1.42 | 2.48 | 1.07 | 2.44 | 1.28 | 2.41 |
| **Food expenditure as share of total expenditure (%)** | 49.10 | 46.24 | 48.07 | 46.57 | 42.38 | 46.66 |
| **Expenditure on other items as share of total expenditure (%)** | 36.46 | 50.13 | 33.46 | 49.53 | 29.60 | 49.27 |

## 6.2 Econometric results

In several regression models, the coefficient on the selection term derived from the Heckman approach is significantly different from zero, as in Equation 2, but not in Equation 3. This suggests that the Heckman selection model is appropriated to analyze the health expenditure function, and that the probit estimates of catastrophic health expenditure function is not biased due to the sample selection. Note that the estimated coefficients of catastrophic health expenditure equation using Heckman and Olsen approaches for selectivity are shown in Table A3 in Appendix. In addition, given that the Heckman approach could lead in some circumstances to non-convergence or convergence to a wrong solution (Olsen, 1980), we checked the robustness of the Heckman coefficient by using Olsen's (1980) method for selectivity bias, which only requires OLS regression techniques in the first step. The two approaches give similar results. The results obtained from the Olsen's method are reported in Table A2 in Appendix. The Breusch-Pagan test of independence shows that the residuals in Equation 4 are correlated, indicating that a seemingly unrelated regression estimator is appropriated.

Firstly, we discuss the results of the Heckman selection model for the determinants of health-care expenditure (Table 4). Secondly, we examine the probit estimates of the risk factors of catastrophic expenditure (Table 5). Finally, we analyze the results presented in Table 6, which summarizes the effect of the presence of catastrophic health expenditure on the budget share allocated to education and food.

***Socio-economic determinants of positive health investment expenditure and household health expenditure level***

Table 4 shows that total household income per capita is positively and significantly related to the probability of making positive health expenditure. A 1% rise in total household expenditure is associated with a 0.083% rise in the probability of having positive health spending. With respect to formal educational qualification, having a primary-level education is positively and significantly associated with an increase in the probability of incurring non-zero health expenses compared to a household with no formal education. The shift of the probability of incurring non-zero health expenditure for a unit change in education (no formal education to primary formal education) is 1.72%. However, there is no significant difference, respectively, between households headed by a person with a secondary and higher degree of qualification and a household headed by a person with any formal education in terms of the probability of incurring positive health investment. We observed a positive and statistically significant relationship between household size and the probability of making non-zero health expenditure; which indicates that large households have a higher probability of seeking health care than small households. Control variables such as the ratio of dependence, marital status the head of the household and the religion of the household head are positively and significantly related to the probability of making positive health expenditure. However, age of the head of the household has a negative and significant correlation with the probability of using any health-care service. Urban effect has the expected sign, but is not statistically significant, meaning that there are no urban-rural differences in terms of health care-seeking behaviour. One explanation is that rural migration is increasing in Benin, which increases the urban population and could create a tendency for insufficient service provision for the urban population. It creates a tendency among the urban poor to suffer from this challenge of poor use of health care.

**Table 4: Estimated coefficients of Heckman selection model for health expenditure equation**

| | Selection equation | Logarithm of health expenditure | Health expenditure as % of total household expenditure |
|---|---|---|---|
| | Coefficients | Coefficients | Coefficients |
| **Income** | | | |
| Log($h$ exp) | 0.271*** (0.000) | 0.763*** (0.000) | 0.0016* (0.082) |
| ***Education (educ)*** | | | |
| No qualification® | | | |
| Primary qualification | 0.161*** (0.000) | 0.091*** (0.013) | 0.0016 (0.138) |

| | | | |
|---|---|---|---|
| Secondary qualification | 0.023 (0.608) | 0.127*** (0.002) | 0.0008 (0.532) |
| Higher qualification | 0.041 (0.646) | 0.269*** (0.001) | 0.0017 (0.479) |
| **Status of occupation** | | | |
| Household sector® | | | |
| Public sector | -0.093 (0.385) | -0.577*** (0.000) | -0.011*** (0.000) |
| Private sector | -0.014 (0.861) | -0.639*** (0.000) | -0.0108*** (0.000) |
| **Size and composition of household** | | | |
| *hsize* | 0.056*** (0.000) | 0.163*** (0.000) | 0.0005** (0.025) |
| *ratiodep* | 0.036** (0.021) | 0.117*** (0.000) | 0.0008* (0.073) |
| *pfem*1549 | -0.110 (0.195) | 0.153* (0.059) | -0.0041* (0.095) |
| *pmale* | -0.208*** (0.001) | -0.291*** (0.000) | -0.0071*** (0.000) |
| **Demographics and community characteristics of household head** | | | |
| Gender (female)® | 0.017 (0.687) | 0.109*** (0.006) | 0.0008 (0.507) |
| Age | -0.002** (0.021) | -0.002** (0.027) | -0.00004 (0.146) |
| **Marital status** | | | |
| Single® | | | |
| Married | 0.274*** (0.000) | 0.310*** (0.000) | -0.0029* (0.078) |
| Divorced | 0.174** (0.024) | 0.103 (0.184) | 0.0041* (0.089) |
| Widowed | 0.295*** (0.000) | 0.230*** (0.001) | 0.0029 (0.170) |
| **Religion** | | | |
| Traditional® | | | |
| Muslim | 0.120** (0.015) | 0.032 (0.494) | -0.0001 (0.907) |
| Christian | 0.080** (0.012) | -0.065** (0.043) | 0.0011 (0.260) |
| Urban (rural®) | 0.029 (0.335) | -0.061** (0.021) | -0.0024*** (0.003) |
| *devcom* | -0.0003 (0.000) | - | - |
| Selection term | - | 0.540* (0.085) | 0.034*** (0.000) |

| | | | |
|---|---|---|---|
| Constant | -2.176*** (0.000) | -1.086** (0.045) | 0.002 (0.873) |
| Prob> $\chi^2$ (df.) | Prob> $\chi^2(30)=0.0000$ | Prob> $\chi^2(29)=0.0000$ | Prob> $\chi^2(29)=0.0000$ |
| Number of observations | 15411 | 12673 | 12673 |

Notes: ® is reference category P-values presented below the corresponding coefficient.
***, ** and * denote significance at 1%, 5% and 10%, respectively.
Regional dummies were included in all regressions.

In the regression of the logarithm of health-care expenditure, there were more significant coefficients than in the percentage spent on health care. With a few exceptions, similar results are found for the log of health expenditure and budget share regression, respectively. Household income per capita and status of occupation have a statistically significant impact on the level of monetary investment in health. The elasticity of health care expenditure with respect to household income per capita is 0.75 for a regression of natural logarithm of health expenditure against 1.083 for a regression of health-care expenditure as a percentage of total household expenditure. However, the coefficient of income per capita is more robust in log regression ( $p < 0.0001 \; against \; p < 0.0$ ). The positive coefficient of income reveals that health care is a normal good, as commonly assumed; a higher income level will combine with a higher demand for health care. Our estimate of income elasticity is high, but consistent with previous studies in developing countries. For instance, Musgrove (1983) found 1.17 for Brazil, Parker and Wong (1997) found elasticity ranged from 0.96 to 1.60 for Mexico, and Hjortsberg (2003) found 0.646 for Zambia. Our higher income elasticity could be explained by the low effectiveness of health insurance coverage. Therefore, the household's decision of how much health care to use and how much money to spend on health care depends on their budget constraints. In addition, the level of education of the household head has a positive and significant effect on the amount spent on health-care expenditure, but no significant impact on the share of income devoted to health care. Households headed by a person with a primary educational qualification, secondary educational qualification and high degree of qualification spent 9.54%, 13.60% and 30.89% respectively, more on health care than households headed by a person with no formal education. The positive effect of education on health expenditure may be explained by the fact that the better-educated have better access to health information and value the benefit of good health more. They are also among the better off. Therefore, they seek a high quality of health care. As the best quality is associated with a higher price, they spend more on health services. Another possible explanation is that more often the higher an individual's education, the more socially advantaged she/he will probably be and the easier access she/he will have to medical care. It follows that the more medical care sought by a person, the more they spend on health.

Status of occupation had a negative and significant impact on both log health expenditure and budget share of health expenditure. For instance, a household headed by

a person working in the public or private sector spent 40.84% and 47.22%, respectively, less on health care than a household headed by a person working in the household sector. However, the percentage spent on health care among households headed by a person working in the public or private sector were 1.17% and 1.07%, respectively, less than households working in the household sector. The equal access to free health care at government facilities and healthy lifestyles could explain this. Another reason for these findings could be that, as found by earlier research, government subsidies in the health sector profit the rich rather than the poor.

Urban residents spent less on health care than rural people, which may reflect the lesser availability of health-care services in rural areas. This result is similar to Parker and Wong (19997), and Rous and Hotchkiss's (2003) findings but contradicts Malik and Syed's (2012) results casting doubt on the true effect of location on health expenditure.

***Socio-economic determinants of catastrophic health expenditure***

Table 5 shows that factors associated with the probability of catastrophic health expenditure change with the threshold levels in terms of magnitude of the coefficients and levels of significance. Thus, setting only one threshold value may result in an inaccurate estimation, leading to a misinterpretation of the importance of some variables. For example, household income per capita is significantly and negatively linked to the occurrence of catastrophic expenses at a threshold level of 10%. Thus, if a household earns more, it may lead to such an association. However, at threshold levels of 20% and 30%, the income effect is found to be insignificant. This partly may be because, at these threshold levels, the increase in household income also makes healthier foods available to the household. A household headed by a person working in the public sector and a household headed by a person working in the private sector are statistically and negatively related to the probability of incurring catastrophic expenditure. Therefore, a household headed by a person working in the household sector is more likely to be exposed to catastrophic expenses than those working in the public or private sector. The change in probability of occurrence of catastrophic expenditure with respect to the change in professional status of occupation (household sector to public sector and household sector to private sector) was 0.18% and 0.22%, respectively. This may reflect the greater opportunities for those working in the public and private sector to obtain social security benefits to cover health expenses and health insurance. Again, location is strongly correlated with the occurrence of catastrophic expenditure. Moreover, households in urban areas are 0.06% less likely to incur catastrophic expenditure than households living in a rural area. This reveals that living in an urban area is found to be a protective factor against the risk of catastrophic health expenditure (Li et al., 2014).

The age structure of household members influences the occurrence of catastrophic expenditure. Households with both children (five years old or less) and elderly (older than 60 years) have a higher risk of experiencing catastrophic expenditure than households with neither children nor elderly. This result could be explained by the fact that children and the elderly are at the highest risk in terms of health status. This finding

is similar to Knaul et al. (2013). These groups generally need more frequent, as well as more expensive health care and are more likely to demand health care. In addition, they tend to have significantly reduced income. The lack of health-care resources allocation by the government for management of non-communicable diseases among the elderly could also be an explaining factor. Household size had a positive, strong association with the probability of catastrophic expenditure at all threshold levels. Large households are more likely to be concentrated on the lower socio-economic quintile and have more dependents, and therefore they are more likely to have limited resources for health care. Education is negatively correlated with the probability of catastrophic expenditure, but in most cases the effect is not significant. However, the probability of catastrophic expenditure for households headed by a person with a secondary level education is 0.056% lower than for households headed by a person with no formal education.

**Table 5: Estimated coefficient in probit model for different catastrophic threshold levels**

| **Variables** | **Coefficients** | | |
|---|---|---|---|
| | 10% | 20% | 30% |
| **Income** | | | |
| Log($h$ exp) | -0.069*** (0.006) | 0.052 (0.158) | 0.048 (0.350) |
| ***Education*** | | | |
| No qualification® | | | |
| Primary qualification | -0.053 (0.233) | 0.034 (0.586) | 0.020 (0.825) |
| Secondary qualification | -0.146** (0.015) | -0.063 (0.472) | -0.024 (0.842) |
| Higher qualification | -0.087 (0.465) | -0.237 (0.254) | -0.444 (0.208) |
| **Occupational sector** | | | |
| Household sector® | | | |
| Public sector | -0.501*** (0.000) | -0.509*** (0.009) | -0.132 (0.612) |
| Private sector | -0.520*** (0.000) | -0.360*** (0.004) | -0.229 (0.218) |
| **Size and composition of household** | | | |
| *hsize* | 0.017** (0.012) | 0.0009* (0.064) | 0.006* (0.096) |
| Household with neither child nor elderly person® | | | |
| Grpage5 (presence of at least one child) | 0.019 (0.777) | 0.041 (0.678) | 0.001 (0.993) |
| Grpage60 (presence of at least one elderly person) | -0.032 (0.620) | -0.057 (0.542) | 0.014 (0.910) |

| | | | |
|---|---|---|---|
| Grpage560 (presence of both child and elderly person) | 0.244*** (0.001) | 0.184* (0.094) | 0.181 (0.238) |
| **Demographics and characteristics of household head** | | | |
| Gender (Female)® | -0.076* (0.054) | -0.045 (0.435) | 0.065 (0.449) |
| Age | 0.001 (0.456) | 0.003 (0.150) | 0.002 (0.462) |
| Urban (**rural**®) | -0.180*** (0.000) | -0.239*** (0.000) | -0.250*** (0.001) |
| Constant | 0.029 (0.931) | -2.376*** (0.000) | -2.857*** (0.000) |
| $R^2$ | 0.115 | 0.10173 | 0.0866 |
| Prob> $\chi^2$ (27) | 0.0000 | 0.0000 | 0.0187 |
| Number of observations | 12673 | 12673 | 12673 |

Notes: ® is reference category, P-values presented below the corresponding coefficient.
***, **and * denote significance at 1%, 5% and 10%, respectively.
Regional dummies were included in all regressions.

### *Catastrophic health expenditure and households' spending on education and food*

Table 6 contains the estimated coefficient of the presence of catastrophic health expenditure obtained from Equation 4. It shows that after adjusting for household characteristics and selectivity bias, there is a strong correlation between the presence of catastrophic health expenditure and budget share devoted to education, food and other items at various thresholds of expenditure. For example, the presence of catastrophic health expenditure is negatively and significantly associated with expenditure on education and with the budget share allocated to the remaining items excluding health services, education services and food items, respectively. Conversely, the share of expenditure on food is positively and significantly correlated with the presence of catastrophic health expenditure at the 10% threshold level. However, at the 20% and 30% cut-off point levels, this correlation changed and became negative and significant. Households with catastrophic health expenditure spend 0.20% less on education than households without catastrophic expenditure and 48.30% less on education than households without catastrophic expenditure at the 10% and 20% thresholds level, respectively. As far as food is concerned, at the threshold level of 10%, households with catastrophic expenditure spend 0.80% more than households without catastrophic expenditure. Whereas, at the 20% and 30% cut-off point level, households with catastrophic expenditure spend less on food than households without catastrophic expenditure with a 3.25% and 6.20%, respectively, decreased share spent on food. With respect to the share spent on the remainder, as threshold levels of catastrophic expenditure increase, households with catastrophic health expenditure spend less on other items except health care, education and food, with a magnitude ranging from 8.42% to 14.19%.

**Table 6: Parameter estimate for presence of catastrophic health expenditure in seemingly unrelated regression for expenditure share of education, food and other items**

| Thresholds | 10% | 20% | 30% |
|---|---|---|---|
| **Expenditure share of education** | | | |
| Coef cata | -0.001* (0.089) | -0.005*** (0.007) | -0.002 (0.411) |
| Selection term | 0.010*** (0 .000) | 0.010*** (0.000) | 0.010*** (0.000) |
| Adj R-squared | 0.1304 | 0.1306 | 0.1302 |
| **Expenditure share of food** | | | |
| Coef cata | 0.077*** (0.000) | 0.072*** (0.000) | -0.1000*** (0.000) |
| Selection term | -0.191*** (0.000) | -0.198*** (0.000) | -0.198*** (0.000) |
| Adj R-squared | 0.1474 | 0.1523 | 0.1539 |
| **Expenditure share of remaining items** | | | |
| Coef cat | -0.113*** (0.000) | -0.140*** (0.000) | -0.190*** (0.000) |
| Selection term | -0.055*** (0.000) | -0.045*** (0.000) | -0.044*** (0.000) |
| Adj R-squared | 0.1607 | 0.1526 | 0.1512 |
| Breusch-Pagan test of independence | P-value =0.0000 | P-value = 0.0000 | P-value =0.0000 |

Notes: Coef of cata, coefficient of presence of catastrophic health expenditure. The regressions are shown after adjusting for total household income, household size, education of the head of the household, age and sex of household head, school-aged children, children under 5, location of household, and regional dummies.

P-values presented below the corresponding coefficient.

***, ** and * denote significance at 1%, 5% and 10%, respectively.

Therefore, differences were found in the expenditure pattern in education and food expenditure between households with and without catastrophic health expenditure. Although total expenditure in households facing catastrophic health expenditure were higher except at the cut-off level of 10% of non-food expenditure, the share of budget devoted to education, food and other spending categories by households with catastrophic expenditure was lower than those without catastrophic expenditure, except for food at the 10% threshold level. The reason is that households that had to contend with catastrophic health-care expenditure had economic difficulties and found it hard to reorganize their resources sufficiently to offset their health expenditure. To respond to economic shocks due to a health crisis, a household may be obliged to reduce the levels of consumption of education by, for example, getting children out of school.

The higher budget share allocated to food by households with catastrophic expenditure than that by households without catastrophic expenditure at the 10% cut-off point level may be due to the fact that, at this threshold, food is typically considered a necessary good while caring for sick household members is not. The lower budget share spent on education and other expenditure, and the higher budget share spent on food in households with catastrophic health expenditure can be viewed as an indicator of coping strategies used by households to cover large and involuntary health expenditure. Therefore, ill health occurs first, and then expenditure patterns are adjusted subsequently. This may be a plausible explanation because a social security net or health insurance is not available to the population.

# 7 Conclusion and Policy Implications

Our analysis points out that household income is positively and significantly correlated with the level or budget share devoted to health care. The income effect reveals that health care is a necessary good for Benin households. Household size, status of occupation and the ratio of dependency in the household were found to have a significant effect on health expenditure. The major determinants of the occurrence of catastrophic expenditure are the location of the household, the presence of both children and elderly in the household, and the size of the household. We also found that the presence of catastrophic health expenditure was significantly and negatively correlated with the budget share allocated to education. Findings confirmed expectations in many cases, but not all.

Results represent a reference for comparison and a starting point for additional analysis to explain unexpected outcomes in greater detail. For example, urban-rural differences in the health care decision, and health care use by status of occupation need more detailed analysis, which is beyond the scope of this paper. The implications of this study are that if nothing is done by the policy makers: (i) poor households will have poor health reflecting the fact that health care consumption by households increases with household income. Because poor households have less money to pay for good quality of care they are excluded from the consumption of health care; and (ii) households with elderly and children, big households and households in rural areas will have a large burden of disease. Moreover, households that have a large burden of disease will in the short run reduce investment expenditure on education and the consumption of food to meet their health expenditure. This strategic behaviour will have an adverse impact on the household's welfare in the long term.

# References

Anyanwu, C.J. and E.O.A. Erhijakpor. 2009. "Health expenditures and health outcomes in Africa". *African Development Review*, 21(2).

Baltagi, B.H. and F. Moscone. 2010. "Health care expenditure and income in the OECD reconsidered: Evidence from panel data". *Economic Modelling*, 27: 804 – 11.

Barros, P.P. 1998. "The black box of health care expenditure growth determinants". *Health Economics*, 7(6): 533–44.

Berki, S.E. 1986. "A look at catastrophic medical expenses and the poor". *Health Affairs,* 5(4): 138–45.

Bokhari, F.A., Y. Gai and P. Gottret. 2007. "Government health expenditures and health outcomes". *Health Economics*, 16(3): 257–73.

Bolduc, D., G. Lacroux and C. Muller. 1996. "The choice of medical providers in rural Benin: A comparison of discrete choice models". *Journal of Health Economics*, 16: 477–98.

Cai, L. and G. Kalb. 2006. "Health status and labour force participation: Evidence from Australia". *Health Economics*, 15(3): 241–61.

Chaze, J.P. 2005. "Assessing household health expenditure with Box-Cox censoring models". *Health Economics*, 14(9): 893–907.

Chuma, J. and T. Maina. 2012. "Catastrophic health care spending and impoverishment in Kenya". *BMC Health Services Research*, 12: 413.

Council of Economic Analysis. 2010. Report on the state of Beninese economy and social indicators, Presidency of the Republic of Benin.

Deaton, A. 1997. *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore: Johns Hopkins University Press.

Farag, M, A.K. Nanda Kumar, S. Wallack, D. Hodgkin, G. Gaumer and C. Erbil. 2012. "The income elasticity of health care spending in developing and developed countries". *International Journal of Health Care Finance and Economics*, 12(2): 145–62.

Garg, C.C. and A.K. Karan. 2009. "Reducing out-of-pocket expenditures to reduce poverty: A disaggregated analysis at rural-urban and state level in India". *Health Policy and Planning*, 24: 116–28.

Gerdtham, K. P., and U., Gbesemete. 1992. "Determinants of health care expenditure in Africa: A cross-sectional study" , *World Development* 20(2) 303-308

Gotsadze, G., A. Zoidze and N. Rukhadze. 2009. "Household catastrophic health expenditure: Evidence from Georgia and its policy implications". *BMC Health Services Research*, 9(69).

Grossman, M. 1972. "On the concept of health capital and the demand for health", *The Journal of Political Economy*, 80(2): 223–55.

Heckman, J.J. 1979. "Sample selection bias as a specification error". *Econometrica*, 47: 153–63.

Hitiris, T. and J, Posnett. 1992. "The determinants and effects of health expenditure in developed countries", *Journal of Health Economics*, 11(2):173-81

Hjortsberg, C. 2003. "Why do the sick not utilize health care? The case of Zambia". *Health Economics*, 12: 755–70.

National Institute of Statistics and Economic Analysis. 2012. Table of economic and social indicators, Republic of Benin.

Kim, Y. and B. Yang. 2011. "Relationship between catastrophic health expenditures and household incomes and expenditure patterns in South Korea". *Health Policy*, 100(2-3): 239–46.

Knaul, F.M., H. Arreola, O. Méndez and M. Miranda. 2009. "Preventing impoverishment, promoting equity and protecting households from financial crisis: Universal insurance through institutional reform in Mexico." In P. Smith and D. Pinto, eds, *Addressing Challenges of Health Systems in the Developing World*. New York: Springer Publishing.

Knaul, F.M., R. Wong and H. Arreola-Ornelas, eds. 2013. "Health Financing in Latin America, Volume 1: Household spending and impoverishment". *Harvard Global Equity Initiative*. Harvard University Press.

Lee, L. 1983. "Generalized econometric models with selectivity". *Econometrica*, 51: 507–12.

Li, Y., Q. Wu, L. Xu, D. Legge, Y. Hao, L. Gao, N. Ninga and D. Wand. 2012. "Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: Policy implications of universal health insurance". *Bulletin of the World Health Organization,* 90: 664–71.

Li, Y, Q. Wu, C. Liu, Z. Kang, X. Xie, H. Yin, M. Jiao and G. Lui. 2014. "Catastrophic health expenditure and rural household impoverishment in China: What role does the new cooperative health insurance scheme play?" PLoS ONE 9(4): e93253. doi:10.1371/journal.pone.0093253.

Makinen, M, H. Waters, M. Rauch, N. Almagambetova, R. Bitran, L. Gilson, D. Mclntyre, S. Panarunothai, A.L. Prieto, G. Ubilla and S. Ram. 2000. "Inequalities in health care use and expenditure: Empirical data from eight developing countries and countries in transition". *Bulletin of the World Health Organization*, 78(1): 54–65.

Merlis, M. 2002. "Family out-of-pocket spending for health services: A Continuing source of financial insecurity". The Commonwealth Fund, June.

Miller, L. 1994. "Medical schools put women in curricula". *Wall Street Journal*, p. B1, May 24.

Ministry of Health. 2011, Health statistics, Republic of Benin

Malik, M.A. and S.I.A. Syed. 2012. "Socioeconomic determinants of household out-of-pocket payments on healthcare in Pakistan". *International Journal for Equity in Health*, 11: 51.

Musgrove, P. 1983. "Family health care spending in Latin America". *Journal of Health Economics*, 2: 245–57.

Mwabu, G. 2007. "Health economics for low income countries". Paper accepted

for publication in the *Handbook of Development Economics*, *Volume 4*, by T. Paul Schultz and J. Strauss, eds. Amsterdam: Elsevier, North-Holland.

Narayana , P. K. and S. Narayana. 2008. "The role of permanent and transitory shocks in explaining international health expenditure", *Health Economics*, 17(10):1171-1186.

O'Donnell, O, E. van Doorslaer, P.R. Rannan-Eliya, A. Somanathan, C.C. Garg, P. Hanvoravongchai, M.N. Huq, A. Karan, G.M. Leung, K. Tin and C. Vasavid. 2005. "Explaining the incidence of catastrophic expenditures on health care: Comparative evidence from Asia". Working Paper No. 5. EQUITAP Project, University of Macedonia, Greece, June.

Okunade, A.A. 1985. "Engel curves for developing nations: The case of Africa". *Eastern Africa Economic Review New Series*, 1(1)*:* 13–22.

Okunade, A.A. 2005. "Analysis and implication of the determinants of health care expenditure in African countries". *Health Care Management Sciences*, 8: 267–76.

Okunade, A.A., V.N.R. Murthy, and N.R. Vasudeva. 2009. "The core determinants of health expenditure in the African context: Some econometric evidence for policy". *Health Policy*, 91(1): 57–62.

Olsen, B. 1980. "A least squares correction for selectivity bias". *Econometrica*, 48(7): 1815–20.

Parker, W.S. and R. Wong. 1997. "Household income and health care expenditure in Mexico". *Health Policy*, 40: 237–55.

Pradhan, M. and N. Prescott. 2002. "Social risk management option for medical care in Indonesia", *Health Economics*, 11:431-446.

Rosenzweig, M.R., and T.P. Schultz. 1983. "Estimating a household production function: Heterogeneity, the demand for health inputs, and their effects on birth weight". *Journal of Political Economy*, 91(5): 723–46.

Rous, J.J. and D.R. Hotchkiss. 2003. "Estimation of the determinants of household health care expenditures in Nepal with controls for endogenous illness and provider choice". *Health Economics*, 12: 431–51.

Russell, S. 1996. "Ability to pay for health care: Concepts and evidence". *Health Policy and Planning*, 11(3): 219–37.

Russell, S. 2004. "The economic burden of illness for households in developing countries: A review of studies focusing on malaria, tuberculosis, and human immunodeficiency virus/acquired immunodeficiency syndrome". The *American Journal of Tropical Medicine and Hygiene*, 71:147–55.

Sahn, D. 1992. "Public expenditure in Sub-Saharan Africa during the period of economic reform", *World Development*, 20(5) 673-693

Sen, A. 2005. "Is health care a luxury? New evidence from OECD data". *International Journal of Health Care Finance and Economics*, 5: 147–64.

Su, T., S. Pokhrel, A. Gbangou and S. Flessa. 2006a. "Determinants of household health expenditure on Western institutional health care". *European Journal of Health Economics*, 7: 199–207.

Su, T., B. Kouyaté and S. Flessa. 2006b. "Catastrophic household expenditure

for health care in low-income society: A study from Nouna District, Burkina Faso". *Bulletin of the World Health Organization*, 8(1) :21-27.

Tandon., A. and C. Cashin. 2010. *Assessing Public Expenditure on Health From a Fiscal Space Perspective*. Health, Nutrition and Population Discussion Paper.

The World Bank, Washington, D.C. Wagstaff, A. 2007. "The economic consequences of health shocks: Evidence from Vietnam". *Journal of Health Economics*; 26: 82–100.

Wagstaff. A. 2008. "Measuring financial protection in health". Policy Research Working Paper No. 4554. The World Bank, Washington, D.C.

Wagstaff A. and E. van Doorslaer. 2003. "Catastrophe and impoverishment in paying for health care: With applications to Vietnam 1993–1998. *Health Economics*, 12: 921–34.

World Bank. 2014. World Development Indicators, Washington DC.

World Health Organization. 2005. The world Health report – Make every mother and child count, Geneva

World Health Organization. 2014. World health statistics, Geneva

Wouter, A., O. Adeyi and R. Marrow. 1993. *Quality of Health Care and its Role in Cost Recovery with a Focus on Empirical Findings about Willingness to Pay for Quality Improvements*. HFS Major Applied Research paper No.8, Bethesda, MD: Abt Associates.

Wyszewianski, L. 1986. "Families with catastrophic health care expenditures". *Health Services Research*, 21: 617–34.

Wang, H, L. Zhang and W. Hsiao. 2006. "Ill health and its potential influence on household consumption in rural China". *Health Policy*, 78: 167–77.

Xu, K., D.B. Evans, P. Kadama, J. Nabyonga, P. Ogwang Ogwal, P. Nabukhonzo and M.A. Aguilar. 2006. "Understanding the impact of eliminating user fees: Utilization and catastrophic health expenditures in Uganda". *Social Science & Medicine*, 62: 866–76.

Xu, K., D. Evans, K. Kwabata, D. Zeamdini, T. Klavus and C. Murray. 2003, "Household catastrophic health expenditure: a multicountry analysis", *The Lancet*, 362: 111–17.

Zellner, A. 1962. "An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias". *Journal of the American Statistical Association*, 57: 348–68.

Zimmermann, A. and R.A. Easterlin. 2006. "Happily ever after? Cohabitation, marriage, divorce and happiness in Germany". *Population and Development Review*, 32(3): 511–28.

# Appendix

**Table A1: Descriptive statistics and variables definition**

| Dependent variables | Definition of variables | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| $h\exp_i$ | Total health-care expenditure | 19,935.41 | 55,632.99 | 0 | 500,000 |
| $W_{1i}$ | Health expenditure as % of total household expenditure | 0.016 | 0.033 | 0 | 0.939 |
| $W_{2i}$ | Budget share for education | 0.015 | 0.039 | 0 | 0.674 |
| $W_{3i}$ | Budget share for food | 0.500 | 0.187 | 0.001 | 0.977 |
| $W_{4i}$ | Budget share for other goods | 0.467 | 0.179 | 0.015 | 0.998 |
| $prop$ | 1 if the household has positive health expenditure and 0 otherwise | 0.822 | 0.382 | 0 | 1 |
| $cath\exp_i$ | 1 if a household's health expenditure equals or is greater than 10%, 20% and 30% of the household's capacity to pay, and 0 otherwise. | | | | |
| | 1 if a household's health expenditure equals or is greater than 10% of the household's capacity to pay, and 0 otherwise | 0.065 | 0.247 | 0 | 1 |
| | 1 if a household's health expenditure equals or is greater than 20% of the household's capacity to pay , and 0 otherwise | 0.020 | 0.140 | 0 | 1 |
| | 1 if a household health expenditure equals or greater than 30% of the household's capacity to pay , and 0 otherwise | 0.007 | 0.086 | 0 | 1 |
| **Independent variables** | | | | | |
| **Socioeconomic status** | | | | | |
| $h\ \exp$ | Level of total household expenditure | 274,451.7 | 397,207.8 | 7,495.833 | 8,000,000 |

| | | | | | |
|---|---|---|---|---|---|
| ***Education*** | | | | | |
| No qualification® | 1 if household head is without any qualification, 0 otherwise | 0.687 | 0.463 | 0 | 1 |
| Primary qualification | 1 if household head has primary qualification, 0 otherwise | 0.166 | 0.372 | 0 | 1 |
| Secondary qualification | 1 if household head has secondary qualification, 0 otherwise | 0.117 | 0.321 | 0 | 1 |
| Higher qualification | 1 if household head has higher qualification, 0 otherwise | 0.029 | 0.168 | 0 | 1 |
| ***Status of occupation*** | | | | | |
| Household sector® | 1 if household head works in household sector, 0 otherwise | 0.0210 | 0.142 | 0 | 1 |
| Public sector | 1 if household head works in public sector, 0 otherwise | 0.045 | 0.208 | 0 | 1 |
| Private sector | 1 if household head works in public sector, 0 otherwise | 0.933 | 0.248 | 0 | 1 |
| **Size and Composition of household** | | | | | |
| *hsize* | Household size | 4.921 | 2.827 | 1 | 26 |
| *ratiodep* | The proportion of non-active members in the household | 1.184 | 0.995 | 0 | 8 |
| *grage* | 1 if household has neither children nor elderly members and 0 otherwise. | 0.919 | 0.271 | 0 | 1 |
| *grage*5 | 1 if at least one member of the household is younger than 5 years (children), 0 otherwise | 0.571 | 0.494 | 0 | 1 |
| *grage*560 | 1 if household has member younger than 5 years and member older than 60 years and 0 otherwise | 0.085 | 0.281 | 0 | 1 |
| *grage***60** | 1 if at least one member of the household is older than 60 years (elderly), 0 otherwise | 0.255 | 0.436 | 0 | 1 |
| *pfem*1549 | Percentage of female between 15 and 49 year old | 0.216 | 0.178 | 0 | 1 |
| *pmale* | Percentage of men in the household | 0.507 | 0.257 | 0 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| **Demographics and characteristics of household head** | | | | | |
| *sex* | 1 if the household head is male, 0 otherwise | 0.783 | 0.411 | 0 | 1 |
| age | Age of household head | 44.683 | 13.478 | 2 | 90 |
| **Marital status** | | | | | |
| Single | 1 if household head is single, 0 otherwise | 0.099 | 0.299 | 0 | 1 |
| Married | 1 if household head is married, 0 otherwise | 0.772 | 0.418 | 0 | 1 |
| Divorcee | 1 if household head is divorcee, 0 otherwise | 0.031 | 0.175 | 0 | 1 |
| Widowed | 1 if household head is widowed, 0 otherwise | 0.095 | 0.294 | 0 | 1 |
| **Religion of the head of household** | | | | | |
| Traditional | 1 if household head's religion is traditional, 0 otherwise | 0.266 | 0.442 | 0 | 1 |
| Muslim | 1 if household head's religion is Muslim, 0 otherwise | 0.212 | 0.409 | 0 | 1 |
| Christian | 1 if household head's religion is Christian, 0 otherwise | 0.520 | 0.499 | 0 | 1 |
| **Residences** | | | | | |
| *urban* | 1 if the household lives in an urban area and 0 otherwise. | 0.389 | 0.487 | 0 | 1 |
| *devcom* | number of health and educational facilities available in the community | 141.318 | 161.525 | 0 | 994 |

**Table A2: Estimated coefficients of health care expenditure using Olsen approach for selectivity**

| | Selection equation | Logarithm of health expenditure | Health expenditure as % of total household expenditure |
|---|---|---|---|
| | Coefficients | Coefficients | Coefficients |
| **Income** | | | |
| Log($h$ exp) | 0.065*** (0.000) | 0.787*** (0.000) | 0.0003* (0.090) |
| ***Education*** | | | |
| No qualification® | | | |
| Primary qualification | 0.036*** (0.000) | 0.101** (0.013) | 0.0009 (0.419) |
| Secondary qualification | 0.005 (0.626) | 0.127*** (0.002) | 0.0008 (0.465) |
| Higher qualification | 0.006 (0.754) | 0.267*** (0.001) | 0.0016 (0.404) |
| ***Status of occupation*** | | | |
| Household sector® | | | |
| Public sector | -0.020 (0.437) | -0.580*** (0.000) | -0.011*** (0.000) |
| Private sector | -0.00008 (0.997) | -0.635*** (0.000) | -0.010*** (0.000) |
| **Size and composition of household** | | | |
| *hsize* | 0.012*** (0.000) | 0.167*** (0.000) | 0.0002 (0.328) |
| *ratiodep* | 0.009** (0.018) | 0.121*** (0.000) | 0.0006 (0.135) |
| *pfem*1549 | -0.021 (0.309) | 0.147* (0.082) | -0.0035 (0.113) |
| *pmale* | -0.047*** (0.002) | -0.305*** (0.000) | -0.0059*** (0.001) |
| **Demographics and characteristics of household head** | | | |
| Gender **(Female®)** | 0.0048 (0.641) | 0.111*** (0.004) | 0.0006 (0.547) |
| age | -0.0005** (0.021) | -0.002** (0.021) | -0.00003 (0.303) |
| Single® | | | |
| Married | 0.074*** (0.000) | 0.338*** (0.000) | 0.0014 (0.452) |
| Divorcee | 0.048** (0.017) | 0.122 (0.149) | 0.0030 (0.244) |

| | | | |
|---|---|---|---|
| Widowed | 0.079 *** (0.000) | 0.260 *** (0.001) | 0.001 (0.574) |
| Traditional® | | | |
| Muslim | 0.032 *** (0.005) | 0.048 (0.346) | -0.0007 (0.601) |
| Christian | 0.024 *** (0.003) | -0.052 (0.130) | -0.0014 (0.139) |
| Urban (**rural** ®) | 0.008 (0.202) | -0.059 ** (0.024) | -0.002 *** (0.000) |
| *devcom* | -0.00007 *** (0.000) | - | - |
| Selection term | - | -1.140* (0.099) | -0.029 (0.105) |
| Constant | 0.0049 (0.950) | -1.446* (0.054) | 0.023 (0.281) |
| Prob> $\chi^2$ (df .) | Prob> $\chi^2$(30)=0.000 | Prob> $\chi^2$(29)=0.000 | Prob> $\chi^2$ (30)=0.000 |
| Number of observations | 15411 | 12673 | 12673 |

Notes: ® is reference category.

P-values presented below the corresponding coefficient.

***, ** and * denote significance at 1%, 5% and 10%, respectively.

Regional controls were included in all regressions.

**Table A3: Estimated coefficients of catastrophic health expenditure equation using Heckman and Olsen approaches for selectivity**

| | Threshold levels | | | Threshold levels | | |
|---|---|---|---|---|---|---|
| | 10% | 20% | 30% | 10% | 20% | 30% |
| **Income** | | | | | | |
| Log ($\hbar$ exp) | -0.132* | 0.059 | 0.161 | -0.095** | 0.022 | 0.038 |
| | (0.074) | (0.575) | (0.283) | (0.049) | (0.756) | (0.701) |
| ***Education*** | | | | | | |
| No qualification® | | | | | | |
| Primary qualification | -0.067 | 0.036 | -0.045 | -0.060 | 0.026 | 0.017 |
| | (0.155) | (0.590) | (0.637) | (0.190) | (0.691) | (0.853) |
| Secondary qualification | -0.160*** | -0.061 | 0.005 | -0.141** | -0.057 | -0.022 |
| | (0.010) | (0.497) | (0.996) | (0.020) | (0.518) | (0.855) |
| Higher qualification | -0.111 | -0.234 | -0.400 | -0.079 | -0.228 | -0.441 |
| | (0.366) | (0.267) | (0.261) | (0.510) | (0.275) | (0.212) |
| ***Status of occupation*** | | | | | | |
| Household sector® | | | | | | |
| Public sector | -0.469*** | -0.513*** | -0.191 | -0.505*** | -0.513*** | -0.133 |
| | (0.000) | (0.011) | (0.480) | (0.000) | (0.008) | (0.609) |
| Private sector | -0.488*** | -0.364*** | -0.285 | -0.528*** | -0.370*** | -0.232 |
| | (0.000) | (0.007) | (0.151) | (0.000) | (0.004) | (0.217) |
| **Size and composition of household** | | | | | | |
| *hsize* | -0.032* | 0.002 | 0.020 | -0.024** | -0.006 | -0.008 |
| | (0.067) | (0.912) | (0.575) | (0.046) | (0.729) | (0.735) |
| Household with neither children nor elderly® | | | | | | **t** |
| Grpage1 | 0.015 | 0.042 | 0.011 | 0.018 | 0.039 | 0.0003 |
| | (0.826) | (0.674) | (0.936) | (0.795) | (0.695) | (0.998) |
| Grpage2 | -0.027 | -0.058 | 0.006 | -0.029 | -0.054 | 0.015 |
| | (0.676) | (0.539) | 0.964 | (0.657) | (0.568) | (0.904) |
| Grpage3 | 0.235*** | 0.185* | 0.196 | 0.236*** | 0.176 | 0.178 |
| | (0.002) | (0.094) | (0.205) | (0.002) | (0.112) | (0.250) |
| **Demographics and characteristics of household head** | | | | | | |
| Gender (Female®) | -0.075* | -0.045 | 0.063 | -0.072* | -0.040 | 0.067 |
| | (0.059) | (0.434) | (0.463) | (0.073) | (0.490) | (0.445) |
| age | 0.001 | -0.003 | -0.002 | 0.001 | 0.004 | 0.002 |
| | (0.392) | (0.156) | (0.529) | (0.397) | (0.133) | (0.458) |
| Urban(**rural**®) | -0.176*** | -0.240*** | -0.258*** | -0.182*** | -0.241*** | -0.250*** |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) | (0.001) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Selection term | -0.067 | -0.008 | -0.121 | 0.355 | 0.405 | 0.126 |
| | (0.367) | (0.937) | (0.424) | (0.527) | (0.621) | (0.914) |
| Constant | 0.277 | -2.407*** | -3.307*** | 0.442 | -1.903* | -2.709* |
| | (0.526) | (0.000) | (0.000) | (0.548) | (0.077) | (0.079) |
| Prob $\chi^2$ ( 29) | 0.0000 | 0.000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Number of observations | 12673 | 12673 | 12673 | 12673 | 12673 | 12673 |

Notes: ® is reference category, P-values presented below the corresponding coefficient.
***, ** and * denote significance at the 1%, 5% and 10% level, respectively.
Regional control was included in all regression.

## Notes

1 Households' ability to pay has been calculated according to the total household expenditure, total non-food expenditure (Wagstaff and van Doorslaer, 2003) and the non-subsistence spending of the household (Xu et al., 2003; Li et al., 2012).

2 Macroeconomic studies of health spending determinants in developed countries comprise international comparisons of total health care expenditure at national level in high income countries (e.g. Barros, 1998; Hitiris and Posnett, 1992; Narayana and Narayana, 2008, where per capita income elasticity of health expenditure is greater than one. However, Baltagi and Moscone (2010) used a panel of 20 OECD countries within the context of cross-section dependence and unobserved heterogeneity. Their findings suggest that health care is a necessity rather than a luxury, with an elasticity much smaller than that estimated in previous studies.

3 Burkina Faso, Guatemala, Kazakhstan, Kyrgyzstan, Paraguay, South Africa, Thailand and Zambia.