Effect of Private Health Expenditure on Mortality Level in Kenya: A Linear Probability Model (LPM) Approach

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Abstract: The study is motivated by recognition that health of an individual is key to the development process. The Kenya Vision 2030 emphasises the need to adopt health care financing method that promotes good health. The main objective of this article is to estimate the effect of out-of-pocket (private) health expenditure on mortality level (health status) in Kenya. In the estimation of the impact of out-of-pocket health expenditure on mortality level, it emerges that the problem of endogeneity and unobserved heterogeneity has to be addressed.

The main source of data for the article is the household health expenditure and utilisation survey conducted jointly in 2008 by the Kenyan health ministries and the Kenya National Bureau of Statistics. A causal link between out-of-pocket health expenditure and mortality controlling for other covariates such as land, education, age, gender and residence is studied taking into account the endogeneity of expenditure and heterogeneity of mortality. The estimation results indicate that the private (out-of-pocket) health expenditure is negatively and statistically correlated with mortality level. Therefore a percentage increase in the out-of-pocket health expenditure (a proxy for health inputs) is associated with a decrease in mortality level of 0.179 per cent. Hence private health expenditures mainly through out-of-pocket health expenditures have a major implication on health status of individuals particularly on their mortality probabilities.

An important policy implication of the article is that government should make every effort to increase public health expenditure to reduce user charges for healthcare, which are a barrier to health service utilisation. Currently, user charges at health facilities in Kenya are quite high and unaffordable by the poor. There is a need for a public policy to address this issue. The article provides insights into how such a policy is designed; illustrating the effect it would have on health at the household level.

Keywords: Private health expenditure, mortality level, linear probability model, endogeneity, heterogeneity, Instrumental Variables (IV) models and Two Stage Least Squares (2SLS).

1. INTRODUCTION

The Kenya Vision 2030 focuses on health care financing reforms as a mechanism for improving health status of the population. The health financing reforms are aimed at improving health services access, equity, and quality. Improving health is essential for realization of Kenya's middle income country status by 2030[1]. The Vision 2030 puts forward policies that seek to transform Kenya into a globally competitive and prosperous nation by 2030. The blueprint emphasises the need to strengthen the economic, social and political pillars of the society as a precondition for development. The social pillar involves investing in the people of Kenya through transformation of eight key social sectors. These sectors are education and training, health, water and sanitation, environment, housing and urbanisation and finally gender, youth, sports and culture. The health sector reform of the Vision 2030 focuses on improving the access, equity, quality, service delivery capacity and institutional framework governing health care financing[2].

Developing countries and in particular Kenya, face major challenges in improving the health status of their population. Poverty rates which stand at about 46.6 per cent of the population contributes to poor health of the population[3]. Kenya is faced with continued high infant, child and maternal mortality levels, high birth rate and increasing re-emergence of diseases, particularly tuberculosis and hence increasing the mortality level[4]. The onset of Human Immune Deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) whose prevalence rate stood at 6.7 per cent by 2010[5] has had a profound negative effect on the health of the population. High cost of drugs, inadequate funding and high cost of health care have equally drastically affected the health sector[6].

The expenditure on improvement of health status is essential for the realization of a country's economic development and growth goals. The access to basic healthcare, e.g., through affordable financing is considered as a way to achieve human development[7]. Improving health status of the population through effective health care financing has been a key policy focus of development experts for a long time, with many studies being conducted in many parts of the world[8] . The micro and macro benefits of adult and child health are numerous. Among the key benefits of better health is the, (i) provision of a steady supply of labour force to the economy, (ii) formation of physical capital and avoidance of disease treatment expenses [9](iii) better child health and nutrition are associated with better educational outcomes so that investment in child health and nutrition are important determinants of future human capital and labour productivity[10]. Health is therefore vital in the process of creating wealth for a nation as well as in the acquisition of cognitive skills and practical knowledge[11].

The health inputs and the demographic factors determining the mortality level in various sub-groups vary depending on unobserved factors such as genetics, environment and individual behaviour. The major health input that is assumed to be used in the production of health in this thesis is the medical care purchased by out-of-pocket health care expenditure. Other non-health inputs include health knowledge, nutrition and the unobserved factors related to the residence of an individual. Since the mortality level as used in this thesis encompasses summaries of all forms of mortality, the overall health status of an individual can be summarized by infant mortality, under-five mortality and life expectancy (see figures 1, 2 and 3).

Infant mortality is the probability of dying before the first birthday[12]. Mortality rates are basic indicators of a country's level of socio-economic development and quality of life. Kenya's infant mortality rate recorded during the period 2000-2005 was 70.5 deaths per 1,000 live births, compared with the world of 51.7 deaths per 1000 live births. This is a clear indication that the Kenyan average infant mortality rate was higher than the world average. Although the trend of infant mortality rates in Kenya is expected to decline steadily up to the period 2050, this decline will still be lower than the expected world average. This is an indication that infant mortality rate will continue to be a major health problem in Kenya. Thus there is need to reduce out-of-pocket health expenditure through subsidies in an effort to address this problem (Figure 1).
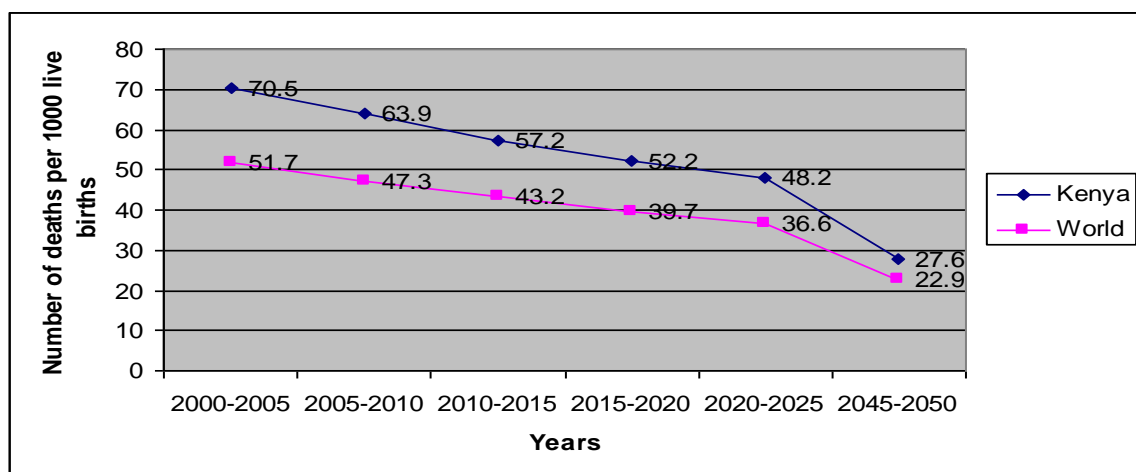
Source: United Nations Department of Economic and Social Affairs (2008)

Figure 1: Trend in Infant Mortality Rates in Kenya Relative to World Trends

The level of under-five mortality was 113.8 deaths per 1,000 live- births during the 2000-2005 period[13], implying that one in every nine children born in Kenya during the period died before reaching their fifth birthday. There is a clear trend of the projected decline in the under-five mortality rate for the period spanning 2000-2050. However, this decline is still steadily below the expected world average which puts pressure on Kenya to reduce its under-five mortality rates, through interventions that reduce the out-of-pocket health expenditure (figure 2).
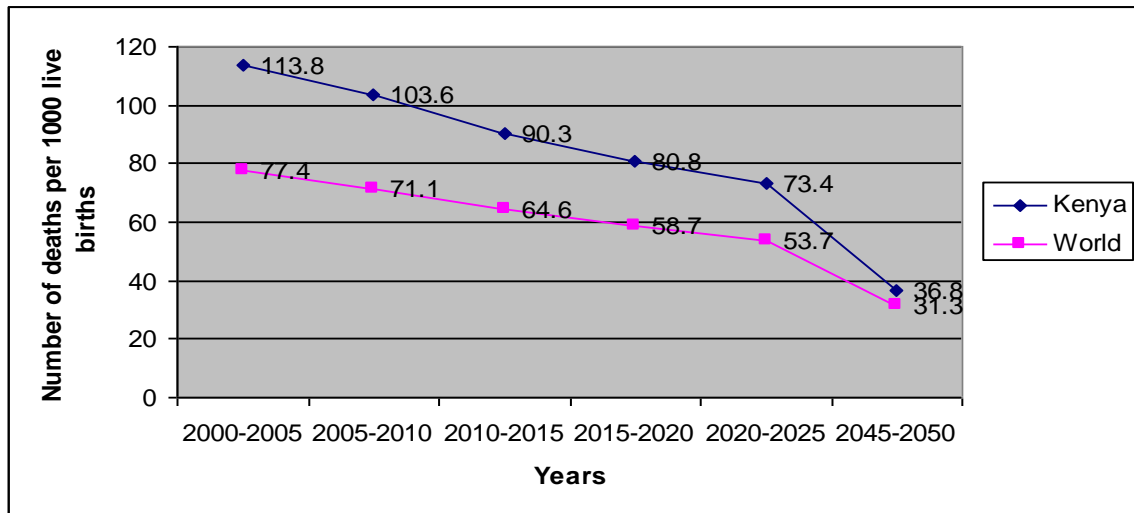
Source: United Nations Department of Economic and Social Affairs (2008)

Figure 2: Trend in Under-Five Mortality Rate in Kenya Relative to World Trend

Life expectancy in Kenya stood at 47 in the year 2000 and to a low of 45.5 in 2002. The notable decreases in life expectancy between 2000 and 2002 for both male and female[1] was attributed to the rising incidence and prevalence of HIV/AIDS[14]. In 2006, life-expectancy for women was 51 years and 50 years for men, while the overall life expectancy stood at 51.7 years. The trend indicates that life expectancy will improve for the period 2000-2050 but will still be below the world expected average.
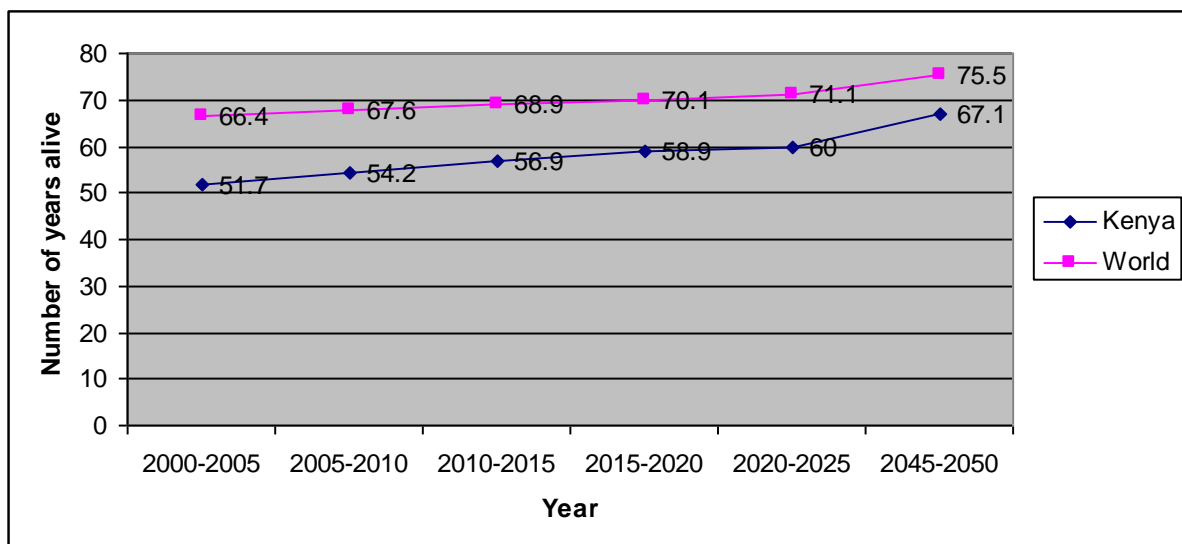
Source: United Nations Department of Economic and Social Affairs (2008)

Figure 3: Trend in Life Expectancy in Kenya Relative to World Trends

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[1] The female life expectancy in 2000 was 47 falling to a low of 46.1. in 2003 while that of males was 47 in 2000 falling to a low of 44 in 2002.

It is therefore evident from figures 1 to 3 that the major health indicators in Kenya have not performed well since 2000. This calls for the mobilisation of resources to reverse the trends and meet the Millennium Development Goals (MDGs) and the Vision 2030 targets on health.

The share of private financing, particularly out-of-pocket spending has declined fast in both relative and absolute terms in the recent years. According to the latest National Health Accounts (NHA), the share of private financing fell from 54 per cent in 2002 to 39.3% in 2008, with much of this being due to the increase in the share accounted for by donor support. Private spending declined in real terms by 9.8 per cent, from Kshs.30.8 billion in 2002 to Kshs.27.8 billion in 2007. Household spending dropped from 51% in 2002 to 36 per cent in 2007 of total health expenditures, and spending per capita declined from Kshs.770 in 2002 to Kshs.713 in 2007[15] . The direct out-of-pocket spending decreased by 29 per cent from Kshs.819 in 2002 to Kshs.578 in 2008. This huge drop in household spending was due to a significant increase in flow of donor funds mainly through the US President's Emergency Programme for AIDS Relief (PEPFAR) to the sector even though still not compliant with the required MDGs levels.

The broad question the article seeks to answer is whether the individual out-of-pocket (private) health care expenditures have had a favourable effect on mortality level in Kenya. The justification of the article is based on the fact that major health indicators for the poor in Kenya have continued to lag behind as compared to the rest of the population. Although the major health indicators are on an upward trend as indicated in figure 1 to 3, it is not enough to reach the MDG targets.

Although human capital has been accepted as a production factor in the Grossman Model, very few[2] structural models exist in Kenya on effects of the individual out-of-pocket health expenditures on overall mortality. In fact, most of the studies have concentrated on the impact of health expenditures on child health, life expectancy and on anthropometric measures of health status. The effect of household health on aggregated mortality level has largely been ignored.

Becker argued that the production of health stock requires time apart from other inputs. This is possible subject to the availability of health care resources such as health expenditures and time. Therefore the author in essence emphasized on the need to consider time in the production of health stock. This idea was also shared by Lancaster[17]. Grossman[18] on the other hand regards health as both consumption good as well as an investment good. Both papers postulate that health stock is an output whose production must involve the use of inputs such as health care resources.

Cutler and Richardson[19] argued that health is multi-dimensional and a highly dynamic notion and composed of both physical and mental components. As individuals advance in age, their health status gets influenced by both observed (lifestyle choices such as smoking and drinking) and unobserved factors (unobserved genetic, hormonal and biochemical factors). Belloc and Breslow[20] and Kenkel[21] confirmed the theoretical notion that health is affected by several lifestyle choices such as diet, smoking, exercise, alcohol consumption, sleep, weight (relative to height), and stress. This was given a theoretical backing by Rosenzweig and Schultz[22]. According to Strittmatter and Sunde[23], health as measured by the mortality of infants and adults affects the performance of the economy through human capital investments, physical capital accumulation, population growth, productivity as well as the female labor force participation.

The empirical literatures indicate varied findings regarding the impact of out-of-pocket (private) health expenditures on the general health status and the mortality level in particular. Jourmand, et. al.[24], Berger and Messer[25], Or[26] , Crémieux, et. al.[27], Elola, et. al.[28] and Grubaugh and Rexford[29]tudies show that out-of-pocket (private) health expenditures have a significant, large and positive effect on mortality level in Organisation for Economic Co-operation and Development (OECD) countries. Issa and Quattara[30] using a disaggregated health expenditure data into public and private with a column data of 160 countries showed a strong negative relationship between out-of-pocket health expenditures and mortality levels. Similar results of a negative relationship between out-of-pocket health expenditure and mortality level were found in studies by Gupta, et. al.[31] and Gupta, et. al.[32].

Nixon and Ulmann[33] on the other hand show that an increase in out-of –pocket (private) health expenditure has only a small impact on health status. Other studies found that out-of-pocket (private) health expenditure has no significant impact on the population health stock following Self and Grabowski[34].

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[2] The only other study on structural modeling in Kenya that the author is aware of is that of Mwabu (2009).

Babazono and Hillman[35; Cochrane, et. al.[36]; Judge, et. al.[37]; Pampel and Pillai[38] and Wolfe, et. al.[39], Leu[40], Strittmatter and Sunde[41], Lichtenberg[42] Mwabu, Ainsworth and Nyamete[43], Akin, Guilkey and Denton[44] , Mocan, Telkin and Zax[45], Gupta and Dasgupta[46], Leonard, Mliga and Mariam[47] Havemann and Van der Berg[48], Phelps[49] , Sahn, Younger and Genicot[50], Lawson[51], Lindelow[52] and Grobler and Stuart[53] in their respective studies using correlations between health expenditures and mortality found that the state health care spending in developed countries negatively influences (lowers) mortality level.

However, only Pampel and Pillai[54] found significance between health expenditures and mortality level. This was attributed to differing definitions of health care spending; controlling for different variables; varying time frames including cross section and over time analysis; inclusion of different countries, and a variety of methodologies.

2. METHODOLOGY

2.1 Conceptual Framework:

This article estimates a health production function for Kenya based on the ground breaking work of Grossman[55] and subsequent literature by Rosenzweig and Schultz[56] The model treats social, economic and environmental factors as inputs into the health production function. Thornton[57] argue that importance of estimating an aggregate health production function is that the estimates of the overall effect of medical care utilization on the health stock of the population can be obtained directly.

Following Mwabu[58] as indicated by equation, this article adopts Rosenzweig and Schultz[59] conceptual model in which health is produced by utility maximizing household member. The following utility function is presumed:

$$U = U(N, R, M) \tag{1}$$

Where

N = a health neutral good, i.e., a commodity that yields utility, U, but has no direct effect on the health of the household, such as distance to the hospital and the housing status of the household.

R = a health-related good or behaviour that yields utility to the household and also affects the mortality status such out-of-pocket health expenditures.

M = mortality level of the an individual (Health Status)

The health production function can be restated as:

$$M = M(R, W, \mu) \tag{2}$$

Where,

W = Inputs such as education, health knowledge and other covariates that affect the individual health directly.

μ = the component of the household health due to genetic or environmental conditions uninfluenced by the household healthcare expenditures.

The household member aims at maximizing (1) given (2) subject to the budget constraint given by equation (3)

$$B = P_n N + P_r R + P_w W \tag{3}$$

Where B is exogenous income and P_n, P_r and P_w are, respectively, the prices of the health-neutral good, *N,* health-related consumer good, *R*, and overall investment good, *W* since health is both a consumption and an investment good as discussed by Grossman[60].

Equation (2) describes an individual member's production of health which is superimposed on the constrained utility maximization behaviour of an individual. By manipulation, equations (1), (2) and (3) follows Mwabu[61] and yield health input demand functions of the form.

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$$N = D_n(P_n, P_r, P_w, B, \mu) \tag{4}$$

$$R = D_r(P_n, P_r, P_w, B, \mu) \tag{5}$$

$$W = D_w(P_n, P_r, P_w, B, \mu) \tag{6}$$

The effects of changes in prices of the three goods on an individual's health can be derived from equations (8) to (10) since from equation (2), a change in health status (mortality level) can be expressed as:

$$dM = F_r \bullet dR + F_w \bullet dW + F_\mu \bullet d\mu \tag{7}$$

Where,

F_R, F_w, F_μ are marginal products of health inputs R, W and μ, respectively.

From equation (2), the change in health can be related to changes in respective prices of health inputs as follows:

$$dM/dP_n = F_r \bullet dR/dP_n + F_w \bullet dW/dP_n + F_\mu \bullet d\mu/dP_n \tag{8}$$

$$dM/dP_r = F_r \bullet dR/dP_r + F_w \bullet dW/dP_r + F_\mu \bullet d\mu/dP_r \tag{9}$$

$$dM/dP_w = F_r \bullet dR/dP_w + F_w \bullet dW/dP_w + F_\mu \bullet d\mu/dP_w \tag{10}$$

Where: $d\mu/dPi = 0$, for i = n, r, w so that in equation (8) to (10) the terms $F\mu(.) = 0$, since μ is a random variable unrelated to commodity prices.

The above expressions show that commodity prices are correlated with the health status (mortality level) of an individual. The signs and sizes of effects of commodity prices on health depend on the magnitudes of changes in demand for health inputs following price changes and the sizes of the marginal products of health inputs. It is of more interest to note that the system of demand equations (8) to (10) exhibit the properties of additivity, negativity, homogeneity and symmetric conditions[62].

2.2 Model Specification and Estimation:

The relationship between mortality level and individual out-of-pocket (private) health expenditure has been the focus of health economists for a long period of time. The model specification has a foundation in a model developed by Mwabu[63] as indicated by equations (1) to (10). Equation (2) was estimated using Instrumental Variable (IV) and Linear Probability Model (LPM) that allows for the correction of the common econometric problems such as endogeneity and unobserved heterogeneity. Following Murray[64], Instrumental Variable (IV) analysis was applied to purge off the biases caused by endogeneity in health inputs to mortality level, while the control function approach which follows Blundell and Dias[65], Garen[66] and Card[67] deals with the non-linear interactions of mortality level with unobservable variables specific to an individual household member.

Following Wooldridge[68] and Mwabu[69] the Linear probability Model was estimated by equation (11) using instrumental variable two stage least squares method to correct for the problem of endogeneity and heterogeneity.

$$m_i = \alpha_0 + \sum \delta_i d_i + \sum \gamma_i \log Ex_i + \sum \phi \log h_i + u_m \tag{11}$$

Where,

m_i and h_i represents mortality level and endogenous out-of-pocket health expenditures respectively.

d_i = A vector of exogenous dummy variables such as religion, residence and sex.

Ex_i = A vector of other exogenous continuous variables such as individual income and assets proxied by land acreage, age and education that also belong to mortality level.

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δ, γ, α, ϕ, β, ω and μ =Vectors of parameters to be estimated while u = disturbance term

2.3 Data and Variables:

This article used data from the Household Health Expenditure and Utilisation Survey of 2008. This is the latest dataset accessible for research purposes because the subsequent survey which commenced on July 2013 is still in the analysis stage and the dataset is yet to be released for public consumption. This is a survey usually undertaken as part the NHA estimations. The NHA estimates give information not only on the distribution of health funding by financing sources but also by the entities through which the funds pass (financing agents), the health services providers that consume the funds, and ultimately the health functions on which the funds are spent.

The survey covered Kenya's eight provinces and all its districts. In all, 737 clusters were selected; 506 (68.7 percent) were rural and 231 urban. In each cluster, 12 households were systematically randomly selected; whenever possible, the households selected for the 2008 survey were the same households that had been interviewed in the 2003 survey. The sample frame, therefore, consisted of 8,844 households, 6,072 of them rural and 2,772 urban with a total sample size for all individuals being 34,164. A total of 8,844 households were successfully interviewed, giving a response rate of 96 percent as indicated in table 1.

Table1: Sampling Frame of Clusters and Households

	Cluster			Household		
Province	**Rural**	**Urban**	**Total**	**Rural**	**Urban**	**Total**
Nairobi	0	90	90	-	1,080	1,080
Central	82	18	100	984	216	1,200
Coast	53	37	90	636	444	1,080
Eastern	85	15	100	1,020	180	1,200
North Eastern	34	11	45	408	132	540
Nyanza	82	18	100	984	216	1,200
Rift Valley	98	21	119	1,176	252	1,428
Western	72	21	93	864	252	1,116
TOTAL	**506**	**231**	**737**	**6,072**	**2,772**	**8,844**

Source: Republic of Kenya, 2009

The household mortality level was used as a measure of the health status. It is binary in nature such that 1 represents households that have reported mortality while 0 represents those who have not reported mortality in the last 12 months. The out-of-pocket individual health expenditure is the main treatment variable in this article. It represents individual household member routine health expenditures in Kenya shillings per year. Other control variables are total permanent income proxied by individual land holding in acres to correct for endogeneity, education level in year of schooling completed, health knowledge was proxied by religion of the household member since the health knowledge is likely to be endogenous to the mortality and the number of years schooling, sex, age and residence of the individual member was used as a proxy for urbanisation rate. The instrumental variables used in the article to correct for endogeneity were distance to the health facility in kilometres and the user fee per visit in Kshs. per year.

3. RESULTS AND DISCUSSION

A Linear Probability Model (LPM), which is the Ordinary Least Squares (OLS) version of a binary dependent model, was estimated. The model provides a bridge between more traditional approaches to econometrics, which treats explanatory variables as fixed, and the random sampling approach based on stochastic explanatory variables discussed by Wooldridge[70]. However, the results should be taken with some caution because of the problems associated the LPM. The major problems associated with the LPM are the probability lying outside 0 and 1 at times as well as the error term being heteroskedastic. This causes bias in the standard errors and probability and therefore the LPM underestimates the

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mortality production function following Cameron and Trivedi[71]. The empirical model to be estimated appeared in the form of semi-log and log-log models whose interpretations follow Wooldridge[72].

Table 1 presents a summary of the key models of the LPM.The results in column (1) present ordinary OLS-LPM without controlling for both endogeneity and heterogeneity while the results in column (2) presents IV-Two-Stage Least Squares (2SLS), LPM which controls for endogeneity both endogeneity and heterogeneity. Therefore the coefficients of estimation for the variables become unbiased as we move form column (1) to column (2). The preferred estimation technique is indicated in column (2).

Table 2: LPM and Probit Estimations of Mortality Model (t and z values in Parenthesis)

Variables	Ordinary Least Squares(LPM) and Two-Stage Least Squares	
	OLS, LPM (without controls for endogeneity and heterogeneity) (1)	IV-2SLS, LPM (with controls for endogeneity only) (2)
Log of Out-of-Pocket Health Expenditures in Kenya Shillings per Annum	.0020 (1.67)	-.1790 (-4.40)
Log of Land Holding in Acres	-.0075 (-2.92)	.0130 (2.30)
Log of Education in number of years of schooling	-.0094 (-0.49)	.0102 (0.41)
Log of Education Squared in number of years of schooling	.0053 (0.59)	-.0030 (-0.26)
Sex(1=Male)	-.0003 (-0.12)	-.0008 (-0.25)
Log of Age in Years	-.0176 (-1.98)	-.0100 (-0.86)
Log of Age Squared in Years	.0673 (2.20)	.0611 (1.54)
Religion(1=Organised Christianity)	.0112 (1.63)	-.0236 (-1.99)
Residence(1=Urban)	-.0106 (-3.66)	.0105 (1.74)
Constant	-.0056 (-0.28)	1.051 (4.40)
R^2	0.0013	…
F-Statistics (p -value)	4.95 (0.00)	4.92 (0.00)
Root MSE	.22123	0.28628
Observations	34164	34164

Source: Authors' own computation

From table (2), an increase in out-of-pocket health expenditure by 1% significantly reduces the probability of mortality of an individual by 0.00179 or 0.1790%. As an individual spends more on health inputs, the chances of dying decreases.

This is because the out-of-pocket health expenditures (OOP) are regarded as a proxy for the health inputs consumed. The higher the out-of-pocket health expenditure, the larger the health inputs consumed by an individual leading to a lower the mortality level. This is consistent with Hitris and Posnet[73] where a pooled cross-country data indicated a negative and a significant relationship between mortality level and health expenditure.

4. CONCLUSIONS AND POLICY IMPLICATIONS

The study was motivated by recognition that health of an individual is key to the development process. The main objective of the article was to investigate the impact of individual out-of-pocket health expenditure on mortality. Mortality level was used as a measure of health status. The effect of mortality was estimated controlling for other covariates such as land, education, age and gender. The estimation results indicate that the out-of-pocket health expenditure is negatively and statistically correlated with mortality.

Therefore the private health expenditures mainly through out-of-pocket health expenditures have a major implication on health status of individuals particularly on their mortality probabilities. Affordable health care can be achieved through the public subsidies or health insurance that reduces out-of-pocket (private) health expenditures. The inequalities in the distribution of healthcare in the country, partly due to high OOP expenditures are a major headache for the government. There is need to generate evidence that can inform health policy on this issue.

REFERENCES

[1] Republic of Kenya, Kenya Vision 2030: A Globally Competitive and Prosperous Kenya, Nairobi, Kenya: Government Printer, pp. 1-10, 2007.

[2] Republic of Kenya, Ministry of Medical Services, Nairobi, Kenya: Government Printer, pp. 2-5. ,2008.

[3] Republic of Kenya, Kenya Integrated Household Budget Survey, Nairobi, Kenya: Government Printer, 2007.

[4] Republic of Kenya, Economic Survey, Nairobi, Kenya: Government Printer, 2009.

[5] UN Joint Programme on HIV/AIDS, Global Report: UNAIDS Report on the Global AIDS Epidemic, New York: ISBN, 2010.

[6] Republic of Kenya, Medium Term Plan 2008 – 2012, Nairobi, Kenya: Government Printer, 2008.

[7] D. Bloom and D. Canning, "The Health and Poverty of Nations: From Theory to Practice," Journal of Human Development, Vol. 4, No.1, pp. 47–71, 2003 and M. Grossman, "The Demand for Health, 30 Years Later: A very Personal Retrospective and Prospective Reflection," Journal of Health Economics, Vol. 23, pp. 629-636,2004.

[8] B. Fayissa and P. Gutema, "A Health Production Functions for SSA," Department of Economics and Finance Working Paper Series, 2008.

[9] A. Measham, "Health and Development: The World Bank's Experience," *Finance and Development* 23(1:1986):26-29 And U. D. Biswal, "Trends in Inequality Using Consumption Expenditures Approach: A Case Study of Atlantic Canada," *Atlantic Canada Opportunity Agency* (2000).

[10] J. R. Berhman, "The Impact of Health and Nutrition on Education," The World Bank Researcher Observer, Vol. 11, No.1, pp. 23-38, 1996.

[11] M. Grossman, "The Demand for Health: A Theoretical and Empirical Investigation," *NBER* (1972); D. Filmer, J. Hammer, and L. Pritchett, "Health Policy in Poor Countries: Weak Links in the Chain," World Bank Policy Research Working Paper,No.1874, 1998; C. J. Anyanwu and E. A. Erhijakpor, "Health Expenditure and Health Outcomes in Africa," African Development Bank,2008 and R. Tamura, "Human Capital and Economic Development," Journal of Development Economics,Vol. 79, pp. 26-72,2006.

[12] T. Thompson, Health Economics for Developing Countries, Malaysia: Macmillan, 2000.

[13] Republic of Kenya, Kenya Demographic and Health Survey, Nairobi, Kenya: Government Printer, 2003.

[14] Republic of Kenya, Public Expenditure Review, Nairobi, Kenya: Government Printer, 2009.

[15] Republic of Kenya, Statistical Abstract, Nairobi, Kenya: Government Printer, 2006.

[16] G. S. Becker, "A Theory of the Allocation of Time," Economic Journal, Vol. 75, pp. 493-517, Sept. 1965.

[17] K. Lancaster, "A New Approach to Consumer Theory," The Journal of Political Economy, Vol. 74, No.2, pp. 132-157,1966.

[18] M. Grossman, "The Concept of Health Capital and Demand for Health," Journal of Political Economy, Vol. 80, No.2, pp. 14-69,1972.

[19] D. M. Cutler and E. Richardson, "The Value of Health 1970-1990," The American Economic Review, Vol. 88, pp. 97-100, 1998.

[20] N. Belloc and L. Breslow, "Relationship of Physical Health Status and Health Practices," Preventive Medicine, Vol.1, pp. 409-421,1972.

[21] D. Kenkel, "Should you Eat Breakfast? Estimates Form Health Productions Functions," Health Economics, Vol. 6, pp. 189-210, 1995.

[22] M. R. Rosenzweig and T. P. Schultz, "Etimating a Household Production Function Heterogeneity, the Demand for Health Inputs, and their Effects on Birth Weight,'' Journal of Political Economy, Vol. 91, pp. 723-46, 1983.

[23] A.Strittmatter and U. Sunde, "Health and Economic Development-Evidence from the Introduction of Public Health Care," University of St. Gallen Discussion Paper, pp. 2011-32,2011.

[24] C.A. Joumard, N. Chantal and O. Chatal, "Health Status Determinants: Lifestyle, Environment, Health Care Resources and Efficiency," OECD Economics Department Working Papers, Vol. 35, pp. 627, Aug. 2008.

[25] M. Berger and J. Messer, "Public Financing of Health Expenditure, Insurance, and Health Outcomes," Journal of Applied Economics, Vol. 34, No. 17, pp. 2105-2113,2002.

[26] Z. Or, "Determinants of Health Outcomes in Industrialized Countries: A Pooled, Cross-Country, Time- Series Analysis," *OECD* 30(2000):53–77 and Z. Or, "Exploring the Effects of Health Care on Mortality across OECD Countries", OECD Labor Market and Social Policy, Occasional Paper, No.46,2000.

[27] P.Y. Crémieux, P.Ouellette and C. Pilon, "Health Care Spending as Determinants of Health Outcomes," Health Economics, Vol. 8, pp. 627–639, 1999 and P.Y Crémieux, M. C. Mieilleur, P.Ouellette, P. Petit, P. Zelder and K. Potvin, "Public and private Pharmaceutical Spending as Determinants of Health Outcomes in Canada," Health Economics, Vol. 14, pp.107–116,2005.

[28] J. Elola, A. Daponte and N. Vicente, "Health Indicators and the Organization of Health Care Systems in Western Europe," American Journal of Public Health, Vol. 85, pp. 1397–1401,1995.

[29] Grubaugh, S. G., and Santerre, R. E., "Comparing the Performance of Health Care Systems: An Alternative Approach," Southern Economic Journal, Vol. 60, No.4, 1030-1042, 1994.

[30] H. Issa and B. Ouattara, "The Effect of Private and Public Health on Infant Mortality Rates: Does the Level of Development Matters?," University of Wales:2005.

[31] S.Gupta, M.Verhoeven and E. Tiongson, "Does Higher Government Spending Buy Better Results in Education and Health Care*?"* IMF Working Paper, Vol. 99, No.21, 1999.

[32] S.Gupta, M.Verhoeven and E. Tiongson, "The Effectiveness of Government Spending on Education and Health Care in Developing and Transition Economies," European Journal of Political Economy, Vol. 18, No. 4, pp.717–37, 2002.

[33] J.Nixon and P.Ulmann, "The Relationship between Health Care Expenditure and Health Outcomes," European Journal of Health economics, Vol. 7, pp. 7-18, 2006.

[34] S. Self and R. Grabowski, "How Effective is Public Health Expenditure in Improving Overall Health? A Cross-country Analysis," Journal of Applied Economics, Vol. 35, pp. 835-845, 2003.

[35] A. Babazono and A. L. Hillman, "A Comparison of International Health Outcomes and Health Care Spending," International Journal of Technological Assessment of Health Care, Vol. 10, pp. pp.376–381,1994.

[36] A. L. Cochrane, A. S. St Ledger and F. Moore, "Health Service 'Input' and Mortality 'Output' in Developed Countries," Journal of Epidemiology Community Health, Vol. 32, pp. 200–205, 1978.

[37] K. Judge, J.Mulligan and M. Benzeval, "Income Inequality and Population Health," Social Science and Medicine, Vol. 46, pp. 567-29, 1998.

[38] F. C Pampel and J. V. Pillai, "Patterns and Determinants of Infant Mortality in Developing Nations, 1950-1975," Demography, Vol. 23, No.4, pp. 525-542, 1986.

[39] B. L. Wolfe and M. Gabay, "Health Status and Medical Expenditures: More Evidence of A Link," Social Science and Medicine, Vol. 25, pp. 883–888, 1987.

[40] R. E. Leu, "The Public-Private Mix and International Health Care Cost," in A.J. Culyer et B. Jonsson, eds, Public and Private Health Services, Blackwell,pp. 41-63,1986.

[41] A. Strittmatter and U. Sunde, "Health and Economic Development-Evidence from the Introduction of Public Health Care," University of St. Gallen, Discussion Paper, pp. 2011-32,2011.

[42] F. Lichteberg, "Sources of U.S. Longevity Increase, 1960–1997," Center for Economic Studies and Ifo Institute for Economic Research (CESifo),Working Paper Series, No. 405,2000.

[43] G. Mwabu, M. Ainsworth and A. Nyamete, "Quality of Medical Care and Choice of Medical Treatment in Kenya, An Empirical Analysis," Journal of Human Resources, Vol. 28, No. 4, pp. 838-62, 1993.

[44] J. S. Akin, K. G. David and E. H. Denton, "Quality of Services and Demand for Health Care in Nigeria: A Multinomial Probit Estimation," Social Science and Medicine, Vol. 40, No. 11, pp. 1527-37,1995.

[45] H. N. Mocan, E. Tekin, and J. S. Zax, "The Demand for Medical Care in Urban China," National Bureau of Economic Research, Working Paper, No. 7673, 2000.

[46] Gupta and P. Dasgupta, "Demand for Curative Health Care in Rural India: Choosing between Private, Public and No Care," National Council of Applied Economic Research (NCAER) Working Paper Series, Vol. 82, 2002.

[47] K. L. Leonard, G. R. Mliga and D. H. Mariam, "Bypassing Health Centres in Tanzania: Revealed Preferences for Quality," Journal of African Economies, Vol. 11, No. 4, pp. 441-471, 2002.

[48] R. Havemann and D. S. Van, "The Demand for Health care in South Africa," Journal for Studies in Economics & Econometrics, Vol. 27, No. 3,pp. 1-27,2003.

[49] T. Phelps, "Les Fonderments De L'economie De La Sante,'' *Noureaux Horizons* : 1995.

[50] D. E. Sahn, S. D. Younger and G.Genicot, "The Demand for Health Care Services in Rural Tanzania,'' Oxford Bulletin of Economics and Statistics, Vol. 65, No.2, pp. 241-258,2003.

[51] D. Lawson, "Determinants of Health Seeking Behaviour in Uganda – Is it Just Income and User Fees that are Important?", Unpublished paper presented at the University of Manchester: UK, 2004.

[52] M. Lindelow, "The Utilisation of Curative Healthcare in Mozambique: Does Income Matter?" Journal of African Economies, Vol. 14, No.3, pp. 435-482, 2005.

[53] C.Grobler, and I. C. Stuart, "Health Care Provider Choice South African," Journal of Economics, Vol. 75, No.2, 2007.

[54] F. C Pampel and J. V. Pillai, "Patterns and Determinants of Infant Mortality in Developing Nations, 1950-1975," Demography, Vol. 23, No.4, pp. 525-542, 1986.

[55]   M. Grossman, "The Concept of Health Capital and Demand for Health," Journal of Political Economy, Vol. 80, No. 2, pp. 14-69, 1972.

[56]   M. R. Rosenzweig and T. P.   Schultz, "Etimating a Household Production Function Heterogeneity, the Demand for Health Inputs, and their Effects on Birth Weight,'' Journal of Political Economy, Vol. 91,pp.723-46, 1983.

[57]   J.Thornton, "Estimating a Health Production Function for the United States, Some New Evidence," Journal of Applied Economics, Vol. 34, No. 1, pp. 59-62, 2002.

[58]   G. Mwabu, "Health Service Provision and Health Status in Africa: The Case of Kenya and Cameroon," Paper presented at the Conference: Czech Republic, 2002.

[59]   M. R. Rosenzweig and T. P.   Schultz, "Etimating a Household Production Function Heterogeneity, the Demand for Health Inputs, and their Effects on Birth Weight,'' Journal of Political Economy, Vol. 91, pp. 723-46, 1983.

[60]   M. Grossman, "The Concept of Health Capital and Demand for Health," Journal of Political Economy, Vol. 80, No.2, pp. 14-69, 1972.

[61]   G. Mwabu, "The Production of Child Health in Kenya: A Structural Model of Birth Weight," Journal of African Economies, Vol. 18, No.2, pp. 212-260, 2009.

[62]   W. H.Greene, Econometric Analysis 6th edn, Upper Saddle River: New Jersey, 2008.

[63]   G. Mwabu, "The Production of Child Health in Kenya: A Structural Model of Birth Weight," Journal of African Economies, Vol. 18, No. 2, pp. 212-260, 2009.

[64]   M. P. Murray, "Avoiding Invalid Instruments and Coping with Weak Instruments," Journal of Economic Perspectives, Vol. 20, No.4, pp. 111–132, 2006.

[65]   R. Blundell, and Dias, M. Costa, "Alternative Approaches to Evaluation in Empirical Microeconomics," The Institute for Fiscal Studies Department of Economics working paper, Vol. 26, 2008.

[66]   J. Garen, "The Returns to Schooling: A Selectivity Bias Approach with a Continuous Choice Variable," Econometrica, Vol. 52, No.5, pp.1199-1218, 1984.

[67]   D. Card, "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems," Econometrica, Vol. 69, No.5, pp. 1127-1160, 2001.

[68]   J. M. Wooldridge, Econometric Analysis of Cross Section and Column Data, Cambridge, MA: MIT Press. 2002.

[69]   G. Mwabu, "The Production of Child Health in Kenya: A Structural Model of Birth Weight," Journal of African Economies, Vol. 18, No. 2, pp. 212-260, 2009.

[70]   J. M. Wooldridge, "Unobserved Heterogeneity and Estimation of Average Partial Effects," in Donald W. K. Andrews and James H. Stock, eds, Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg (Cambridge: Cambridge University Press), pp. 26-55, 2005.

[71]   A. Cameron, and P.Trivedi, Micro econometrics Using Stata,College Station, Texas: Stata Press,2009.

[72]   J. M. Wooldridge, Introductory Econometrics: A Modern Approach, Cincinnati, Ohio: The South-Western College Publishing, Thomson Learning, 2009.

[73] T. Hitiris, and J. Posnett, "The Determinants and Effects of Health Expenditure in Developed Countries," Journal of Health Economics, Vol.1, pp. 173-181, 1992.