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Health insurance and Out-of-Pocket health care expenditure in Kenya

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Abstract

Aim/purpose – The aim of this study was to estimate the effect of health insurance on Out-of-Pocket (OOP) health care expenditure in Kenya. It is informed by persistence in the challenges of access and utilization of quality and affordable health care services. Previously, researchers have estimated the effects of different forms of health care financing on its demand and shown that affordability not only enhances access and use of health services but also cushions people against adverse financial risks associated with catastrophic health care spending.

Design/methodology/approach – The study used the Kenya Household Health Expenditure and Utilization Survey (KHHEUS) 2013 data, and employed the two-part model estimation approach. The sample size considered in the estimation was 6,961 with the unit of analysis being an individual household member.

Findings – The overall results of this study showed that having a health insurance cover did not exclude one from using OOP payments. However, the probability of such spending was low for people with insurance compared to those without insurance. Additionally, if any cash was paid for any health care service, having insurance did not have a significant effect on the level of that spending.

Research implications/limitations – The findings of this study imply that uptake of health insurance does not fully cushion people from both using cash payments when seeking health services and ramifications of catastrophic health care spending. The study however, encountered challenges of unavailability of more recent data in the KHHEUS series. In addition, the sample size was relatively small to the population after data cleaning.

Originality/value/contribution – Potential effect of health insurance on OOP health care payments had not been explored in Kenya. As such, this study filled this gap. In addition, the two-part model estimation technique was also employed with the latest household health survey data.

Keywords: health insurance, Out-of-Pocket, health care, two-part model, Kenya.

JEL Classification: I13, I14.

1. Introduction

Access and utilization of modern health care services, which are fundamental aspects of human life, involve one or several forms of financing (Hernández-Peña, 2019). A well-financed and managed health system ensures high-quality service delivery through the installation of high-quality health care facilities, medical products and services, as well as the employment of highly trained medical personnel. In Kenya, like many other developing countries, health care financing has been met with numerous challenges, which have in turn led to poor health-seeking behavior among many households (Kimani, Mugo, & Kioko, 2016). These hurdles range from heavy financial burdens for health services, lack of essential medical products and care services, to scarcity of resources as well as poor policy design (Aregbeshola & Khan 2021).

Investment in health is not only a productive venture but also an essential priority and subject of great concern for humanity. Mechanisms and strategies for enhancing access and utilization of quality health care services, while ensuring equity and equality for all citizens, remain a top-end goal for governments globally. To achieve this, Litali, Bukhala, and Nguka (2019) postulated that three basic intermediate objectives need to be realized in a country's health care system. These include illness prevention, quality medical treatment for the sick, and protection of people from adverse financial shocks brought about by catastrophic medical bills (Baeza & Packard, 2006). To this end, and while high-quality health service delivery remains a big challenge for developing countries Kenya included, health utilization by the majority of these countries' population equally stands out as a great setback to human capital development.

The presence and affordability of health insurance among people is argued to have an insulating effect against Out-of-Pocket (OOP) payments and catastrophic health care expenditures (Liu, Chhabra, & Scott, 2020). O'Donnell, van Doorslaer, Wagstaff, & Lindelow (2007) cited that OOP health care payments greatly impact the living standards of households as well as impoverish many

more. While these cases are common among poor households, Koch and Setshegetso (2020) revealed that instances of catastrophic health financing are low in health care systems that do not burden their citizens. These arguments are supported by the fact that OOP payments; a) are mostly unpredictable, b) their distribution relative to income are uneven, and c) they occur in large amounts relative to resources available to a household.

In Sub-Saharan Africa, a systematic review of health care financing mechanisms by Ifeagwu, Yang, Parkes-Ratanshi, and Brayne (2021) revealed that the majority of health care payments are direct from out-of-pocket. The results are consistent with Kenya's case, where the percentage of OOP health care spending as a share of total health expenditure accounted for 54% in 2001/2002, 39.3% in 2005/2006, 36.7% in 2009/2010, 39.8% in 2012/2013, and 23.6% in 2017/2018 (Ministry of Health, 2019). These OOP payments have been shown to deny many Kenyans the privilege of access and utilization of quality health services, while constantly thrusting hundreds of thousands into poverty annually, and posing detrimental impoverishing effects to tens of thousands more (Barasa, Maina, & Ravishankar, 2017). Moreover, payment of cash for health services is considered an inequitable form of health financing due to its overburdening effect on some social sub-groups of the society. If the cost of care exceeds the household's ability to pay, people might be forced to avoid the use of health services or even delay using them. Therefore, to promote inclusivity, equity, and equality, it is imperative for governments to structure health care systems with people's welfare in mind, to reduce adverse effects of OOP expenditure, especially catastrophic spending (Hernández-Peña, 2019). To this end, the presence and affordability of health insurance are of prime importance, since they have an insulating effect against adverse OOP payments.

Access and utilization of quality health care services are affected by a variety of factors as documented in the literature. Such factors include, but are not limited to, poverty (Awiti, 2014), lack of information on the availability of quality medical care (Muriithi & Mwabu, 2018), types of illness (Fox & Grandy, 2008), and age segments of social sub-groups such as the elderly (Opondo & Oleche, 2020). The study by Awiti (2014) confirmed that poverty or a household's limited ability to pay for health care results in a negative effect on demand for these services. This is consistent with the findings by Chuma and Maina (2012) on the burden of OOP health payments and their effects on poverty and Zhou, Chen, and Chen (2020) on measures to achieve equitable health care financing.

From the literature, therefore, it is evident that the link between health insurance and OOP health care expenditure in Kenya is not explored. This study, therefore, adds to the literature by investigating the effect of health insurance on OOP health care expenditure. The choice of the covariates was based on the reviewed literature on health care financing decisions by individuals and households. To this end, the aim of the study was to investigate the effect of health insurance on out-of-pocket health care expenditure in Kenya. Specifically, the study sought to investigate the effect of health insurance on the probability of positive OOP health care expenditure as well as the effect of health insurance on the levels of OOP health care payments.

The paper is structured in five parts. Following this introduction is part two which covers review of the literature, part three discusses the methods and statistical techniques used in the research, part four presents the findings of the study, and part five provides the conclusion and the policy implications.

2. Literature review

2.1. Theories of health care financing

2.1.1. Welfarism theory

Welfarism theory is a theory that was developed by Pigou in his book *Wealth and welfare* (1912) and later improved by Lerner in his work *Economic theory and socialist economy* (1934). The theory argues that a competitive market economy generates optimal allocation of resources characterized by efficiency in both production and consumption. Although this is the ideal market scenario, the provision of goods and services in any economy can be said to follow one or both types of market structures; the free market establishment (unregulated) or the one with government intervention (regulated). In the realm of health care, free markets are rare and almost all health systems operate with some level of government intervention. The challenge with free markets is that they function under various assumptions despite high-efficiency levels and maximum community benefits associated with them. These assumptions are thought to be realistically unachievable leading to failure of the free-market. Furthermore, an individual's utility function from which a social utility is derived varies from one person or household to another. This leads to Arrow's impossibility idea of obtaining a socially acceptable welfare function. As such, government intervention is called for.

According to Musgrove (1996), there are three distinct justifications for government involvement in the market for health care. They include; a) assurance of optimal production of public goods and services, b) correction of market failures for health insurance, and c) cushioning consumers perceived to be too poor to buy insurance or unable to finance inexpensive health services using OOP. The mainstream economic theory stipulates that appropriate intervention in one or more of these aspects results in outcomes that are preferable to many people about a health care system: these outcomes include, among others, reduced OOP health spending through public financing, low cost, and equity (Musgrove, 1996). Therefore, under welfarism, and given the complexity of providing health care services, governments endeavor to prioritize a universal financing approach that is fair to all in terms of harmonizing access, use, and payment for health services.

2.1.2. Cost-benefit theory

The theory presents a decision-making approach that assesses the costs and benefits of pursuing a particular action. For the various economic agents, the decision-rule is that the benefits of a program/project upon which resources are spent must be greater than the associated costs over time (Kingston, 2001). Given the stochastic nature of disease and ill-health, and considering individual rationality in planning consumption expenditure, health care is perceived to be different from other goods and services (Culyer, 1989). For other normal goods and services, a consumer's willingness to pay is measured by the amount of benefit they would receive compared to the associated cost.

Unlike OOP health payments where benefits can be directly obtained, the case with health insurance is not clearly defined. This is because, with insurance, the direct benefits obtainable from this form of health financing is unclear, especially for households with constrained resources and highly competing demands. Furthermore, in the absence of definable benefits, one cannot plan the future's consumption of health care as they would for items such as food. As a result, individuals and households in an unregulated market would exhibit different behavioral responses concerning the uptake of health insurance, where risk-averse individuals make payments to some risk-pooling agency for financial protection in the event of illness (Cullis, 1993). In most developing countries, majority of households are low-income earners, and as such voluntary uptake of health insurance to insulate them from high costs of treatment and subsequently boost the demand for health care services remains a big challenge.

2.1.3. Efficiency and equity approach

This is the approach behind the concept of health insurance and catastrophic health expenditure cushioning. It explores mechanisms of promoting fairness and equity concerning access and utilization of health services among members of a society (Cullis, 1993). The theory relates to the issue of health insurance and OOP health payments in the sense that increased uptake of the former and subsequent reduction of the latter enhances efficiency and equity. This implies that in the absence of this financial risk protection, various social subgroups may be unfairly affected when diseases occur, given the uncertainties surrounding incidences of ill-health, costs, and efficiency of treatment.

Various studies have supported voluntary uptake of health insurance since they minimize the chances of negative financial shocks and enhance efficiency in health access and use. However, as Olakunde (2012) observed, this necessarily needs not to be the case for low-income countries Kenya included, where the majority of their citizens live below the poverty lines and only spent on health care when it is necessary.

Fried and Gaydos (2012) asserted that financing health care activities are essential, complex, and subject to substantial variations. These complexities and variations reflect the culture, history, income, and the political will of various countries. With limited resources and irrespective of free-market allocation therefore, the optimal position of health care financing depends on the wealth of respective countries and income distribution patterns of households (Anderson & Poullier, 1999). To this end, wealthier nations spend more on health than poorer countries in the various financing mechanisms. Our study utilized the idea advanced in this approach to assess how health insurance may impact OOP health payments among households.

2.2. Empirical research on health care financing

Diseases and ill-health not only cause suffering and death but also have a significant cost on human life. The costs attributable to ill-health can be in form of direct monetary spending on treatment or indirect loss through adverse impact on labor productivity (Gertler & Gruber, 2002). In many of the studies done on health care financing, it has been shown that medical expenses hindered and continue to prevent many people from accessing and using health services due to their inability to pay. Moreover, the cost burden of diseases results in

disruptions in the living standards of people, especially those in low income earning families (Barasa et al., 2017). These notwithstanding, high socioeconomic vulnerability has been documented to contribute to adverse effects on household welfare. For instance, in an analysis of OOP coping behavior of families in selected Sub-Saharan African countries, Leive and Xu (2008) found that borrowing and selling of own assets to finance health expenses was pronounced among persons in low-income quantiles.

Table 1 provides a summary of the health profile for Kenya compared to Sub-Saharan Africa and that of the world. From the table, it is shown that the proportion of OOP payments as a share of total health expenditure stands at 23.6% in Kenya compared to 33.3% and 18.1% in Sub-Saharan Africa and the world respectively. The data signal that in spite of the measures put in place by the government to ensure reduced OOP health care funding, a sizable number of households still use it. The data further reveal that although Kenya's expenditure on health care records a lower value of 23.6% compared to Sub-Saharan Africa at 33.3%, the figure is still higher compared to the world value of 18.1%.

Table 1. Health profile for Kenya, Sub-Saharan Africa and the world

Indicator/parameter	Kenya	Sub-Saharan Africa	World
	value		
Life expectancy at birth	62 years	61.63 years	72.74 years
Under-5 mortality rate	52/1,000	74/1,000	38/1,000
Maternal mortality rate	362 per 100,000	534 per 100,000	211 per 100,000
Total health expenditures as a proportion of GDP	5.2%	6.1%	9.8%
Per capita public sector expenditure on public health care per month	9,680 Kenya shillings (Ksh) (88 USD)	9,130 Kenya shillings (Ksh) (83 USD)	10,175 Kenya shillings (Ksh) (92.5 USD)
Public health expenditure as a proportion of total health expenditure	61.3%	35.2%	60%
Out-of-Pocket payment as a proportion of total health expenditure	23.6%	33.3%	18.1%

Source: Wafula, Khayoni, & Omolo (2017).

Most empirical studies linking household welfare to health expenditure covered areas of health production and demand, earnings, poverty, as well as factors associated with OOP health expenditure among various social subgroups. For example, Kimani et al. (2016) asserted that the ability of households to finance health care greatly influence access and utilization of these services.

A similar position was taken by Kimani, Ettarh, Warren, & Bellows (2014) who argued that due to low-income earnings, families tend to forgo uptake of health insurance and instead choose to gamble with risky chances of OOP expenses at times of disease. This observation is in unison with the finding from Masiye and Kaonga (2016) who identified high dependence of OOP health spending on the socioeconomic status of a household. The revelations from these studies concur with an empirical corroboration in Kenya regarding health care financing where it is documented that challenge of paying for health services is one of the greatest impediments to access and use of these services (Kimani et al., 2016).

Current debates on health care reforms around the world, especially in developing countries, focus on ways of increasing health care access at low costs that minimize financial burdens on households. Researchers argued that one and the most trusted way of dealing with this problem is the introduction of a supportive and expansive private and public health insurance markets.

As a model of health care financing, health insurance has a generally positive impact of not only enhancing access and utilization of health services by households but also on shielding them against unprecedented and catastrophic OOP health payments. This view is widely backed up by evidence from developed countries where it is presented that households with health insurance enjoy easier access to health care services as well as lower OOP health expenditure (Waters, Anderson, & Mays, 2004).

In developing countries, on the contrary, the effects of health insurance on access and use of health services remain unclear. This is brought about by the nature of health insurance contracts, which are argued to be less generous (Wagstaff & Lindelow, 2008). In China, for instance, the study by Wagstaff and Lindelow (2008) suggested that contrary to the intuitive expectation of many, health insurance was found to increase the probability of OOP health spending. According to them, the explanation for the findings was that uptake of health insurance did motivate people to seek expensive medical care while care providers choose medical treatments which are costly for people with insurance and as such engage in price gouging.

In a different study, similar results were replicated, adding that extension of health insurance to the most vulnerable rural poor did not reduce OOP health payments although it had a positive impact on inpatient and outpatient utilization. In Mexico, Galárraga, Sosa-Rubí, Salinas-Rodríguez, and Sesma-Vázquez (2009) sought to investigate the impact of health insurance on excessive health expenditures. Using a selection correction method as a new study approach, the study found that health insurance had a shielding effect on OOP spending concerning the Mexican context. Given this contradicting evidence in developing world and there being limited evidence on the Kenyan case, our study sought to fill this gap.

The manner in which a country's health system is financed critically determines the health of its citizenry. The use of well-selected methods that are efficient and adequate, as well as the establishment of a functional delivery structure of health services define the pathway for any country to achieve its national health objective of provision of health care services for all (Olakunde, 2012). According to Gottret and Schieber (2006), several mechanisms of health financing are commonly used, mainly in developing countries. They include a combination of OOP payments, health insurance (both social and community), donor funding, as well as tax revenue.

While these methods collectively enhance health care access and use, there is no clear research indication on what effect the adoption and use of each have on the use of others. However, some evidence showed the existence of preference of service between private and public providers. This is supported by a study conducted by Ataguba and Goudge (2012) in South Africa to investigate the effect of increased uptake of health insurance on service preference and the use of OOP medical payments. It was established that uptake of insurance increased people's demand for private health services while no significant impact was evident on public health services. Furthermore, the coverage did not result in lower OOP payment among the insured as intuitively expected.

In Egypt and Ghana empirical evidence from studies on School Health Insurance Program and National Health Insurance Program depicted a case of reducing OOP expenses as a result of rolling out of the programs (Yip & Berman, 2001). The mixed evidence leads to the question of whether or not improvement or worsening of people's living standards occasioned by OOP is a valid claim. There is a paucity of empirical evidence on this area in Kenya.

Despite the increasing popularity of health care insurance within health care reform debates around the world, a noticeable evidence gap does exist in Africa on the effect of health insurance schemes on OOP health expenditure. In a set of

related studies, which have analyzed this issue, indicated that out of 18 systematically reviewed studies in Acharya et al. (2013) only two of such studies in Ghana and Burkina Faso captured the African context. Nevertheless, the two cases focused on community-based health insurance and health utilization outcomes.

In Rwanda, a similar analysis by Woldemichael and Shimeles (2016) investigated the role of community-based insurance on OOP health spending as an integral part of the national health care financing system. The findings showed a case of the non-linear effect of community-based health insurance on OOP health spending. Having community-based health insurance also resulted in mixed outcomes for spending on specific health care services. Furthermore, a greater impact on reducing OOP health payments was observed among richer households compared to the poor despite the subscription premiums being subsidized by the government to help the poor and most vulnerable in society.

Besides the existence of contradicting evidence on the effect of health insurance in its general form or sub-categories on OOP health spending, different methodological approaches have been used by different researchers to investigate the matter. In some studies, a methodological consensus has been established. For example, in the study on the impact of health insurance on health care utilization and OOP health payments in South Africa, the propensity score match approach was utilized and the findings were robust (Ataguba & Goudge, 2012). Similarly, in a study conducted by Gnawali et al. (2009) in Burkina Faso to estimate the effect of community-based health insurance on health utilization, the propensity score matching technique was applied.

On a different angle, other methodological techniques have been applied to similar investigations. Woldemichael and Shimeles (2016) while modeling the effect of community-based health insurance on OOP health expenditure in Africa, the case of Rwanda, sought to employ the extended two-part model. According to them, the use of the model takes care of potential endogeneity between insurance enrolment and censored health care expenditure data. A similar approach was applied in an attempt to answer the question of whether or not health insurance helps in lowering health expenditure risks among households in China. This was however, used together with a sample correction procedure as applied in Galárraga et al. (2009) unlike the single two-part model employed in the Rwandan case. The idea of using sample correction is to minimize any possible bias that could emerge from the sample selection process. Our study further contributes to the literature by incorporating the latest methods, borrowing the methodological ideas advanced by previous studies.

3. Research methods and procedure

3.1. Definition and measurement of variables

The study used cross-sectional data from Kenya Household Health Expenditure and Utilization Survey of 2013, the latest available survey on this series. The dependent variable was the OOP health expenditure measured as the amount of money spent from OOP on any health issue. The explanatory variables included Insurance status (Ins), Education (Educ), Age (Ag), Income (Inc), Employment (Emp), and Health visits (Hv). The choice of the covariates was based on the reviewed literature on health care financing decisions by individuals and households.

3.2. Theoretical framework

The framework provides a basis for household decision-making on consumption and health investment with choices in health insurance. Assuming a household earns an income Y_i and the income is spent on consumption C_i and health care services h_i , then the household's general utility as derived from these expenditures is expressed as:

$$U = U(C_i, h_i) \quad (1)$$

where U is utility.

The relationship in equation (1) implies that an increase in both consumption C_i and use of health care services, h_i increases utility. The assumption also is that health investment, V_i consists of payments for health care and other related services. With health care insurance cover, a household's expenditure for health care services is presented as:

$$m_i = rI_i + p(I_i)V_i \quad (2)$$

where m_i stands for health expenses, (I_i) for health insurance, r represents exogenously determined insurance premium, and $p(I_i)$ denotes prices of medical services.

Normally, health status of an individual or a household does not only depend on health investment, it also depends on health shocks, Δ_i and underlying health conditions, h_{i0} if any. As such, we can represent a household's health status as a function of the three factors as: $h_i = f(V_i, h_{i0}, \Delta_i)$. This implies that

health status improves with an increase in investment in health and deteriorates with an increase in the number of underlying conditions as well as the number of health shocks experienced. If a health shock occurs, a household maximizes expected utility with a choice of optimal health insurance and health investment level before and after the shock as:

$$d_i = 1[E(U(C_i, h_i)|I_i = 1, h_{io}) > E(U(C_i, h_i)|I_i = 0, h_{io})] \quad (3)$$

where $d_i = 0,1$ and $C_i, h_i,$ and I_i are defined as in equations (1) and (2) above. Equation (3) implies that the indicator function, $1[.]$ equals 1 if the statement in square bracket is true and zero otherwise. Now, with constant relative risk aversion, the utility function from consumption is expressed as $U(C_i) = C_i^{1-\gamma}/(1 - \gamma)$. Thus, a household chooses an optimal level of health investment that maximizes utility subject to budget constraint and the given health function. Solving for the optimal functions yields the optimal OOP health care expenditure function expressed as:

$$m_i = f(I_i^*, V_i^*; Y_i, r, \gamma, \delta, \mu, \Delta) = rI^* + p(I^*)V^* \quad (4)$$

Equation (4) implies that among other factors, OOP health spending depends on health insurance status. As households achieve increased incomes, better health status, increased health investment, and register low risk preferences, OOP health care spending increases. Furthermore, the equation reveals that other unobserved factor such as health preferences, presence of underlying health conditions, and risk aversion behaviors among households' influence both health insurance choice and uptake and OOP health spending. For this reason, estimating our model could suffer from the presence of potential endogeneity. In addition, presence of unobserved household characteristics may lead to heterogeneity in OOP health spending. Going by the prediction of this model, therefore, we expect that households who have health insurance not only spend less for health from OOP but also have higher health care utilization compared to those without insurance.

3.3. Empirical model

The idea is to estimate the effect of health insurance on OOP health spending. As pioneered by RAND researchers and later adopted by Deb, Munkin, and Trivedi (2006), two models can be appropriately used in our study: the two-part and the sample selection models. The models involve estimation of two equa-

tions; part one, a selection equation which models the probability of spending on health care, and part two an outcome equation that focuses on the logarithmic levels of the OOP health spending for individuals or households with positive health expenditure levels. Although both the sample selection and the two-part models are suitable for application in this study, we considered using the two-part model. This is because unlike the two-part model where the error terms are assumed to be independent and hence no correlation between the selection and the outcome equations, the sample selection model does not impose this zero-correlation assumption. This implies that under the two-part model, estimations of the equations can be carried out and robust results achieved. However, with correlation, estimating the two-part model leads to biased results, and in this case, the selection model stands out as the most appropriate. Our study focused on estimating the two-part model using a Logit model and generalized linear model in the first and second parts, respectively. The estimation involved a two-part model procedure that does not correct for potential endogeneity and one that controls for potential endogeneity.

Borrowing from Deb, Norton, and Manning (2017), the logit model can be used to model the dependent variable y_i as a binary response taking the value of 1 if cash was paid and 0 if otherwise. This relationship can be expressed as;

$$y_i^* = \begin{cases} 1 & \text{if } HE > 0 \\ 0 & \text{if otherwise} \end{cases} \quad (5)$$

y_i^* is viewed as a random variable that takes the values of 1 and 0 with probabilities π_i and $(1 - \pi_i)$, respectively. Transforming π_i to depend on a vector of the observed covariates X , we have;

$$\pi_i = \Pr(y_i^* = 1) \text{ and } 1 - \pi_i = \Pr(y_i^* = 0) \quad (6)$$

where π_i represents the probability of spending cash on health, $1 - \pi_i$ stands for probability of not spending cash on health. Since the probabilities of spending and not spending the OOP are bound between 0 and 1, we transform them into odds as in equation (7) below,

$$odds_i = \frac{\pi_i}{1 - \pi_i} \quad (7)$$

Equation (7) is defined as the ratio of the event occurring to an event not occurring and can take any positive value hence no ceiling restriction. To remove the floor restriction, we take logarithms of the odds to obtain log-odds as.

$$\text{logit}(\pi_i) = \ln\left(\frac{\pi_i}{1 - \pi_i}\right) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \dots + \beta_k X_{ik} \quad (8)$$

Equation (8) implies that as the probability of a household individual member of spending cash on health, π_i , approaches zero, the odds approach zero too while the logit approaches $-\infty$. On the other extreme, both the odds and the logit approaches $+\infty$ as the probability of spending from OOP approaches 1. The equation further displays that the underlying probability π_i is a linear function of the predictors.

From equation (8), assume $\text{logit}(\pi_i)$ is a linear function of predictors such that $\text{logit}(\pi_i) = X_i'\beta$, where X_i is a vector of the independent variables, and β a vector of the regression coefficients, and that there is a link function g with a gamma family distribution that relates the mean outcome of the dependent variable to linear index, $X_i'\beta$ expressed as;

$$X_i'\beta = g\{E(y_i|X_i)\} = \beta_0 + \beta_1X_{i1} + \beta_2X_{i2} + \beta_3X_{i3} + \dots + \beta_kX_{ik} \quad (9)$$

The inverse of the link function, g^{-1} maps $X_i'\beta$ into the expected value, μ , which is the exponentiated linear index function, conditional on the observed characteristics of the outcome variable, y_i as;

$$\mu_i = E(y_i|X_i) = \exp(X_i'\beta) = g^{-1}(X_i'\beta) = g^{-1}(\beta_0 + \beta_1Ins + \beta_2Educ + \beta_3Ag + \beta_4Inc + \beta_5Emp + \beta_6Hv) \quad (10)$$

where $E(y_i|X_i)$ is the expected value of the dependent variable, X_i is a vector of choice variables influencing health expenditure which include health insurance as the variable of interest and a set of other controls, and β is a vector of estimated parameters. From equation (11), the link function g is the natural log.

Since in the second part the dependent variable measured the levels of OOP health expenditure and considering the data has many zeros reported values for cash payments, this study modelled the outcome variable so as to achieve prediction of the conditional means, incremental effects, and marginal effects of the actual outcomes. In this approach, it is assumed that the density of the outcome contains a mixture of processes that generates both zero and positive values (Deb et al., 2017).

Consider an observed outcome y_i and a vector of covariates X_i , and the density of y_i be φ_0 when $y_i=0$ and φ_+ be the density of y_i when $y_i>0$. The density function $g_i()$ of y_i can be written as;

$$g_i(y_i|X_i) = \begin{cases} \{1 - Pr(y_i > 0|X_i)\} * \varphi_0(0|y_i = 0, X_i) & \text{if } y_i = 0 \\ Pr(y_i > 0|X_i) * \varphi_+(y_i|y_i > 0, X_i) & \text{if } y_i > 0 \end{cases} \quad (11)$$

where $\varphi_0(0|y_i = 0, X_i) = 1$ since it defines a degenerate density at $y = 0$. The joint density, $g_i(y_i|X_i)$ decomposes into the product of the probability that the outcome y_i is in a certain subdomain multiplied by its density on condition that

it is in that subdomain. When there is a dependence between the part that determines whether $y = 0$ or $y > 0$ and the part that models $E(y_i|X_i, y > 0)$, we can identify $E(y_i|X_i)$. The two-part model decomposition property allows us to model the estimation into parameters of the model for $Pr(y_i > 0|X_i)$ and $\varphi_+(y_i|y_i > 0, X_i)$, separately. The specific two-part modelling choices applied in our study were the logit, typically specified as $Pr(y_i > 0|X_i)$ and generalized linear model, $E(y_i|y_i > 0, X_i)$ with a log link for part one and two respectively. The expected value would be represented as;

$$E(y_i|X_i) = \frac{1}{1+e^{-x_i' \alpha}} * e^{x_i' \beta^{GLM}} \quad (12)$$

3.4. Estimation issues

While executing the model estimation process, several data and estimation challenges might be encountered. One main problem our study is likely to encounter is the issue of endogeneity. This challenge occurs when the error term (which contains unobserved factors) correlates with an explanatory variable. In our case, health insurance status, which is the explanatory variable of interest may be correlated with these unobserved factors. This is because the perception held in the health economics literature on the selectivity into health insurance plans is that less healthy persons who are risk-averse would choose indemnity plans with higher premiums and wider coverage, unlike healthier individuals who tend to enroll in the managed care plans with less premium payments. Additionally, the decision of enrolling for an insurance plan is determined by among other factors; risk preferences, and preferences over intensity of treatment, which are mostly unobservable. As such, proceeding with the model estimation without first addressing the problem might lead to inconsistency and biasness of the estimation results.

To control for potential endogeneity in the model, some useful approaches are suggested in the existing literature which include among others, the Two Stages Residual Inclusion (2SRI). The procedure requires identification of an appropriate instrument, z_i (in our case, if any household member is insured) that correlates with the endogenous variable but is uncorrelated with the disturbance term (Ruhara & Kioko, 2016). The implications of this condition are that: a) the $cov [z_i, (\varepsilon_i, u_i)] = 0$ and b) z_i should not have an impact on health insurance. The first stage requires that we regress health insurance status, which is the endogenous variable against the identified instrument and all other exogenous variables,

and then predict the insurance residuals. We then proceed to the second stage where regression is run on all explanatory variables, the endogenous variable, and the insurance residuals obtained in stage 1 as an additional regressor. According to Mwabu (2008), inclusion of the residuals allows the endogenous variable to be treated as an exogenous covariate in the estimation. This is done since the residuals serve as controls for latent factors correlated with the covariate in question. Estimation of the insurance model in stage 1, which treats the variable as a binary indicator is expressed as;

$$\Pr(Ins = 1|z_i, X) = \frac{\exp\{x_i'\beta\}}{1+\exp\{x_i'\beta\}} = \frac{\exp\{\beta_0 + \beta_1 Hh_I + \beta_2 Educ + \beta_3 Ag + \beta_4 Inc + \beta_5 Emp + \beta_6 Hv\}}{1+\exp\{\beta_0 + \beta_1 Hh_I + \beta_2 Educ + \beta_3 Ag + \beta_4 Inc + \beta_5 Emp + \beta_6 Hv\}} \tag{13}$$

where *Ins* is insurance status, *z_i* is the instrumental variable, *X* are the explanatory variables, and β_j are the estimation coefficients. From this model we predict the insurance residuals, and denote them as *IR*. We then proceeded to the second stage where we estimated the two-part model as in equations (8) and (11) for part one and two, respectively. In this estimation, however, we included the insurance residuals as an additional regressor. The models were thus reformulated as in equations (14) and (15) below. The standard errors of the model were predicted by bootstrapping. The bootstrapping of the standard errors is done since the 2SRI inserts the predicted residuals from stage one in to the main equation. For this reason, the standard errors computed by the regression do not reflect that this is the estimate of the true error.

$$\pi_i = \Pr(HE > 0|X) = \frac{\exp[\ln(\frac{\pi_i}{1-\pi_i})]}{1+\exp[\ln(\frac{\pi_i}{1-\pi_i})]} = \beta_0 + \beta_1 Ins + \beta_2 Educ + \beta_3 Ag + \beta_4 Inc + \beta_5 Emp + \beta_6 Hv + \beta_7 IR \tag{14}$$

$$E(y_i|X_i) = E[OoPEx_i|X_i] = g^{-1}(\beta_0 + \beta_1 Ins + \beta_2 Educ + \beta_3 Ag + \beta_4 Inc + \beta_5 Emp + \beta_6 Hv + \beta_7 IR) \tag{15}$$

Use of instrumental variable (IV) method is faced with a challenge of identifying a valid instrument for the endogenous variable, in our case, health insurance status. According to Angrist and Krueger (2001), an appropriate instrument must possess three properties of relevance, strength, and exogeneity. Our study proposes to use presence of any health insurance cover among any household member as a potential instrument. Presence of health insurance cover of any member of the household is assumed to be correlated with health insurance sta-

tus of an individual member of that household. This is so because in many of the insurance plans, immediate family members, such as spouses and children, are covered under the principal cover holder, and so may not necessarily take another cover. Moreover, the correlation between the instrument and the response variable is not direct but through the endogenous covariate. We performed the Durbin–Wu–Hausman tests for endogeneity and Wald tests of exogeneity to determine the validity of the identification variable. The Durbin–Wu–Hausman test of endogeneity is done by comparing the IV estimates to Ordinary least squares (OLS) estimates. The Wald test, however, seeks to test the significance of residual coefficients when an IV is used.

4. Research findings and discussions

4.1. Model estimates with and without controlled endogeneity

Table 2 below presents the findings of the study for and without controlled endogeneity. For the case where endogeneity is not corrected for, the coefficient estimates for insurance status are shown to be positive in both parts of the model. However, the statistical significance of the estimates differs, where in part-one the coefficient is statistically significant at 5 percent level, while in part-two it is not statistically significant. People with health insurance spend more cash on health care compared to those without insurance. Although this is contrary to the intuitive expectation of the phenomenon, the relationship concurs with the finding by Wagstaff and Lindelow (2008) who argued that uptake of insurance motivates individuals to seek expensive medical treatment that incentivizes care providers to hike the prices, and so engage in price gouging. A similar result was revealed in Ataguba and Goudge (2012) who found that health insurance did not have significant different in terms of health care spending for people who have insurance and those who did not. These findings, however, differ with Ying and Chang (2020); Galárraga et al. (2009) who noted that investing in health insurance did reduce OOP spending on health care since health insurance has a shielding and crowding out effect on private health care spending.

Table 2. Two-part model with and without controlled endogeneity

Variables		Two-part model that does not control for endogeneity				Two-part model that controls for endogeneity			
OOP Healthcare/ Expenditure	Obs.	Coef.	Std. Err.	z	p-value	Observed Coef.	Bootstrap Std. Err.	z	p-value
logit model [*]									
Insurance status	6,961	.2224146	.0909101	2.45	0.014	.2178262	.0847513	2.57	0.010
**Education									
Primary	6,961	-.2828993	.2603703	-1.09	0.277	-.2814758	.2558793	-1.10	0.271
Secondary	6,961	-.3089567	.2694926	-1.15	0.252	-.3076531	.2716947	-1.13	0.257
Post-secondary	6,961	-.2750231	.2872700	-0.96	0.338	-.2709822	.2810072	-0.96	0.335
Age	6,961	.0075597	.0019697	3.84	0.000	.0074986	.0017258	4.34	0.000
**Income									
Second	6,961	-.1563771	.1243226	-1.26	0.208	-.1605444	.1344851	-1.19	0.233
Middle	6,961	.103976	.1059293	0.98	0.326	.1006032	.1068128	0.94	0.346
Fourth	6,961	.2150245	.1117114	1.92	0.054	.209913	.1178793	1.78	0.075
Richest	6,961	.4476386	.1282598	3.49	0.000	.4441987	.1426902	3.11	0.002
Employment	6,961	.3208721	.0767396	4.18	0.000	.3248914	.080717	4.03	0.000
Health visits	6,961	-.3779005	.1622985	-2.33	0.020	-.3772234	.1622669	-2.32	0.020
Insurance residuals						.0107722	.0303886	0.35	0.723
_cons	6,961	-1.802846	.3230742	-5.58	0.000	-1.799848	.3369773	-5.34	0.000
generalized linear model (glm)									
Insurance status	6,961	.1899439	.1903527	1	0.318	.2213643	.1813923	1.22	0.222
**Education									
Primary	6,961	-.4241459	.5539473	-0.77	0.444	-.4345189	.3473465	-1.25	0.211
Secondary	6,961	-.3678636	.5822834	-0.63	0.528	-.3775857	.3072401	-1.23	0.219
Post-secondary	6,961	.3474252	.6196544	0.56	0.575	.3633483	.3488137	1.04	0.298
Age	6,961	.0175182	.0042812	4.09	0.000	.0174457	.0034124	5.11	0.000
**Income									
Second	6,961	.3107312	.2770199	1.12	0.262	.3121865	.2688815	1.16	0.246
Middle	6,961	.0830856	.2366593	0.35	0.726	.0785664	.2334415	0.34	0.736
Fourth	6,961	.4212308	.2486319	1.69	0.090	.4200457	.202478	2.07	0.038
Richest	6,961	.8853248	.2854208	3.1	0.002	.8546175	.3171885	2.69	0.007
Employment	6,961	-.5266555	.1661501	-3.17	0.002	-.5279589	.1577221	-3.35	0.001
Health visits	6,961	.5663061	.3400734	1.67	0.096	.5856831	.2370841	2.47	0.013
Insurance residuals	6,961					-.0715687	.0286491	-2.50	0.012
_cons	6,961	5.009316	.6752872	7.42	0.000	4.998661	.5379171	9.29	0.000

* Represents part one of the model.

Source: Author's own computation.

For the case of controlled endogeneity, the results indicate that the coefficient estimates for insurance status are positive in both parts of the model. However, the significance level of the coefficients differs in both parts. In part one, the coefficient is statistically significant at one-percent level while in part two, it is statistically insignificant. Individuals with health insurance cover spend more from OOP on health relative to those without insurance. This can be argued that, people with insurance cover seek medical treatment relying majorly on the cover. However, since many insurance plans have conditionalities for cover, some of which include cost sharing, these insured individuals end up paying more from OOP compared to those without insurance. This occurs especially due to price gouging effect, where health care providers choose expensive treatment for the patients (Wagstaff & Lindelow, 2008).

4.2. Marginal and incremental effects

Marginal and incremental effects of health insurance on OOP health expenditure for controlled and without controlled endogeneity are presented in Table 3. For the case where endogeneity is not corrected for, the results show that the incremental effect of Insurance status averages Ksh 27. This implies that holding other factors constant, an additional Ksh 27 (USD 0.24) is spend from OOP on health care per month by persons with health insurance compared those without insurance cover. The effect is statistically significant at 10-percent level. With controlled endogeneity, the results show that the incremental effect of Insurance status averages Ksh 29 (USD 0.26). This implies that holding other factors constant, persons with health insurance spend an additional Ksh 29 more on health care per month compared to those without insurance cover. The effect is statistically significant at 5-percent level.

Table 3. Marginal and incremental effects

Variables	Marginal and incremental effects for the Two-part model without controlled endogeneity				Marginal and incremental effects for the Two-part model with controlled endogeneity			
	dy/dx	Std. Err.	z	P-value	dy/dx	Delta- method Std. Err.	z	P-value
1	2	3	4	5	6	7	8	9
Insurance status	27.05487	15.16498	1.78	0.074	29.02387	13.23566	2.19	0.028
**Education								
Primary	-56.89563	69.58549	-0.82	0.414	-57.57664	46.68231	-1.23	0.217
Secondary	-54.71843	70.99649	-0.77	0.441	-55.3812	44.93746	-1.23	0.218

Table 3 cont.

1	2	3	4	5	6	7	8	9
Post-secondary	15.83655	80.47046	0.20	0.844	18.46747	51.14152	0.36	0.718
Age	1.721899	.3910559	4.40	0.000	1.710863	.3289042	5.2	0.000
**Income								
Second	8.116396	13.96963	0.58	0.561	8.084581	14.8063	0.55	0.585
Middle	7.914203	11.48035	0.69	0.491	7.613213	12.1089	0.63	0.530
Fourth	34.97727	15.56413	2.25	0.025	34.87222	13.46905	2.59	0.010
Richest	106.1545	31.51645	3.37	0.001	102.1766	36.52329	2.8	0.005
Employment	-19.04137	13.32182	-1.43	0.153	-18.87155	13.34956	-1.41	0.157
Health visits	18.51253	26.62698	0.70	0.487	19.93251	18.60891	1.07	0.284
Insurance residuals					-4.54197	3.534145	-1.29	0.199

Note: dy/dx for factor levels is the discrete change from the base level.

Source: Author's own computation.

4.3. Discussion of the results

From the corrected model estimates and the marginal and incremental effect predictions, we can summarize the findings as follows: 1) That individuals with health insurance cover spend more from OOP on health care, compared to those without it. This could be due to the structure of health insurance plans in Kenya which are mostly designed to require members cost share a certain percentage of medical expenses as a condition for cover. The finding is consistent with Wagstaff and Lindelow (2008) on a possible price gouging. 2) That the level of education attained by an individual does not significantly affect their probability of OOP health care spending, neither the level of such spending, if any amount is spent. 3) That an additional year of life of an individual increases the chances of cash payment for health care. This could be due to the fact that as one grows of age, they stand exposed to diseases and injury, which amounts to health care spending if they strike. 4) That individuals with higher levels of income, which is represented by fourth and richest wealth categories, spend higher amounts of cash on health care, and that their unconditional levels of spending are actually higher compared to those in lower income levels. This could be due to the fact that richer persons are better positioned to pay for health care services if it is required of them compared to the poor. The findings imply that, for health insurance to have a cushioning effect against OOP payments, reforms of the health insurance market should be done to allow for more generous covers or even consider a universal coverage plan for all people that is public funded.

5. Conclusions and policy implications

5.1. Research contribution

The contribution of this study was two-fold. First, it established the effect of health insurance on OOP health care expenditure in Kenya, which was the overall objective of the study; and second, employed a new methodology of the two-part estimation approach to answer the research questions. While doing the estimation, the main questions of interest were, what advantage does an insured person have over uninsured person on the probability to spend from OOP on health; and to what level does one spend from OOP on health if they have health insurance or not? The overall results of the study showed that controlling for other factors, an insured person is more likely spend more money from OOP relative to uninsured one. However, in the event that any cash is paid, an insured person would incur OOP health expenditure of about Ksh 29 (USD 0.26) per month more compared to the one without cover controlling for other confounders. This finding is indiscriminate of which insurance cover one has, that is, whether it is publicly or privately funded.

5.2. Practical implications

Whilst this study borrows from the literature that uptake of health insurance is a viable and crucial way of protecting individuals and households against health care financial risks, such as those involving cash payments, more attention should be given to the structural reforms of health insurance market, plans and the ability of people to pay for the said covers. This is informed by the findings of this study which revealed that a mere possession of health insurance cover was not adequate in shielding people from adverse OOP health spending. However, reforms targeted at making the insurance policies more accommodative of financial needs of patients could help achieve the desired outcome. Challenge of affordability and cases of insured people all the same experiencing impoverishment due to unforeseen health financial burdens are still evident since majority of people are low-income earners. While the government tries to devise other ways of boosting economic wellbeing of the people, implementation of health programs such as the Universal Health Coverage (UHC) will go a long way in mitigating these unwanted OOP payments. Rolling out of the UHC program implies that members of the public can access and use health care services free

of charge, thus eliminating the possibility of inequality in health care demand between and among persons of different socioeconomic status. Policymakers should also embark on formulating policies and guidelines of bringing reforms in the health sector and care provision to minimize conditions that end up forcing people even those with insurance to pay cash for medical treatment. This can be partly achieved by ensuring the insurance plans offered in the market are more generous and favorable in terms of monthly premium contributions from their membership.

5.3. Research limitation and future works

The main limitation to this study was unavailability of a more recent dataset on the KHHEUS series which is released by Kenya National Bureau of Statistics (KNBS) periodically. The latest available series is the 2013 release, that was used for analysis in this research. As an extension of research in this subject, however, future studies should seek to estimate the effect of other predictors on OOP health care expenditure, probably employing a different methodological technique such as a multinomial estimation model where health insurance is modelled in its various types. This would assist in establishing whether or not an uptake of various types of health insurance differently impacts OOP health expenditure.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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